# COMPARISON OF LIFESTYLE, NUTRITIONAL STATUS AND VULNERABILITY AMONG THE ELDERLY IN RURAL AND URBAN AREAS OF IBADAN, NIGERIA

**BY**

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## DEDICATION

This thesis is dedicated to Almighty God who inspired me and to my late mentor and former supervisor, Professor Isaac Olaolu Akinyele (1947-2014)

## ABSTRACT

The proportion of the elderly (≥65 years) is increasing in Nigeria and presently constitute 3.2% of the population. Although adequate nutrition is essential for healthy ageing, many elderly become vulnerable to nutritional deficiencies and associated risks. Information on rural/urban differentials in nutritional vulnerability is essential to designing programmes that promote healthy ageing and quality of life. This study was aimed at investigating rural/urban differences in lifestyle, nutritional status and vulnerability of the elderly in Ibadan.

Using a comparative cross-sectional survey, stratified sampling technique was used to select two urban and two rural Local Government Areas. Cluster and simple random sampling were used to select wards/communities and respondents respectively. A total of 168 (Urban) and 178 (Rural) respondents were chosen for the study. A semi-structured questionnaire was used to collect information on socio-demographic and lifestyle profile of the respondents. Socio-Economic Status (SES) was categorised as low (6-13), moderate (14-21) and high (22-29) using education, income, employment status, property ownership, housing type and source of drinking water. Lifestyle was assessed using three indices: smoking, levels of alcohol intake and physical activity. Direct weighing method was used for dietary assessment while energy and nutrient intake were determined using the Total Dietary Assessment software. Weight and armspan were assessed to calculate Body Mass Index (BMI) categorised as underweight (<16.5 Kg/m$^2$), normal-weight (16.5-22.9 Kg/m$^2$) and overweight (≥23.0 Kg/m$^2$). Nutritional vulnerability was evaluated using HelpAge-International checklist, categorised as non-vulnerable (0-5), moderately (6-14) and highly (15-38) vulnerable. Data were analysed using descriptive statistics, Chi-square test and logistic regression at 5% level of significance.

Respondents' ages were 68.9±4.7 years (urban) and 69.7±4.4 years (rural). Men constituted 58.9% and 60.1% in urban and rural areas respectively. Married respondents were 79.8% in urban and 75.8% in rural. Respondents in low SES were more (6.7%) in rural than urban areas (2.4%). Prevalence of heavy alcohol intake (>1 drink/day) (16.1%, 16.9%) and irregular physical activity (1.8%, 9.6%) were lower in urban than rural areas. Current smokers were about three times more (13.5%) in rural than urban areas (4.8%). Inadequate intakes of energy (61.3%, 52.2%), calcium (98.8%, 97.8%), zinc (82.7%, 71.9%) and vitamin B1 (51.2%, 44.9%) were higher while protein (17.9%, 19.7%) and iron (5.4%, 7.9%) were lower in urban than rural areas respectively. Underweight was significantly higher in rural (24.2%) than urban (16.7%) while overweight was higher in urban (8.3%) than rural (7.3%)

areas. In urban, 5.4% were moderately vulnerable whereas in rural area, 29.2% and 21.3% were moderately and highly vulnerable respectively. Smoking and alcohol intake had no significant relationship with nutritional vulnerability in both areas. The likelihood of being underweight was one and half times higher in rural than urban areas (OR: 1.58; CI: 0.66-3.79). Having at least moderate SES reduced the odds of being underweight four times in urban (OR: 4.22; CI: 1.41-7.76) and two times in rural areas (OR: 1.8; CI: 1.21-5.58) among other results.

Unhealthy lifestyle, undernutrition and nutritional vulnerability were higher in rural than urban areas. Nutritional intervention programmes should target the elderly in rural areas.

**Keywords:** Elderly lifestyle, Nutritional status, Nutritional vulnerability.

**Word count**: 500

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May God bless you all.

## CERTIFICATION

I certify that Mr. Oluwaseun Ariyo of the Department of Human Nutrition, Faculty of Public Health, University of Ibadan, Ibadan, Nigeria, carried out this work.



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## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BAPEN | British Association for Parenteral and Enteral Nutrition |
| BMI | Body Mass Index |
| CED | Chronic Energy Deficiency |
| CHESS | Community Health Environment Scan Survey |
| CI | Confidence Interval |
| DALYs | disability adjusted life years |
| DETERMINE | Disease, Eating poorly, Tooth loss/mouth pain, Economic hardship, Reduced social contact, Multiple medicines, Involuntary weight loss/gain, Needs assistance in Self Care, and Elder years above age 80 |
| Df | Degree of freedom |
| DFLE | Disability-Free Life Expectancy |
| DHHS | Department of Health and Human Services |
| DRI | Dietary reference intake |
| FAO | Food and Agriculture Organization |
| FFQ | Food Frequency Questionnaire |
| FOS | Federal Office of Statistics |
| g | Gram |
| HALE | Healthy Life Expectancy |
| HDI | Human Development Index |
| IU | International Unit |
| Kcal | Kilocalorie |
| Kg | Kilogram |
| LGAs | Local Government Areas |
| LSHTM | London School of Hygiene and Tropical Medicine |
| MDG | Millennium Development Goal |
| MeSH | Medical Subject Heading |
| mg | Milligram |
| MNA | Mini Nutritional Assessment |
| MNA-SF | Mini Nutritional Assessment-Short Form |
| MUAC | Mid upper arm circumference |
| MUST | Malnutrition Universal Screening Tool |
| NCDs | Non-communicable diseases |

| | |
|---|---|
| NDHS | Nigeria Demographic and Health Survey |
| NPC | National Population Commission |
| NRS | Nutritional Risk Screening |
| NSI | Nutrition Screening Initiative |
| NST | Nutritional Screening Tool |
| OR | Odd Ratio |
| PCA | Principal Component Analysis |
| RDA | Recommended Dietary Allowance |
| RDI | Recommended Dietary Intakes |
| SCREEN | Seniors in the Community: Risk Evaluation for Eating and Nutrition |
| SD | Standard Deviation |
| SES | Socio-Economic Status |
| SGA | Subjective Global Assessment |
| SNAQ | Simplified Nutritional Assessment Questionnaire |
| SPSS | Statistical Package for Social Sciences |
| UN | United Nations |
| UNFPA | United Nations Population Fund |
| USDA | United States Department of Agriculture |
| WHO | World Health Organization |
| WHS | World Health Statistics |

## OPERATIONAL DEFINITION OF TERMS

**Elderly:** Individuals aged 65 years or older (Millen & Nason, 2004).

**Life expectancy**: This is a statistical projection of the length a human being is expected to live based upon probabilities and assumptions of genetic predispositions, living conditions, medical discoveries and advances, natural disasters and other environmental factors (Vitetta & Anton, 2007).

**Human Development Index (HDI):** This is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.

**Malnutrition**: This is the imbalance between food and nutrient intake and the body's needs concerning both undernutrition and overnutrition (Chen *et al.*, 2001).

**Nutritional vulnerability**: This is defined as the presence of risk factors for malnutrition (Hewitt *et al.*, 2006) .

**Nutritional Status**: The physiological state of an individual that results from the relationship between nutrient intake and nutrient requirements and from the body's ability to digest, absorb and utilise the nutrients.

**Undernutrition**: The result of inadequate food intake, poor absorption or poor biological use of nutrients consumed.

**Household**: A group of persons who live together, shares the same food budget or eat from the same pot.

**Prevalence**: The proportion of the population that has a condition of interest at a specific point in time.

# CHAPTER ONE

## Introduction

### 1.1 Background to the study

The word "elderly" paints a picture of rare individuals with grey hairs, bent posture and poor strength in the minds of many people. However, the elderly refers to individual aged 60 years and above (United Nations (UN), 1980; World Health Organization (WHO), 2002). These sets of people permeate the entire society as about two persons celebrate their sixtieth birthday every second globally (United Nations Population Fund (UNFPA)/HelpAge International, 2012).

Projection indicated that by 2050, individuals aged at least 60 years will represent 22% of the world's population and the proportion will be higher in developing countries (United Nations Department of Economic, 2010). Though elderly Africans presently constitute only 5 percent of the global elderly population, the proportion will increase to 10 per cent by 2050 (World Health Organization, (WHO) 2012; UNFPA/HelpAge, 2012). The 2003 African Union Policy Framework and Plan of Action on Ageing identified food and nutrition as one of the 13 key areas of concern to the elderly.

Nigerians aged 60 years and above constitute 5 percent of the population, however this constitutes 52 per cent and 16 per cent of the older population in West Africa and Africa respectively (National Population Commission (NPC), 2007; WHO, 2012). Projection has shown that the proportion of individuals aged 60 years and above in Nigeria will increase to 7.4% by 2050 (UNFPA/ HelpAge, 2012). In Nigeria, individuals aged 65 years and above in 1963, 1991 and 2006 were 1,151,000 (2.1%), 2,846,840 (3.2%) and 4,536,761 (3.2%) respectively (Federal Office of Statistics (FOS), 1963; 1993; NPC, 2007), this is a three-fold increase in the number of the elderly in 43 years.

The changing demography of population ageing in Nigeria is not supported by improved standard of living and economic prosperity unlike many developed nations. Nigeria (0.453) ranked 156 out of 187 on the United Nations Human Development Index (HDI), over 70% of the population live below the poverty line (Kale, 2012) and the proportion of food insecure household is increasing (Obayelu, 2010). With high rate of poverty, poor HDI and high level of food insecurity, active ageing among older Nigerians is threatened. World Health Organization

(2002) defines active ageing as the process of optimizing opportunities for health, participation and security to enhance quality of life as people age.

Studies have established the significance of lifestyle factors in ageing and three variables; nutrition, tobacco and alcohol consumption have been shown to be of high priority (Lloyd-Sherlock, 2010; Osho, Abidoye, Owoeye, Akinfeleye and Akinbo, 2011; Steves, Spector & Jackson, 2012). Global Report has indicated that at least 20 million deaths could be prevented every year by reducing the level of exposure to lifestyle (modifiable risk) factors (Alwan, 2011). Similarly, the functional capacity and life course framework shows that decline in functional capacities associated with old age is largely determined by lifestyle factors such as tobacco smoking, physical activity, and diet and alcohol consumption (Kalache & Kickbusch, 1997). Likewise, evidences have shown that good nutritional status prevents illness, promotes recuperation from illness, health, physical performance, psychosocial well-being and healthy ageing (Drewnowski & Evans, 2001; Fried, Ferrucci, Darer, Williamson & Anderson, 2004; Foster & Gariballa, 2005; Roman, Carta, Martínez-González & Serra-Majem, 2008; Nijs, de Graaf, van Staveren & de Groot, 2009; Ahmed & Haboubi, 2010; Danthiir, Burns, Nettelbeck, Wilson & Wittert, 2011).

Inspite of these evidences, poor lifestyle and inadequate diet tremendously affect well being especially at old age. In Africa, 53.3% of deaths and 44.7% of losses to disability adjusted life years (DALYs) among people aged 60 years and above have been attributed to diet and lifestyle related factors (Kowal, Johnson and Lee, 2003). Many elderly are given to poor lifestyle, subjected to nutritional risks and eat food of low nutrient density resulting in widespread of preventable malnutrition and associated risks. Brownie (2006) identified the older population as the single largest demographic group at disproportionate risk of inadequate diet and malnutrition. Globally, almost two-thirds of the older population are at risk of nutritional deficiencies (Blumberg, 1997; WHO, 2009).

Like malnutrition, food insecurity and nutritional risks have a profound impact on quality of life of the elderly (Hickson & Frost, 2004; Brownie, 2006) and increase with advanced age (McDonald & Ruhe, 2004). The existence and extent of food security is germane because food security is considered a basic measure of population well-being (Quandt, Arcury, McDonald, Bell, & Vitolins, 2001) and for Nigeria to meet the Millenium Development Goal (MDG) 1 which seeks to eradicate extreme poverty and hunger, food insecurity among older people must be adequately addressed.

As the elderly constitute an increasing proportion of Nigeria's population, it is pertinent to examine their needs and concerns, health and related factors which have direct impacts on their well being and quality of life. The elderly is a diverse group in terms of location, age, sex, ethnicity, education, income and health. Each group of the elderly, urban or rural, has particular needs and interests that must be addressed specifically through tailored programmes and intervention models.

African Union Policy Framework and Plan of Action on Ageing (2003) indicated that majority of the elderly in Africa live in rural areas. Diverse positive and negative factors may affect lifestyle, food security, food habit and consumption pattern, nutritional vulnerability and nutritional status in both urban and rural areas especially as the gap between rural and urban areas keep increasing. Brundtland (1987) reported that in the less developed countries, place of residence influences people's lifestyles, health, economic, social and cultural activities.

Circumstantial evidences tend to support this assertion. Urban areas for example are known for a great deal of diversity and choice including improved healthcare which facilitates public health interventions, and large numbers of social networks that suggest high level of social support (Garrett & Ruel, 1999; Bourne & Steyn, 2000; Zimmer & Kwong, 2004); however, several limitations such as higher food prices, reduced purchasing power and increased competition for scarce resources reduce these choices and access to food and health care (Kjellstrom & Mercado, 2008).

Furthermore, urban elderly are less likely to depend on agricultural production to household supplement food-deficits (Ruel, Garrett, Hawkes & Cohen, 2010). In the rural areas, competitions may be less rife for the available resources and likelihood of long-lasting and more personal relationship may be higher (Zimmer & Kwong, 2004). However, choices in food and health care are often limited and diversities restricted and the traditional kinship support is eroded (Apt, 2012) thereby predisposing the elderly to nutritional risks.

These quality differentials could alter the level of exposure as well as relative effectiveness of key nutrition indicators in rural compared to urban areas.

Furthermore, data from Nigeria Demographic and Health Survey (2008) have shown rural-urban discrepancies in the prevalence and severity of malnutrition among under-five children and the dietary diversity of complementary foods. The finding suggests that even within the same national economy, place of residence can affect food intake and nutritional status. Sastry (1997) indicated that the place of residence (rural versus urban) was second only to maternal education as a socioeconomic covariate in studies of child nutrition and survival in the developing world. As a confirmation, many studies conducted among children, adolescents and mothers in Nigeria and elsewhere have shown urban/rural differences in the prevalence and severity of malnutrition (Garrett & Ruel, 1999; NDHS, 2003, 2008; Smith, Ruel & Ndiaye, 2005; Samuel, Cole & Oldewage-Theron, 2008; Uthman & Aremu, 2008; Akinyele, 2009).

Similarly, location differential have been reported in lifestyle as well as social support among adult population specifically in United States and Japan (Iwasaki, Otani, Ohta, Yosiaki, Kuroiwa & Suzuki, 2002; Fogelholm, Valve, Absetz, Heinonen, Uutela *et al.*, 2006). Irrespective of place of residence, studies in Nigeria have reported malnutrition among older population and its consequences on their health status (Ojofeitimi *et al.*, 2002; Onimawo, Echendu & Njoku, 2004; Olasunbo & Olubode, 2006**;** Fajemilehin, Ayandiram & Salami, 2007**;** Ariyo, Keshinro & Akinyemi, 2012; Olayiwola, Fadupin, Agbato & Soyewo, 2012). Nevertheless, there is a dearth of information on the effect of environment of residence (rural or uban) on the lifestyle, food security, nutritional risks and nutritional status of Nigerian elderly. The distinction is essential to designing programmes that will promote healthy ageing and quality of life. Presently, most national strategies are non-location specific and this may have contributed to the insignificant change in the trend and magnitude of malnutrition inspite of various interventions. This will also assist in understanding if divergent nutrition policies and interventions are required in addressing nutrition and food security challenges among older people in rural and urban areas.

## 1.2 STATEMENT OF THE PROBLEM

The prevalence of malnutrition is particularly high among Nigerian elderly (Ojofeitimi *et al.*, 2002; Olasunbo & Olubode, 2006; Olayiwola, 2007; Fajemilehin *et al.*, 2007; Ariyo *et al.*, 2012), and this is frequently overlooked, resulting in many negative health outcomes (Visvanathan *et al.*, 2004; DiMaria-Ghalili & Guenter, 2008). Also, the existing studies are non-comparative, thus rural-urban differentials in the lifestyle, food security and malnutrition in this age group remain unknown.

Additionally, the use of height for BMI among the elderly as used in earlier studies have been found inappropriate and often lead to underreporting of malnutrition (Ismail, Manandhar, & HelpAge International/London School of Hygiene and Tropical Medicine, 1999; Omran & Morley, 2000; Olasunbo & Olubode, 2006; Olayiwola, 2007). This suggests that the reported prevalence of malnutrition among Nigerian elderly may be an underestimation. Hickson and Frost (2003) proposed the use of demispan, armspan and knee height. This study therefore considers this gap in methodology and incorporates the new approaches in the assessment of nutritional status of the elderly.

Food consumption and food security studies in Nigeria have largely focused on households with children, adolescents and young adults, thus limited information is presently available on the food consumption and food security situation of Nigerian elderly viz a viz the accompanying rural-urbal differentials.

## 1.3 JUSTIFICATION OF THE STUDY

Poor lifestyle and inadequate nutrition increase the incidence and severity of disease, mortality, poor cognition, and hastens loss of independence in old age (Thun, Peto, Lopez, Monaco, Henley, Heath & Doll, 1997; Woo, Ho, & Yu, 2002; Ojofeitimi *et al.*, 2002). Caring for sick or invalid elderly could be an economic burden which can adversely affect the capital available for feeding and healthy living of other sub-population. Conversely, promoting good lifestyle and adequate nutrition can significantly reduce health care, economic and time cost in the treatment of preventable health conditions and enhance independence to contribute to the national development.

Older Nigerians constitute the bulk of the elderly in Africa and the large number of young Nigerians today will someday become older persons. Though malnutrition is widespread, older population remains a highly vulnerable group in Nigeria following the weakened traditional support systems and frequent omission from development programmes and policies (Ojofeitimi *et. al.*, 2002). This evolving scenario calls for increased attention on health and nutrition to forestall increasing burden of malnutrition and its health and social consequences both locally and regionally (Aboderin, 2011).

Elderly are important stakeholders in family, community and national development (Ismail *et al.*, 1999; Khayesi, 2001; Help Age International, 2002). However, malnutrition and poor health which are not inevitable may significantly restrain their contributions, thus, the health and well being of the elderly need to be promoted and sustained. Consequently, adequate information on the nutrition situation and associated factors disaggregated by localities is essential for successful advocacy to meet the challenges of the present crop of the elderly and future increase. Such information can be used in formulating, developing, planning, implementing, and evaluating policies and programmes targeted towards the elderly and thereby solve nutrition and other health related problems concerning the elderly. This rural/urban differential is essential to promote healthy ageing and health quality of life in all areas among older Nigerians.

Besides, nutritionists have focused more on the nutritional problems of young children and pregnant women thereby underscoring the importance and the economic contribution of the older population. The MDGs focus primarily on children, young people and poor people of working age without specific reference to the elderly.

Lastly, available reports indicated that in the next decade and a half, the population of older people will increase significantly and for the first time in history may outnumber the population of children below 15 years (UNFPA/HelpAge, 2012). The projection demands for increased attention on the health and nutrition care of this vulnerable group to forestall increasing health care and economic burden following preventable poor functionality occasioned by malnutrition. There is therefore a limited understanding of how location influences older Nigerians' lifestyle, food security, nutritional status and vulnerability. This study was intended to fill this gap with respect to older Nigerians.

## 1.4 GENERAL OBJECTIVE

The overall objective of this study is to assess by rural/urban comparison the lifestyles, food habits and consumption pattern, food security, nutritional status and vulnerability of the elderly in Ibadan, Nigeria.

### 1.4.1 Specific Objectives

The specific objectives were to:

i. Describe by urban/rural comparison, the socioeconomic patterns, social supports and lifestyles of the elderly in the study areas.

ii. Assess the usual food habit and consumption pattern of the elderly by location

iii. Identify factors predicting food security and nutritional vulnerability of the elderly and their relative strength at different locality.

iv. Evaluate the locality differences in the nutritional status of the elderly.

v. Identify factors predicting nutritional status of the elderly by location

## 1.5 RESEARCH QUESTIONS

The study seeks to answer the following questions:

1. How varied are the socioeconomic situation, social support and lifestyle of the elderly by location?
2. How varied are the food habit and consumption pattern of the elderly by location?
3. What are the nature, frequency and degree of nutritional risks/vulnerability among Nigerian elderly at different location and which factors suggest them?
4. What is the relationship between residential location of the elderly and their nutritional status?

## 1.6 STUDY HYPOTHESIS

The main hypothesis of the study stated in null and alternative forms, are as given below:

1. $H_{01}$: There is no significant difference in rural/urban socioeconomic variables, social support and lifestyles of the elderly.

   $H_1$: There is a significant difference in rural/urban socioeconomic variables, social support and lifestyles of the elderly

2. $H_{02}$: There is no significant variation in rural/urban food habit and consumption pattern among the elderly.

   $H_2$: There is a significant rural/urban variation in the food habit and consumption pattern of the elderly.

3. $H_{03}$: There is no significant difference in rural/urban food security and nutritional vulnerability of the elderly.

   $H_3$: There is a significant difference in rural/urban food security and nutritional vulnerability of the elderly.

4. $H_{04}$: There is no significant relationshipbetween the nutritional status of the elderly and their locations.

   $H_4$: There is a significant relationship between the nutritional status of the elderly and their locations.

## 1.7 SCOPE OF THE STUDY

Different researchers have explored several salient issues with respect to the nutrition and health of older Nigerians. This study, while contributing to the existing knowledge was limited to comparative evaluation of the following areas:

- Lifestyle and socio-economic variables in relation to dietary intake of the older Nigerians.
- Social support and age-friendliness of study areas
- Food habit and consumption pattern
- Food security, nutritional risks and associated factors
- Dietary adequacy of the elderly
- Anthropometrics measurements based on body mass index and mid-upper arm circumference of the elderly
- Determination of the relationships and their strengths among some social and lifestyle variables on one hand and nutritional status and vulnerability on the other hand.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 AGEING PROCESS AND THE ELDERLY

### 2.1.1 Ageing process

The maximum life-span for the *Homo sapiens* is presently estimated to be approximately 120 years**.** Significant change in lifespan across different generations and changing dietary habits have been explored from paleolithic period till the present time. The process that moves every individual from the state at birth towards the end of his or her lifespan is described as ageing.

According to the Medical Subject Heading (MeSH) database, ageing is the gradual irreversible changes in structure and function of an organism that occur as a result of the passage of time. Bowen and Atwood (2004) defined ageing as a series of changes that begin from conception and includes structural and functional changes. Ageing in adults brings about changes in body composition like decrease in lean body mass, total body water, muscle mass and weight as well as redistribution and increase in body fat (Deschenes, 2004; Stathopoulos, Katsimbri, Atsali, Metania, Zoubos & Skarantavos, 2011). These changes affect physical functionality: strength, endurance, balance and walking performance (Bales & Ritchie, 2002; Rockwood *et al.*, 2004), influence nutritional needs (Blumberg, 1997; Saltzman & Russell, 1998; Hickson, 2006) and ability to meet these needs (Foster & Gariballa, 2005) and consequently predisposes to poor nutritional status. Health-related quality of life include adequate nutrition and optimal functioning can however be ensured in ageing by averting malnutrition and preventing nutritional deficiencies (Amarantos, Martinez & Dwyer, 2001).

### 2.1.2 Who Are the Elderly?

The definition of the words “aged”, “elderly”, “senior citizen” or the “older person” is contentious because the chronological age definition has varied with times and development with the starting point clustering around 60, 64 and 65 years. The most common definition refers to the elderly as ‘group of persons aged 60 years and above’ (UN, 1980; WHO, 2002). Although this definition was adopted at the World Assembly on Ageing in Vienna, several researchers, international organizations and governments have used 65 years as benchmark for the elderly possibly as a result of notable changes in the age structure of the workforce globally. Besides, most national and international dietary recommendations used 65 years as the starting point for old age (Dietary Reference Intakes, 2002; Eurostat, 2009; WHO, 2010).

WHO (1993) reported increased rates of participation of 60-64 years age group in the workforce. The recent review of the age of retirement in Nigeria to 65 years and 70 years depending on profession led credence to this development. Moreover, poor record keeping among Nigerians has increased reliance on guess estimation of age or use of notable events to predict or deduce age which often may be misleading. Millen and Nason (2004) defined the elderly as individuals aged 65 years or older. For convenience and easy elimination of unqualified respondents, the elderly in this study are independent, active, community-living older Nigerians who were at least 65 years old during the data collection phase.

Appreciable differences occur within the population of the elderly and these necessitate categorization in a bid to examine physical, psychological and economic changes. Some of the reported functional classifications are 'frail versus non-frail elderly' (Rockwood, 2005); 'successful versus accelerated agers' (Rowe & Kahn 1997); 'apparently healthy versus not healthy' (Chandra, 2001); 'institutionalized versus free-living' (Wadhwa, Sabharwal & Sharma, 1997; Martínez Tomé, Rodríguez, Jiménez, Mariscal, Murcia & García-Diz, 2011).

### 2.1.3 Factors determining the proportion of elderly in a population

The global increase in the proportion of the elderly has been linked to the trio of increasing life expectancy, declining fertility and increasing survival rates (Gavazzi, Hermann & Krause, 2004). Improved nutrition, better housing, good hygiene and sanitation, and medical advances in treatment of diseases even in old age are other contributory factors as identified by Oswald and Wahl (2004). In Nigeria, these factors have manifested in various magnitude in urban and rural areas. For example, life expectancy increased from 45.5 years in 1980 to 51.9 years in 2011 with a projection of 65.7 and 66.1 years for male and female respectively by 2055 while fertility declined from 6.0 during 1950-1955 to 5.42 during 2000-2005 (United Nations Department of Economic & Social Affairs, 2004).

Data on global fertility showed that globally every home is nearing replacement value of 2.6 children per woman as against 4.2 as at 1950 (United Nations, 2010). Although the decline is not significant in Nigeria, fertility decline from 6.0 between 1950-1955 to 5.42 between 2000-2005 can be said to be substantial following the high incidence of infant and child mortality in the country. Total fertility rate is the average number of children a woman would bear over the course of her lifetime if current age-specific fertility rates remained constant throughout her childbearing years (United Nations, 2010). Fertility decline results in a decreased availability of kin and potential support ratio (Baldacci & Lugaresi, 1997).

Secondly, studies have shown that life expectancy has increased while mortality has declined especially at old age (Cai & Lubitz, 2007; Gureje, Ogunniyi, Kola & Afolabi, 2006; Crimmins, 2004; Lubitz, Cai, Kramarow & Lentzner, 2003; Apt, 1997). Life expectancy at birth is the average number of years a newborn would live if current age-specific mortality rates were to continue (United Nations, 2010). Public health advances such as decreased infant and child mortality from infectious diseases, immunization against killer diseases, and prevention of diseases contribute to increasing life expectancy and declining mortality, thus a larger proportion of people grow to adulthood compared to time past. Public health measures have also contributed to the decreased in sequelae of infectious diseases in later life. Riley (2001) attributed increased life expectancy to improved hygiene, improvement in public health, improved application of nutrition knowledge and the advances in medicines.

Lastly, the relative increase in the older population can also be linked to improved chances of surviving to old ages (Grundy & Holt, 2000; Cutler, 2001). The survival rate to a specific age x is the proportion of newborns in a given year who would be expected to survive at age x if current mortality trends were to continue for at least the next x years (United Nations, 2010).

These three factors have interplayed to produce a three-fold increase in the population of older Nigerians in the last 43 years. In Nigeria, available report has indicated a decline in infant and under-five mortality rate, increase in life expectancy at birth and at age 60 years, and an increase in survival probability of both sexes (UN World Mortality Report 2011).

### 2.1.4 Healthy Life Expectancy

Healthy life expectancy is a population-level health indicator derived from estimates of mortality and disability and addresses the question of whether observed increases in life expectancy are accompanied by decreases in morbidity (Robine & Ritchie, 1991). Liu, Yuan, Benashski & McCullough (2009) defined health expectancy as the life-years free of any form of general or specific morbidity and its consequences. This concept brings together both quantitative (mortality) and qualitative (health, nutrition and lifestyle) data to estimate the average time that an individual will live in varying health states (Lièvre, Alley & Crimmins, 2008). Several concepts have emerged to expound the concept of healthy life expectancy, these include the concept of the compression and expansion of morbidity (Fries, 2002) and the Disability-Free Life Expectancy (DFLE) (Lièvre *et al.*, 2008). Non-communicable diseases (NCDs) are well known to limit healthy life expectancy in different populations and these NCDs are lifestyle or/and nutrition related and as such modifiable. In Nigeria, an average of 10 percent of life expectancy is lost to NCDs (WHS, 2008), this is the highest in the West Africa sub-region and suggests that healthy lifestyle including good nutrition can increase number of years to be lived in good health (Table 2.1).

*Table 2.1 Comparison of healthy life expectancy in West Africa*

| | *Life expectancy at birth Both sexes (years)* | | | *Healthy life expectancy (HALE) at birth (years)* | *Years of life lost to Non-Communicable Diseases (%)* |
|---|---|---|---|---|---|
| | *1990* | *2000* | *2006* | *2002* | *2002* |
| *Global* | *63* | *66* | *67* | *58* | *33* |
| *Africa Region* | *51* | *50* | *51* | *41* | *10* |
| *Low Income group* | *55* | *57* | *59* | *50* | *20* |
| *High Income group* | *75* | *78* | *80* | *71* | *77* |
| *Nigeria* | *46* | *47* | *48* | *42* | *10* |
| *Benin Republic* | *51* | *53* | *55* | *44* | *10* |
| *Liberia* | *45* | *44* | *44* | *35* | *7* |
| *Mali* | *43* | *46* | *46* | *38* | *8* |
| *Niger* | *34* | *40* | *42* | *36* | *7* |

(Adapted from World Health Statistics, 2008)

### 2.1.5 Socio-Economic Characteristics of the Older Population

Emphasis has been laid on economic empowerment of the elderly through their sustained involvement in income-generation and other productive activities (United Nations, 2002). However, the elderly are often economically dependent and subjected to nutritional risk. Globally, poverty constitutes a major threat to the well-being of the older population and this is linked to low income, lack of pension benefits, low literacy, poor health and malnutrition (UNFPA/HelpAge, 2012). The United Nations (2010) report indicated a declining rate of employment among older population from 55% in 1950, 30% in 2000 to 18% in 2010. Unemployment and poor income predispose to nutritional vulnerability and dependency in old age (Power, 2005; Tarasuk, 2003). The poor socioeconomic condition is particularly worse in Africa. Household data from 15 countries in sub-Saharan Africa show that the incidence of poverty in households with an older person is higher than the average population in 11 of these countries **(**Barrientos, 2006**).** Studies have shown that elderly constitute one of the subpopulation with poor income, with higher discrepancies against rural elderly (Glasgow, 1993; Smith, Ruel & Ndiaye, 2005; Sicular, Ximing, Gustafsson, & Shi, 2007).

UNFPA/HelpAge (2012) revealed that population ageing is not accompanied with adequate economic development in many parts of Africa; thus older Africans are at higher risk of malnutrition than the elderly in other regions. African Union Policy Framework and Plan of Action on Ageing (2003) recognized discrimination against the elderly with consequences on health, socioeconomic well being and nutrition of the elderly. It identified that elderly Africans are consistently among the poorest of the poor, they are most affected by economic policies and their needs are seldom acknowledged in poverty reduction initiatives. Among the black in United States of America, 21 percent of the elderly population live below the poverty line and poverty rate was higher in rural than urban areas (Cawthorne, 2008). These elderly have limited access to essential health services and are unable to afford even basic medical treatment. Asagba (2005) identified that growing old in Nigeria constitutes a painful process attended by poor health, poverty and helplessness.

Socio-economic changes induce critical risk factors for malnutrition and the elderly are particularly at risk for marginal deficiency of vitamins and minerals (Meydani, 2001; Andrès, Loukili, Noel, Kaltenbach, Abdelgheni *et al.*, 2004). Furthermore, old-age support systems in form of pension and retirement programmes are inadequate in Nigeria. In African settings, there are growing concerns on the long-term viability of intergenerational social support systems, which are crucial for the well-being of both the older and younger generations (Cliquet & Nizamuddin, 1999). Additionally, low SES in old age has been shown to increase mortality rates (Bassuk, Berkman & Amick, 2002), stroke incidence (Avendano, Kunst, Huisman, Lenthe, Bopp *et al*., 2006), and reduce health-related quality of life (Huguet, Kaplan & Feeney, 2008).

Socioeconomic status (SES) is often measured as a combination of education, income, and occupation. Many studies have established that diet quality is affected by SES indicators such as occupation, education, and income levels (Galobardes, Morabia & Bernstein, 2001; Darmon and Drewnowski, 2008). Fajemilehin and Odebiyi (2011) reported that the older persons' socio-economic status and traditional lifestyle practices were strong determinant of health behaviours and quality of life. A study among the elderly in Kenya indicated that 57 percent of the older people earned incomes of less than US $25, 64 percent had only completed primary education and 1.8% had no formal education (Ondigi, 2012).

It is a common knowledge that the unemployed, poorly educated and individuals with low or irregular income are less likely to be food secured and are less likely to consume healthy diets. There are evidences to show that high quality diets (high in whole grains, lean meats, fish, and fresh vegetables and fruit) and a high content of vitamins and minerals are often expensive (Ledikwe, Blanck, Khan, Serdula, Seymour *et al*., 2006; Andrieu, Darmon & Drewnowski, 2006) whereas nutrient-poor diets (high in refined grains, roots and tubers, added sugars, and added fats) with lower intakes of several micronutrients are cheaper (Ledikwe *et al.*, 2006).

### 2.1.6 Situations of the elderly in Nigeria

As at 1991, more than four million of over 80 million household heads in Nigeria were 60 years and above, translating to 5.34%. Also almost 17,000 persons of age 60 years and above were institutionalized, about 1,400 were homeless, 103 were transient persons and 33,224 were nomadic (NDHS, 1991). National Bureau of Statistics (2011) indicated that the unemployed among the elderly aged 65 years and above was 4.2%, which is lower than 56.3% among individuals aged 15-64 years. The report further showed that unemployment was higher in the rural (25.6%) than the urban sector (17.1%). The unemployment rate as reported by National

Buraeu of Statistics (2007) also indicated that unemployment among the elderly is increasing by the year; and this is particularly worse in the rural areas (Figure 2.1).

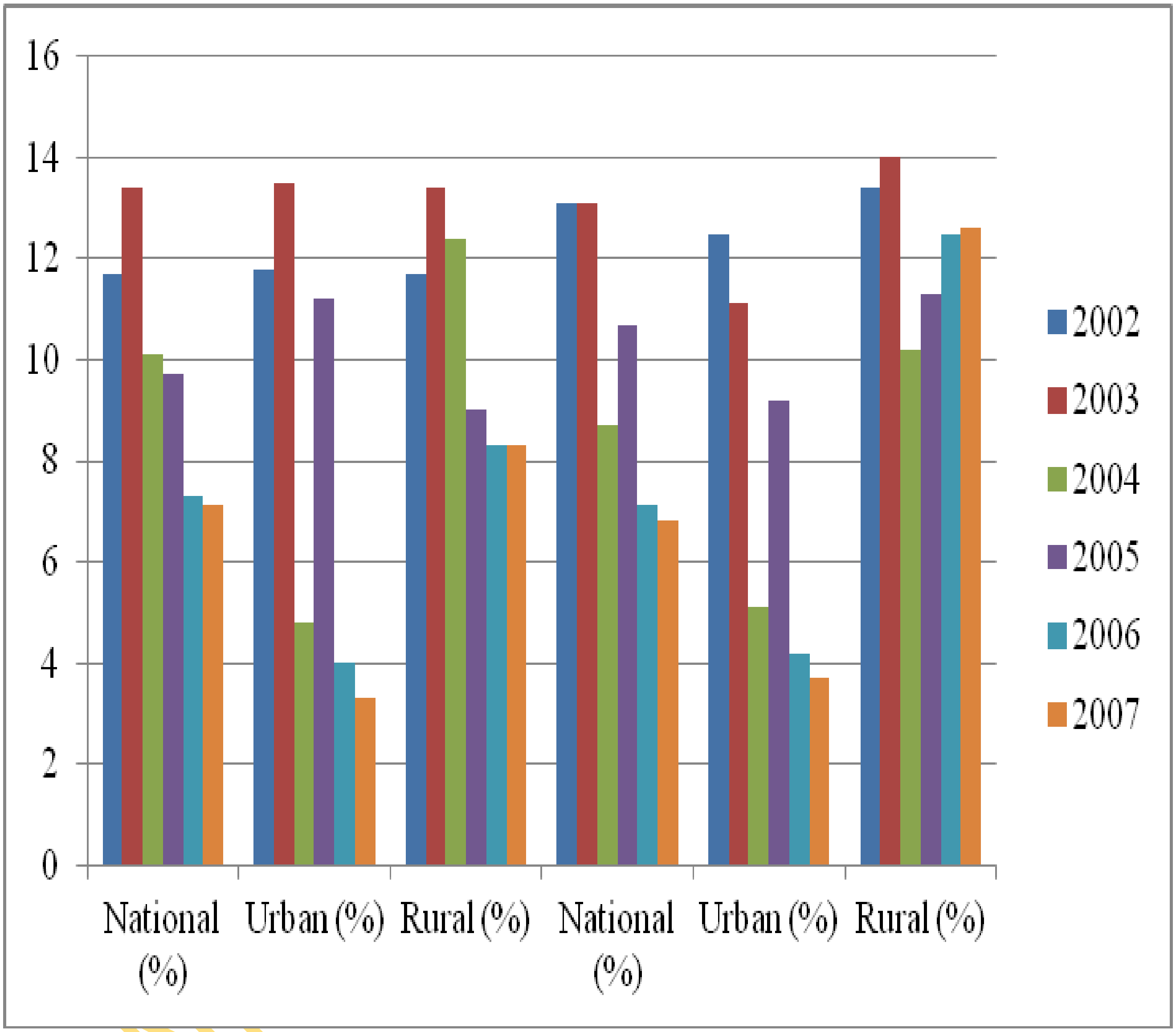
Fadupin (2013) reported high level of unemployment and poor income conditioned by lack of formal education among Nigerian elderly in Ibadan. A study in Nigeria found that income for 75 percent of the elderly was below poverty line and only 6.4 percent were on a regular pension (Baiyewu, Bella, Adeyemi, Bamgboye & Jegede, 1996). This finding suggests the increased likelihood of poverty and nutritional vulnerability in older Nigerians. Conversely, a study among the elderly Nigerians in Ilorin indicated that 66.2% were literate and 42.8% had higher education (Abdulraheem, 2007).

United Nations World Population Ageing (2010) reported that the number of older persons is increasing rapidly in urban areas of developing countries. Concurrently, the proportion of the elderly rises in the rural areas when persons of working age migrate in search of work opportunities thereby creating a double demographic burden. Urban areas are characterized by weakening traditional family support systems and rural areas are characterized by deprived living conditions and poor infrastructures (Apt, 2012). Rapid urban expansion exerts pressure on housing, health care facilities, food distribution and basic amenities.

In Nigeria, poverty is widespread and older people are more at risk since they are no longer in the economically active phase of life and there is no national social security to provide economic buffer in old age. Social network is dwindling and traditional family support is decreasing as urbanization and migration take young members of the family away, thereby leading to a reduction in the social status and influence of older people in the community (Gureje and Oyewole, 2006).

Fajemilehin and Odebiyi (2011) also reported that social support can influence specific health behavior such as diet, exercise, compliance with medical regime, smoking, and drinking of alcohol by providing information about positive health practices and by establishing norms that will encourage good health behavior. A study conducted in Delta State, Nigeria indicated that social supports for the elderly are mostly from their children, family members and friends (Okumagba, 2011). The study further identified a relationship between the number of children and availability of support at old age; and this is affected by economic, proximity and willingness on the part of the children.

Figure 2.1: Unemployment Rate among Older Nigerians (60-64, 65-70 years) by sector




Source: National Bureau of Statistics, General Household survey (2002-2007)

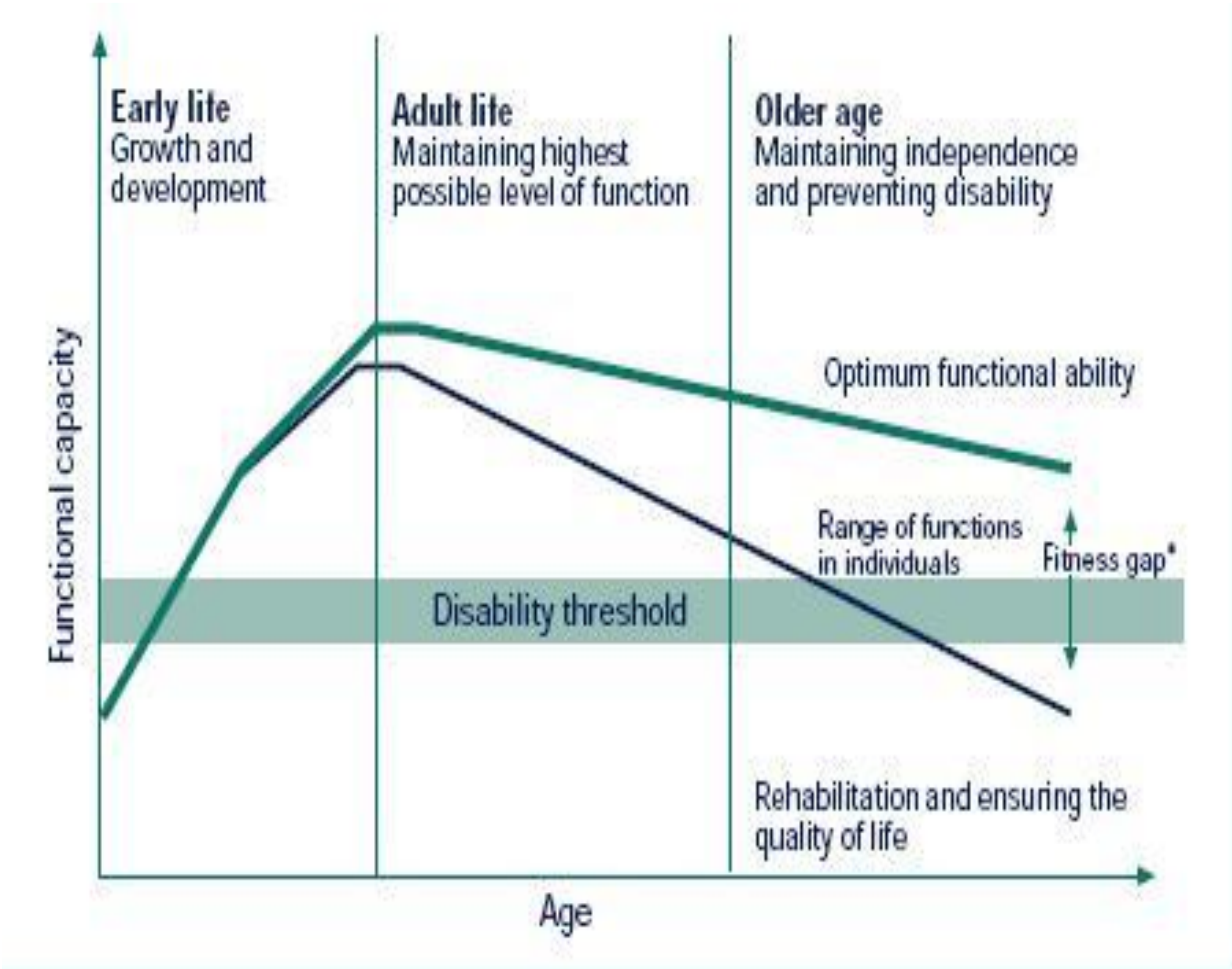
## 2.2 LIFESTYLE, NUTRITION AND AGEING

Lifestyle and nutrition are inextricably linked and both interplay in all age groups to influence health and well being. Healthy lifestyle characterized by a healthy diet, moderate physical activity and non-smoking has been shown to prevent age-related deterioration in health (Brownie, 2006; Haveman-Nies, De Groot & van Staveren, 2003). Lifestyle factors such as tobaaco smoking, unhealthy diets, physical inactivity and harmful use of alcohol increase the risk of morbidity and mortality due to Non-Communicable Diseases (NCDs).

In a study conducted by Haveman-Nies, de Groot, Burema, Cruz, Osler and van Staveren (2002), a high-quality diet, non-smoking, and physical activity were positively related to 10-year survival in older Europeans while a combination of three unhealthy lifestyle factors (smoking, physically inactivity and consumption of low quality diet) produced a three- to four fold increase in mortality risk. Likewise, studies have shown that having good nutritional status prevents illness, promotes recuperation from illness, health, physical performance, psychosocial well-being and healthy ageing (Drewnowski & Evans, 2001; Fried, Ferrucci, Darer, Williamson & Anderson, 2004; Foster & Gariballa, 2005; Roman, Carta, Martínez-González & Serra-Majem, 2008; Nijs, de Graaf, van Staveren & de Groot, 2009; Ahmed & Haboubi, 2010; Danthiir, Burns, Nettelbeck, Wilson & Wittert, 2011).

According to Maestre Castelblanque, Albert Cunat & Martinez Perez (2005), activities related to lifestyle are generally regarded as important component of instruments for the functional assessment of older patients. It is also generally known that functional capacities reach its peak in early adulthood and decline with age, and this explains why there is need to disengage certain people from service having reached a certain age. Though the decline is expected, the rate is determined to a great degree by lifestyle factors as depicted by the functional capacity over the life course (Kalache & Kickbusch, 1997). The fitness gap in the lifecourse has been interoreted to mean the impact that lifestyle factors such as smoking, physical activity, diet and alcohol consumption have on functional capacity.

Figure 2.2: Functional capacity over the life course




Source: Kalache and Kickbusch (1997)

Several variables have been used in the description of lifestyle. These include physical activity, smoking status, alcohol consumption, fruits and vegetable intake, BMI, sleep hours and number of hours spent watching television.

Studies in Nigeria have identified that moderate physical activity is essential to promote healthy older population (Ojofeitimi *et al.*, 2002; Osho, Abidoye, Owoeye, Akinfeleye & Akinbo, 2011). Physical inactivity in elderly increases the risk of developing cardiovascular diseases, osteoporosis, loss of muscle mass, and the risk of type 2 diabetes mellitus (Hui & Rubenstein, 2006). In United States, sedentary lifestyle was reportedly higher in rural than urban women. Additionally rural and urban women face different barriers and enablers to leisure time physical activity, and have a different pattern of determinants (Wilcox, Castro, King, Housemann & Brownson, 2000). Another study revealed that poor health, smoking, and physical inactivity were higher among rural cancer survivors than their urban counterparts (Weaver, Palmer, Lu, Case & Geiger, 2013).

Polidori (2003) reported that a healthy lifestyle involving regular exercise and avoidance of tobacco or alcohol abuse are essential in the prevention of several age-related diseases; and this is further promoted by intake of antioxidant nutrients. In a study conducted by Seo and Hah (2004), nutrition, physical activity and stress management were factors with high score on the subscale of health promoting lifestyle which differ with age and residential district. Dickerson, Smith and Ory (2011) reported a high level of sedentary behaviours among older adults which is characterised by longer hours of watching television than their younger counterparts. In a study conducted in Malaysia, though physical activity was high among adults and older people, smoking among older people was unexpectedly high too (Yusof, Ching, Ibrahim & Lola, 2007).

Evidences abound to show that nutrition is a key factor in successful ageing which has been defined as "maintaining a low risk of disease and disease-related disability, high mental and physical function, and active engagement with life (Rowe & Kahn, 1997)". A regular nutrition with at least five portions of fruit and vegetables per day is known to promote healthy living.

Sleep has been reported to be one of the core components of lifestyle. However, this is rarely measured as a lifestyle variable in Nigeria. Studies around the world had shown that sleep constutes an important portion of lifestyle especially in old age. A study in Okinawa, Japan identified that sleep health among the elderly is related to physical and mental health (Tanaka, Taira, Arakawa, Urasaki, Yamamoto *et al.*, 2002). Individuals engaged in long sleep duration have been found to consume fewer kilocalories per day and expended less energy in physical activity than short sleep individuals ( Nedeltcheva, Kilkus, Imperial, Kasza, Schoeller & Penev, 2009; St-Onge, Roberts, Chen, Kelleman, O'Keeffe *et al.*, 2011). Short sleep has been defined as < 6 hours per day (Gallicchio and Kalesan, 2009). The identified possible causes of the higher intake of energy among short sleep individuals include higher opportunities for eating during the day and at night, emotional stress and psychologic distress, increased susceptibility to food rewards, greater energy needs to sustain wakefulness and increased appetite (St-Onge *et al*., 2011; McNeil, Doucet and Chaput, 2013).

The harmful and beneficial effects of alcohol consumption are well known. However there is a problem in creating a definite cut-off point to distinguish between heavy and moderate alcohol intake. This is because of the variation in alcohol content by volume of drinks such as beer, light beer, craft-brewed beers/malt, light wine, fermented wine, fortified wines, and spirits. Also, what constitutes a standard drink differ by countries: a standard (unit) drink in Great Britain, United States and Japan is equivalent to 8 g, 12 g and 19.75 g alcohol respectively (Turner, 1990; DHHS and USDA, 1995).

Alcohol abuse is common in people older than 65 years and can be especially dangerous for them; alcohol can interact with medications and is responsible for many fall-related injuries. Moderate intake of alcohol has been associated with reduced risk of heart attack, atherosclerosis, and certain types of strokes (Doernberg and Stinson, 1985).

Many methods have been deployed in the assessment of alcohol intake in various sub-populations. However, the use of short-term recall methods that ask respondents for information about their actual alcohol consumption over a short period of time is considered most useful for the older population. In a short-term recall method, a respondent is prompted to cite the number of drinks that he or she consumed on each of the 7 days preceding the survey, beginning with the most recent day (Rehm, 1998). This approach assumed that respondents remember the actual alcohol consumption over short periods more accurately than they remember consumption over long periods (Dufour, 1999).

This approach is however marred by likelihood of overestimation of abstainers where occasional drinkers are involved (Searles, Perrine, Mundt & Helzer, 1995). Studies have classified the wide range of alcohol consumption found in the population into a manageable number of drinking categories. A commonly used classification includes the categories of abstainer, light drinker, moderate drinker, and heavy or heavier drinker. Dawson, Grant and Chou (1995) proposed the following definitions, where one drink is equivalent to 0.5 fl oz alcohol:

• Abstainer: drinks less than 0.01 fl oz alcohol per day (Less than 12 drinks in the past year)
• Light drinker: drinks 0.01 to 0.21 fl oz alcohol per day (1 to 13 drinks per month)
• Moderate drinker: drinks 0.22 to 1.00 fl oz alcohol per day (4 to 14 drinks per week)
• Heavier drinker: drinks more than 1.00 fl oz alcohol per day (more than 2 drinks per day).

The above definition is however non-specific with respect to age and sex and none presently exists in Nigeria. Nutrition and Your Health: Dietary Guidelines for Americans defines moderate drinking as no more than one drink per day for women and no more than two drinks per day for men below 65 years of age and no more than one drink per day for individuals aged 65 years and above (DHHS and USDA 1995). A drink refers to 12 oz regular beer (5% alcohol), 5 oz wine (12.5% alcohol), or 1.5 oz distilled spirits (40% alcohol).

Lifestyle factors such as tobacco consumption and calcium intake also influence bone density in the elderly and consequently the osteoporotic fracture risk (Nguyen, Kelly, Sambrook, Gilbert, Pocock & Eisman, 1994).

Some studies have attributed rising rates of chronic illness in developed countries to lifestyle behaviours and associated risk factors (Binkley, Eales & Jekanowski, 2000; Sherwood & Jeffery, 2000). Afoakwah and Owusu (2011) found that unhealthy lifestyle and eating habits are associated with the increasing prevalence of diet-related non- communicable diseases among adult miners in Ghana. Other studies have established a relationship between a poor diet and health conditions such as cardiovascular disease, type II diabetes mellitus, gastrointestinal disorders, dental caries and osteoporosis (Binkley *et al*., 2000; Hu & Willett, 2002).

Though a change in body composition is typical of ageing, studies have shown that unhealthy lifestyle and inadequate food intake hastens these changes and change in biochemical markers in older population (Vellas, Guigoz, Garry, Nourhashemi, Bennahum *et al.*, 1999; Rodrigue, Kennedy, Devous, Rieck, Hebrank *et al.*, 2012). Inspite of all these evidences, many Nigerian elderly live a sedentary lifestyle, some are smokers and consume alcohol heavily.

Almost one-third of adults in a study conducted in China had unhealthy lifestyle characterised by a high prevalence of current daily smoking, a moderate or low level of physical activity, low fruits and vegetable consumption and frequent occurrences of eating out (Lv, Liu, Ren, Gong, Wang & Li, 2011). In a study among the Belgian, lack of physical activity, smoking and high fat intake were identified as modifiable lifestyle risk factors for cardiovascular diseases, however, this knowledge does not translate to healthier lifestyle (Mullie & Clarys, 2011). Bedford and Barr (2005) reported that most non-vegetarian adults rarely consider various health conditions and food/nutrition concerns in their choice of foods. Lifestyle modification factors are known to optimize nutrition, physical activity and mental health and reduce the risks of disease (Vitetta & Anton, 2007; Holmback, Ericson, Gullberg and Wirfalt, 2010).

Paganini-Hill (2011) confirmed the beneficial effect of not smoking, participating in physical activities, moderate alcohol consumption, and having a normal body mass index in reduced cardiovascular death among the elderly. According to Paganini-Hill (2011), smoking increased risk of cardiovasular death by 1.95 in men and 1.67 in women; moderate alcohol intake was found to reduce risk by 15%, being underweight increased risk by 50% and obesity increases risk by 20-25%.

Earlier, Haveman-Nies *et al.* (2002) identified that a high-quality diet, non-smoking, and physical activity were positively related to 10-year survival in European men and women. For men, the mortality risk for a low-quality diet was 1.25, inactivity was 1.36, and smoking was 2.06. For women, the mortality risk for smoking was 1 .76 and inactivity 1.75, much higher than the risk associated with a low-quality diet (1.26). Likewise in another study, physical activity was reported to reduce blood pressure, increase high density lipoprotein cholesterol, decrease triglycerides, improve cardio-respiratory fitness, and produced beneficial changes in inflammatory/hemostaticfactors (Buchner, 2009). Conversely, physical inactivity has been reported to lead to increased risk of cardiovascular diseases, osteoporosis, sarcopenia and type 2 diabetes mellitus among older people (Hui & Rubenstein, 2006).

A multifaceted approach is required for the improvement lifestyle. Understanding the socio-demographic and lifestyle characteristics of the elderly could increase the effectiveness of policies aimed at promoting healthy living. Available evidence also suggests that lifestyle may vary with location. In a Community Health Environment Scan Survey (CHESS) conducted in Mexico, the environments where people live, work, and play have been reported as key factors in determining their diet, levels of physical activity, and tobacco use (Wong, Stevens, O'Connor-Duffany, Siegel & Gao, 2011).

Malnutrition increases the effects of disease and disability and lowers resistance to infection. Some of the factors affecting diet consumption, the absorption and utilization of nutrients among the elderly are discussed below.

### 2.2.1 Changes associated with ageing with nutritional implication

Ageing is typified by a multifaceted interplay of physiological, psycho-social, and functional changes, all of which can affect nutritional status of the elderly. Ageing affects nutritional needs and nutritional status of the elderly in four major ways.

Firstly, composition and physiological functioning of body tissues change with age. Notable physiological changes may include decreased lean body mass, reduced strength and weight loss (Hickson, 2006), decreased cardiac output, skeletal changes, decreased lung and kidney function (Roubenoff & Hughes, 2000; Timiras, 2003), and changes in the sensory and gastrointestinal systems (Saltzman & Russell, 1998; Rolls, 1999). Weight loss and the associated protein-energy malnutrition contribute to functional decline (Morley, 1998) and the absence of weight loss is predictive of survival (De Groot, Verheijden, De Henauw, Schroll & Van Staveren, 2004; Alibhai, Greenwood & Payette, 2005).

Decline in homeostatic control and age-related loss of responsiveness also occur with ageing. The ability to sense thirst can also be diminished with ageing (Asai, 2004). Additionally, other nutrition related changes in body function have been reported such as decreased functioning of the liver and pancreases with resulting reduced production of gastric juice, thinning of the walls of the stomach and decrease muscular activity in the gastro-intestinal tract resulting in constipation. Ritz (2000) reported a difficulty in digestion and absorption of dietary fat, calcium and vitamins B12. Another study reported reduced iron absorption in old age attributable to reduced hydrochloric acid secretion (Feldman, Cryer, McArthur, Huet & Lee, 1996). These changes may affect digestion and reduce utilization of food nutrients.

Similarly, immune function decline with age and this is worsened by inadequate diet (Yung, 2000; Ritz, 2000). Protein energy malnutrition and other nutrients deficiencies impair immune responses. Infection results in loss of appetite, poor food intake and malnutrition, which weaken the patient's resistance to further infection. Secondly, chronic diseases and disability occur more frequently thereby necessitating dietary change that may be difficult for some elderly to follow (Harman, 1981; Tucker & Buranapin, 2001).

Ageing is also accompanied by reduced ability to chew thereby affecting the types and quantities of foods consumed and reduce the intakes of fruits, vegetables and dietary fibre (Walls and Steele, 2004; Hickson, 2006). There is reduction in organoleptic abilities in old age (Schiffman & Graham, 2000), thus affecting food choices and nutrient intake. There is also a decreased ability to convert ultraviolet light from the sun into the active form of Vitamin D (MacLaughlin & Holick, 1985), thereby necessitating sole reliance on dietary sources for adequate Vitamin D intake and where intake is inadequate, calcium absorption may be impaired.

Thirdly, intake of prescription medication is often high in the elderly and these may interfere with the absorption, metabolism and utilization of certain nutrients and cause anorexia (Delafuente, 2003; Ahmed & Haboubi, 2010). Chen *et al.* (2007) identified that taking medication and being female among other variables are independent predictors of poor nutritional status among the elderly. Additionally, medical conditions and medications can influence taste and smell (Schiffman & Graham, 2000; Chen *et al*., 2007) with consequences on food intake and utilization.

Lastly, the elderly eat less, so they are less able to choose wide variety of foods that constitute a nutritious diet (Dichter, 1992). Elderly are also known to consume in small and infrequent quantities, therefore, the nutrient density of the food consumed becomes more important as people age. Studies have identified causes of the decreased energy and nutrients intake in elderly to include meal skipping and low frequency of snacking (Sharkey, Branch, Zohoori, Giuliani, Busby-Whitehead & Haines, 2002; Shahar, Shai, Vardi & Fraser, 2003).

#### 2.2.1.1 Sarcopenia

Sarcopenia is an involuntary loss of muscle mass, strength and function which may be caused by neural, hormonal and cytokine activity alterations with age (Hickson, 2006). Malnutrition and illnesses can accelerate loss of muscle and the elderly are less able to tolerate the muscle loss than the young. It is therefore desirable to reduce or prevent further loss of muscle conditioned by malnutrition. Sarcopenia causes decreased functional abilities and increased risk of falls (Cesari, Kritchevsky, Baumgartner, Atkinson, Penninx *et al.*, 2005), loss of mobility and decreased physical activity (Gariballa & Sinclair, 1998).

It is a common knowledge that strength is directly proportional to the amount of muscle;

such that people with less muscle mass are necessarily weaker than people with more muscle. Moreover, roughly two-thirds of human muscle is below the waist, therefore basic motions which are fundamental units of independence such as rising from a chair or bed, walking, and standing are affected by sarcopenia. Vetta, Ronzoni, Taglieri & Bollea (1999) indicated that although sarcopenia is common in ageing, it is worsened in malnutrition and has a serious health and quality of life consequences.

#### 2.2.1.2 Osteoporosis

Osteoporosis is characterized by the softness of bones due to loss of calcium and cholecalciferol (Vitamin D) in the body and also associated with poor quality of life (Webb, 2002) and affects majority of the elderly. Osteoporosis is one of the leading causes of pathological fractures globally, puts both moral and financial burden families with older people and constitutes a threat to the quality of life of the elderly (Nordin, Need, Steurer, Morris, Chatterton & Horowitz, 1998). Osteoporotic fractures contribute to considerable mortality, morbidity, reduced mobility and decreased quality of life. The Recommended Daily Allowances (RDA) for calcium for the elderly population above age 65 is 700-800 mg/day. The main sources of calcium in the diet are dairy products (milk, yoghurts and cheese), fish (sardines with bones), few vegetables and fruits.

Osteoporosis is worsened by malnutrition and several nutrients have been implicated in the etiology of osteoporosis; however, calcium is the most reported nutritional factor. Calcium is essential for bone strength and acts as a regulator of cellular activity in all organs of the body (Owusu, Willett, Feskanich, Ascherio, Spiegelman & Colditz, 1997; Michaëlsson, Melhus, Bellocco & Wolk, 2003). Vitamin D is closely linked with calcium absorption and utilization and the capacity of the body to produce vitamin D decreases with age, this indicates that like calcium, dietary intake of vitamin D is important in the elderly.

Ariyo *et al.* (2012) reported that only one-third of Nigerian elderly satisfied the daily calcium requirements. Though Nigeria lacks precise data on the incidence of osteoporosis and its progression, the poor dietary intake of calcium is an indication of high susceptibility to osteoporosis. Older women in Africa and Asia have been identified to have poor bone mineral status especially calcium, notwithstanding the low fracture incidence (Russell-Aulet, Wang, Thornton, Colt & Pierson, 1993; Prentice, 1997).

Like osteoporosis, osteomalacia is another common outcome of nutritional deficiency in adults with repercussion on bone health. A chronic and severe vitamin D deficiency leads to osteomalacia, a metabolic bone disease characterized by a decreased mineralization of bone. Vitamin D insufficiency is frequently found in the older individuals; the major causes are decreased renal hydroxylation of vitamin D, poor nutrition, scarce exposure to sunlight and a decline in the synthesis of vitamin D in the skin. A study on the effects of vitamin D supplementation on bone loss in the elderly, showed that supplementations with daily doses of 400-800 IU of vitamin D, given alone or in combination with calcium, are able to reverse vitamin D insufficiency, to prevent bone loss and to improve bone density in the elderly (Gennari, 2001). The RDA for vitamin D is 400-800 IU (10-20 microgram) for people aged 65 years or over.

## 2.3 FOOD INSECURITY AND NUTRITIONAL VULNERABILITY

In Nigeria, food insecurity in the general population is a potential outcome of the removal of oil subsidy and the consequential increase in the cost of living especially in food prices and poor renumeration. The vulnerable groups especially the older people are therefore readily prone to food insecurity. Quine and Morrell (2006) reported that food insecurity is an important public health and equity issue in older people that can be addressed through implementing appropriate income and social support policies. However, such policies are non existent in Nigeria and income is generally poor and many elderly are not even benefitting from the income however poor.

Many studies have been conducted on the food security of the general population in Nigeria; however, few studies have focused on the elderly. The conceptual framework of food and nutrition security identified two factors that influence food security as physical and temporal factor. The physical determinant refers to the food flow: Availability, Accessibility, and Use and Utilization. The temporal determinant of food and nutrition security refers to stability, which affects all three physical elements. The framework identified the need for a sustainable and stable availability, accessibility as well as use of foods to ensure food security.

Food insecurity is defined as “limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” (Anderson, 1990). Though this definition is widely used and generally accepted, it has failed to cover the peculiarities of the older population with respect to food security such as the importance to older people of having the right foods for health, and the inability to use food, and/or eat food that is available in the household because of functional impairments and health problems. In essence, the household may be food secure while the older person in the household remains food insecure. Therefore for the older people, food insecurity has been defined as "the inability to acquire or consume an adequate quality or sufficient quantity of food appropriate for one's health in socially acceptable ways, or the uncertainty that one will be able to do so (Wolfe, Frongillo & Valois, 2003). Measurement of food insecurity has been described as important in understanding and assessing nutritional problems (Anderson, 1990; Reuben, Greendale & Harrison, 1995; Nord, 2003).

Food insecurity and hunger contribute to poor health and nutrition in the general population; however, studies in United States have shown that older people are particularly affected (Vailas, Nitzke, Becker & Gast, 1998; Lee & Frongillo, 2001; Nord, 2003). The increasing population of the elderly people therefore requires an accurate assessment of the extent of food insecurity for programme and policy decisions (Wolfe *et al.*, 2003). Furthermore, the existence and extent of food security among older adults is of interest because food security is considered a basic measure of population well-being (Quandt *et al.*, 2001) and for Nigeria to meet the Millennium Development Goal 1 which seeks to eradicate extreme poverty and hunger, food insecurity among older people must be adequately addressed.

Food supply for the elderly can be challenging especially in Nigeria where the unemployment rate is very high and the number of active working population is significantly reducing relative to dependent people thus increasing the dependency ratio. Wolfe, Olson, Kendall and Frongillo (1998) identified that food insecurity among the elderly followed a progression of severity, beginning with compromised diet quality, food anxiety, socially unacceptable meals, use of emergency food strategies, and finally actual hunger. Studies have demonstrated the negative influence of food insecurity on health and quality of life in the general population and older people (Lee & Frongillo, 2001; Sahyoun & Basiotis, 2001; Stuff, Casey, Szeto, Gossett, Robbins *et al.*, 2004). Lee and Frongillo (2001) reported that the health of older people can be worsened by food insecurity and other studies indentified it leads to significantly reduced quality and variety of dietary intakes and lower intakes of key foods and nutrients (Rose, 1999; Tarasuk, 2001).

Many factors interplay to influence food security among the elderly. These include economic and social resources, functional status, loneliness, family size, social support, support from families and friends, physical and cognitive health problems, limited mobility, living situation, poor access to home garden and poor food management skills (High & Shackleton, 2000; Faber, Phungula, Venter, Dhansay, & Benadé, 2002; Obamiro, Doppler, & Kormawa, 2003; Frongillo & Horan, 2004; Locher, Ritchie, Roth, Baker, Bodner & Allman, 2005; O'Hare, Manning, Porter, & Lyons, 2009; Olayemi, 2012). Living alone among the elderly has been reported to be between 10.7% and over 15% (Abdulraheem, 2007; Sun, Watanabe, Tanimoto, Shibutani, Kono, Saito, Usuda & Kono, 2007) and leads to dietary inadequacies (Pirlich & Lochs, 2001; Ferry, Sidobre, Lambertin & Barberger-Gateau, 2005).

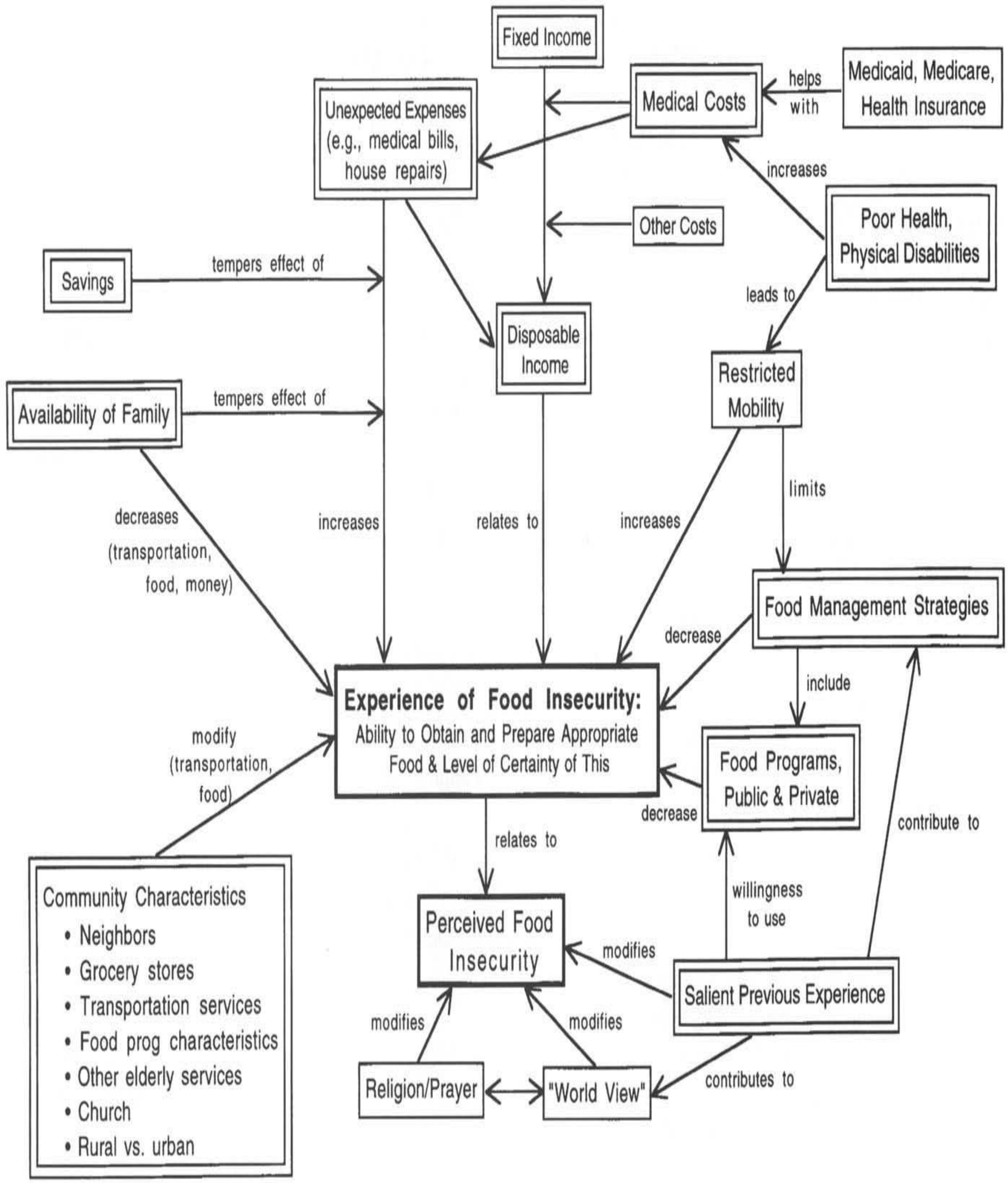
Food insecurity among the elderly can also occur as a result of lack of motivation or energy to prepare meals. Wolfe *et al.* (1996) conceptual framework of causes and methods of coping with food insecurity among the elderly identified factors that predispose older people to food insecurity to include: limited incomes, poor health and physical disabilities, high medical bills and medicine costs, and unexpected expenses such as house repairs or medical emergencies. The study further found that food programs, personal savings, proximity of children or other family members, and inventive food management strategies tempered the risks of food insecurity.

Other factors found to reduce or exacerbate food insecurity included community characteristics, such as transportation availability and proximity to grocery stores, and the elder's perception of his or her food insecurity severity and world view, particularly religious beliefs. Locher *et al.* (2005) also reported that social isolation, reduced social support and lower incomes significantly predict food insecurity. Quine and Morrell (2006) reported that older people with poor health, limited financial resources, lack of home ownership and/or who lived alone were more like to be food insecure.

Olson, Anderson, Kiss, Lawrence and Seiling, (2004) reported that almost half of families in rural areas were food insecure and food insecurity was higher when the families did not own a home, the women had less than a high school education among non-White participants and when the mother had lower levels of food and financial skills. Nord, Andrews and Carlson (2003) indicated a higher prevalence of food insecurity in non-metropolitan households than metropolitan households.

The inter-relationship of the pillars of food security as they relate to the elderly are discussed below.

Figure 2.3: Conceptual framework of food insecurity in the elderly




Source: Wolfe *et al.* (1996)

### 2.3.1 Food Access

Food access in older population can be said to be ensured when the elderly have sufficient resources to obtain appropriate foods for a nutritious diet. This largely depends on the level of available resources and food prices. Quine and Morrell (2006) found that food insecurity is common among the elderly in the community as a result of inadequate finances. In Nigeria, Olarinde and Kuponiyi (2005) reported a high level of food insecurity and income poverty in rural areas where purchasing power is very low. The quality of the diet in the elderly can be compromised due to limited access to a variety of foods or to the capacity to purchase food (Sharkey, 2004). In Nigeria, a study indicated rising prevalence of food insecurity with food insecure households increasing from 18% in 1986 to over 40% in 2005 (Ajani, Adebukola & Oyindamola, 2006). Among the elderly, the ability to generate sufficient income is often impaired, potential labor is reduced and unemployment may be high. Although no study has documented food insecurity among Nigerian elderly, available studies have shown high prevalence in the general population with 30 percent among urban households in Gwagwalada, Abuja to (Ibrahim, Uba-Eze, Oyewole & Onuk, 2009), 36 percent among farming households in Kwara State (Babatunde, Omotesho & Sholotan, 2007), and 90 percent in two urban communities of Ibadan, Oyo State (Sanusi, Manyong, Akinyele, Bamire & Oginni, 2005).

Studies in different parts of the world have identified higher prevalence of food insecurity among the elderly with low socioeconomic status, disability, those living alone, those receiving help and those that are inactive or who cannot prepare food without assistance (Lee & Frongillo, 2001; Tomstad, Söderhamn, Espnes & Söderhamn, 2011). In some developed countries, food assistance programs have been instituted to cater for the elderly, however, such arrangement is lacking in many developing countries.

Though, food access may be flexible with respect to location, for instance, older people in rural areas may have higher opportunity to practice gardening, food production and a wide variety of food preservation technique (Quandt, Popyach & DeWalt, 1994), lower incomes and poorer health (Glasgow, 1993) and high costs for food purchase (Crockett, Clancy & Bowering, 1992) still predispose to food insecurity. According to Morris, Neuhauser and Campbell (1992), rural areas have some unique characteristics affecting food availability and acquisition that might contribute to the higher prevalence of food insecurity in nonmetropolitan areas—including the limited number of supermarkets, limited availability of food items, and high relative costs of food. Studies have shown that food access is necessary to promote health and well-being (Holben & Myles, 2004; Stuff *et al.*, 2004).

### 2.3.2 Use of Food and Utilization

Food insecurity among the elderly is associated with functional limitations which can prevent the acquisition and use of appropriate foods (Gollub & Weddle, 2004). Use of food refers to the socio-economic aspect of household food security. Where sufficient and nutritious food is both available and accessible; decisions concerning food preparation, consumption and intra-household food distribution contribute to food and nutrition security. The elderly are rarely considered a priority group in decisions regarding food purchase, preparation, consumption and distribution. Utilization refers to the capacity of the human body to absorb the food eaten in an environment that supplies appropriate care, clean water, good sanitation and health services. The biological utilization of food among the elderly is less efficient (Russell, 2000). Utilization requires not only an adequate diet, but also a healthy physical environment, including safe drinking water, adequate sanitary facilities and an understanding of proper health care, food preparation, and storage processes. Reduced nutrient absorption and changes in the gastrointestinal system as a result of ageing are well known (Russell, 2000; Ritz, 2000).

### 2.3.3 Stability of food access and supply

Stability or sustainability refers to the temporal dimension of nutrition security. Maxwell and Frankenberger (1992) distinguished chronic food insecurity-the inability to meet food needs on an ongoing basis from transitory food insecurity-when the inability to meet food needs is temporary. Stability refers to the vulnerability context and risk factors that impact negatively on food availability or access to food.

Vulnerability is an important food security concept and refers to the full range of factors that place people at risk of becoming food-insecure. The degree of vulnerability of the elderly is determined by exposure to risk factors and ability to cope with or withstand stressful situations. For the elderly, the vulnerability status changes over time according to a complex combination of factors. The elderly's capacity to cope is determined by own levels of natural, physical, economic, and human assets, household production, income and consumption, and, ability to diversify income sources and consumption levels to mitigate the effects of risks at any given moment (HelpAge International, 2001).

Burt (1993) reported that the elderly do not always have adequate food; they cannot always afford to buy enough food and may not be able to go to the market or to prepare and eat the food in their homes. Help Age International (2000) noted that the elderly may be vulnerable if not empowered economically, socially, physically and psychologically. Ruel *et al.* (2010) found disproportional levels of vulnerability to food security between the poor urban households and poor rural households. Being net food buyers, reliance on income for food security, spending a large proportion of the total budget on food, the greater labor force participation of women outside the home, the greater availability of services but larger inequalities in access; the changes in lifestyle and consumption patterns, and having little access to agriculture or land are factors that make the urban poor highly vulnerable to food insecurity (Ruel & Garrett, 2004; FAO, 2008; Ruel *et al.*, 2010). However, the rural people can fall back on agriculture production for food and/or income in the short term and they often have access to land. Globally, about 97% of urban residents are net food buyers compared with 75% of rural dwellers (FAO, 2008).

The assessment of food security varies with discipline. In nutrition survey, food security assessment has been facilitated by the United States Department of Agriculture's developed Household Food Security Survey Module or simply U.S. Food Security Scale which may be used to classify the food security status (Carlson, Andrews & Bickel, 1999; Bickel, Nord, Price, Hamilton & Cook, 2000). This instrument has been shown to be valid for the assessment of food security of older population in United States (Nord, 2003; Lee, Johnson, Brown & Nord, 2011). The Food Security Scale, calculated from responses to specific questions, measures the food security of the household and classifies each as food-secure, food-insecure without hunger, or foodinsecure with hunger (Bickel *et al*., 2000).

### 2.3.4 Nutritional Vulnerability Assessment

This segment builds on the essentiality of stability in food access, use and utilization of food and considers frameworks for assessing factors influencing the health of the elderly with respect to nutrition. Studies have established that malnutrition among the elderly is easier to prevent than to treat (Larsson, Unosson, Ek, Nilsson, Thorslund & Bjurulf, 1990; Payette, 2005). It is therefore desirable to discover malnutrition at the earliest possible stage among the elderly, before severe consequences have set in.

Hewitt, Ismail, Patterson and Draper (2006) defined nutritional vulnerability as the presence of risk factors for malnutrition. Risk factors for malnutrition among older people include diseases, several medications, being female, low functional status, and symptoms of depression (Payette, 2005; Callen & Wells, 2005; Alberda, Graf & McCargar, 2006; Chen, Bai, Huang & Tang, 2007; Johansson, Bachrach-Lindström, Carstensen & Ek, 2009**).** Poor denture and problems associated with chewing and swallowing problems also subject the elderly to nutritional risks **(**Asai, 2004; Suominen *et al.*, 2005**)**. The United Nations identifies the elderly as a vulnerable group and nutritional vulnerability predisposes to several outcomes including altered infections, delayed wound healing, prolonged length of hospital stay and rehabilitation, increased need for personal help, decreased quality of life and increased mortality.

Nutritional vulnerability is particularly higher in Nigeria than in many other countries. A study conducted in Australia by Rist, Miles and Karimi (2012) identified that 34.5% of community living elderly was nutritionally vulnerable while Alert, Villarroel, Formiga, Casas and Farré (2012) reported 32.5 percent among geriatric patients in Spain. Studies in Nigeria have reported that nutritional vulnerability affect more than 75 percent and may be as high as 96 percent (Olayiwola, Olusanya & Ketiku, 2004; Olasunbo & Olubode, 2006; Olayiwola, 2007; Nzeagwu & Uwaegbute, 2010). A study in South-West Nigeria also reported that more than half (52%) of non-institutionalized elderly were malnourished (Ojofeitimi, Ijadunola, Jegede, Freeman, Owolabi *et al.*, 2002). Adebusoye, Ajayi, Dairo, and Ogunniyi (2012) also reported the prevalence of malnutrition among the elderly in a hospital setting to be 61.9%. These studies established that malnutrition is high among the elderly in different settings especially in Nigeria.

Payette (2005) had observed that malnutrition among the elderly is more difficult to treat than to prevent, it is therefore necessary to discover malnutrition early among the elderly, before severe consequences set in. This is conducted by assessment of nutritional vulnerability and various methods for such screening have been developed.

Nutritional vulnerability assessment is vital for effective use of resources in addressing malnutrition in older people. It helps in specific targeting of individuals who are most needful of nutrition intervention, prioritize services, define short- and long-term outcomes, prepare nutrition care plans, make referrals and engage community partners (Sharkey, Dean, & Johnson, 2011). There are a variety of factors that may affect the nutrition vulnerability of the elderly living in the community and many frameworks have been developed to explore this vulnerability. Alberda, Graf and McCargar (2006) broadly classified methods for detecting risk of malnutrition into nutritional screening and anthropometry in combination with biochemical markers. Risk factors for malnutrition identified in earlier studies are diseases (Chen *et al.*, 2007; Alberda *et al.*, 2006; Payette, 2005), several medications (Chen *et al.*, 2007), low functional status (Payette, 2005) and symptoms of depression (Callen & Wells, 2005; Chen *et al.*, 2007).

The importance of supportive social networks, living and eating alone, self-rated health and physical and mental wellbeing have also been explored. The American Dietetic Association defines nutrition risk screening as the process of identifying characteristics known to be associated with nutrition problems (Lacey & Pritchett, 2003). The purpose of nutrition screening can be to identify people who are malnourished or to identify currently well people who display behaviours or characteristics that put them at risk of malnutrition over time (Reuben, Greendale, & Harrison, 1995; Keller, 2007). Generally, the existing screening tools focus on three segments of older adults: community-dwelling, institutionalized or other formal care settings or acute-care settings.

Green and Watson (2006) identified 21 tools which aim to screen or assess the nutritional status of older adults. A brief review of nine common nutritional vulnerability assessment tools is presented below.

#### 2.3.4.1 Mini Nutritional Assessment (MNA)

The Mini Nutritional Assessment (MNA) is a non-invasive, well-validated tool consisting of 18 questions and is designed to quickly identify older adults at risk for developing malnutrition (Vellas *et al.*, 1999; Guigoz, Lauque & Vellas, 2002; DiMaria-Ghalili & Guenter, 2008). The tool has been used to detects risk of malnutrition and lifestyle characteristics associated with nutritional risk among community-dwelling elderly persons (Christensson, Unosson, & Ek., 2002; Guigoz *et al*., 2002), predict outcome and cost of care in hospitalized patients (Guigoz, 2006) and facilitate early intervention (Vellas *et al.*, 1999; Kondrup, Allison, Elia, Vellas, & Plauth, 2003; Green & Watson, 2006).

The MNA has two levels of screening: a short form [MNA-SF] and the long form. The MNA-SF consists of 6 questions including BMI estimation and questions about weight loss, appetite, emotion, mobility and acute illness. The long form is composed of 18 questions grouped in four categories: anthropometric assessment (weight, height, and weight loss), general assessment (six questions related to lifestyle, medication, and mobility), dietary assessment (eight questions related to number of meals, food and fluid intake, and autonomy of feeding), and subjective assessment (self-perception of health and nutrition). The maximum score in MNA is 30 and the score classifies respondents into three categories: a total score $\geq$24 indicates no nutritional risk whilst a score between17-23.5 indicates that the individual is at-risk of malnutrition and a score <17 suggests that the individual is malnourished.

Where individuals are found to be at-risk of malnutrition, a more in-depth assessment may need to occur to determine the need for intervention (Visvanathan, Penhall, & Chapman, 2004). Sensitivity, specificity and predictive values of MNA are 96 percent, 98 percent and 97 percent respectively (Vellas *et al.*, 1999). The major short-coming of the MNA is that it was originally designed for the frail elderly and for hospital setting (Guigoz, 2006). The frail elderly are the elderly with some functional impairments, such as mobility, hearing or cognitive disorders, those who live alone, in nursing homes, or who are more than 85 years old, but living in the community (Vellas *et al.*, 1999).

#### 2.3.4.2 Seniors in the Community: Risk Evaluation for Eating and Nutrition

Seniors in the Community: Risk Evaluation for Eating and Nutrition **(**SCREEN) was developed in Canada for a prospective cohort study which had the goal of assessing the association of nutritional risk with health outcomes among the elderly living within the community (Keller, Goy, & Kane, 2005). SCREEN was developed to be either self-administered or completed in an interview, without the need for anthropometric or biochemical measurements (Keller *et al.*, 2005) and has been extensively used to identify nutrition risk among community-living older people and establish the frequently occurring risk factors for poor nutrition(Watson, Zhang, & Wilkinson, 2010).

The latest version of SCREEN (SCREEN II) is a simple, easy to use tool and aims to identify currently well people who are at nutritional risk; that is, people with identified factors or characteristics related to nutrition status that, if not managed or changed, could result in malnutrition over time. The three key elements of nutrition risk in SCREEN are weight change, food intake and risk factors for impaired food intake (Keller *et al.*, 2005).

#### 2.3.4.3 HelpAge International/London School of Hygiene and Tropical Medicine Nutritional Vulnerability Checklist

The Help Age International and the London School of Hygiene and Tropical Medicine assessment tool drew from the strength of both MNA and SCREEN and it has been validated in African countries among the community living elderly people (Suraiya & Manandar, 1999). HelpAge International is a global network of over 70 not-for-profit organizations with a mission to work with and for disadvantaged elderly worldwide to achieve a lasting improvement in the quality of their lives. The checklist was designed to provide a single, rapid assessment of status and has been validated in different parts of the world. A total of thirty-eight items were used in the vulnerability assessment and each item was scored one point if the subject was susceptible to the item (Suraiya & Manadar, 1999). These items were broadly categorized into seven subtopics namely; health, food intake, economics, disability, functional ability, family life and psychological or emotional life. The tool has demonstrated validity, reliability, sensitivity and specificity (Suraiya & Manandar, 1999).

#### 2.3.4.4 Malnutrition Universal Screening Tool (MUST)

The Malnutrition Universal Screening Tool (MUST) is a screening instrument for nutrition risk in all adult patients across all health care settings in the United Kingdom (Stratton *et al.,* 2004) and has been used among adults in the community for detection of undernutrition (Elia, 2003; Kondrup *et al.,* 2003). An overall risk of under-nutrition is assessed by totalling scores for a low body mass index (BMI), the presence of weight loss, the presence of acute illness and the likelihood of experiencing reduced oral intake of more than 5 days. MUST can also be applied to adult patients of different ages (Elia & Stratton, 2004) and has been found to be a reliable and valid instrument (Kondrup *et al.*, 2003).

#### 2.3.4.5 Nutritional Risk Screening-2002 (NRS-2002)

The Nutritional Risk Screening-2002 (NRS-2002) was developed for detection of patients with undernutrition or at risk for developing undernutrition in hospitals (Kondrup *et al.,* 2003). NRS-2002 was shown in a study in Denmark to be practical, because almost all patients could be screened, and it is regarded as a reliable and valid tool (Kondrup *et al.,* 2003).

#### 2.3.4.6 Nutritional Screening Tool (NST)

The Nutritional Screening Tool (NST) was developed for use in hospitals and is recommended by the British Association for Parenteral and Enteral Nutrition (BAPEN). It has been shown that NST is a reliable and valid instrument for identifying patients at risk for undernutrition and has also been used among older patients (Elizabeth, Elia, & Emery, 2004).

#### 2.3.4.7 Simplified (Short) Nutritional Assessment Questionnaire (SNAQ)

The Simplified Nutritional Assessment Questionnaire (SNAQ) is a simple 4-item appetite assessment tool and was developed for early detection of undernourished hospital patients at their admission (Wilson *et al.*, 2005). The tool contains four questions about appetite, satiety, taste and quantity aimed at detecting risk of poor nutritional health prior to weight loss and has been tested regarding validity and reproducibility (Kruizenga, Seidell, De Vet, Wierdsma, & van Bokhorst–de van der Schueren, 2005). The maximum score is 20 and a score $\geq$ 14 indicates risk of at least 5% weight loss within 6 months. The SNAQ was derived from the Council of Nutrition appetite questionnaire which was developed using the Delphi technique (Wilson *et al.*, 2005). In a group of long term care residents, the SNAQ was shown to have sensitivities and specificities for 5% and 10% weight loss of 81.3 and 76.4 and 88.2 and 83.5 respectively (Wilson *et al.*, 2005).

#### 2.3.4.8 Subjective Global Assessment (SGA)

The Subjective Global Assessment (SGA) was developed to assess nutritional status in hospitalized surgical patients. The SGA is considered a reliable and valid method for assessing nutritional status in hospitalized surgical patients (Detsky *et al.*, 1987; Jeejeebhoy, 2000). It has also been shown to be useful in detecting the elderly suffering from undernutrition (Christensson *et al.*, 2002; Kyle, Genton, & Pichard, 2005). This tool also involves physical examinations, including anthropometric measurements.

#### 2.3.4.9 Nutrition Screening Initiative (NSI)

The Nutrition Screening Initiative (NSI) is a screening checklist that can be self-administered or used by health professionals as an alert to identify those older people living independently in the community who may be at risk of under-nutrition (Lipski, 1996). It involves three screening instruments: the DETERMINE checklist as well as the Level I and Level II (L-II) screening instruments (Nutrition Screening Initiative, 1994). The DETERMINE is an acronym for common nutrition risk indicators among older adults**:** Disease, Eating poorly, Tooth loss/mouth pain, Economic hardship, Reduced social contact, Multiple medicines, Involuntary weight loss/gain**,** Needs assistance in Self Care, and Elder years above age 80**.** The Level I screening queries weight status, eating habits, and living conditions such as isolation, depression and functional status. The L-II is more in-depth than the Level I and queries anthropometric data, laboratory data, medication use, oral health status, skin changes, eating habits, living environment, functional status, and cognitive status and is to be completed by a healthcare professional (Nutrition Screening Initiative, 1994). However, the major limitation in the use of NSI is that the food group questions are not predictive of health outcomes (Jensen, Friedmann, Coleman, & Smiciklas-Wright, 2001).

## 2.4 FOOD HABIT AND CONSUMPTION PATTERN

Better nutrition and healthy living require an understanding of food habits and dietary patterns (Oniang'o, Mutuku, & Malaba, 2003). Dietary pattern encompasses foods regularly consumed, the number of eating occasions, meal stability, snack patterns, and temporal distribution of intake. Dietary patterns are an integrated way of describing the human diet and look into meals and dishes, the food habit, meal time and effect of tradition on various dishes that are eaten (Kouris-Blazos, Wahlqvist, Trichopoulou, Polychronopoulos, & Trichopoulos, 1996; Nicklas, Baranowski, Cullen, & Berenson, 2001).

Food consumption patterns looks into social, economic and environmental aspects of foods and eating patterns. The food pattern is culture specific and could be related to health status. It acknowledges excess, deficiency or the combination in food intake. Food consumption data vary from country to country and even within a country due to variations in ethnicity, geographical areas, age and sex (Gracia & Albisu, 2001).

Studies have reported differences between the food habits in the rural and urban areas (Mennen, Mbanya, Cade, Balkau, Sharma *et al*., 2000; Yannakoulia, Karayiannis, Terzidou, Kokkevi, & Sidossis, 2004). Nzefa Dapi, Nouedoui, Janlert and Håglin (2005) found significant differences in the frequencies of consumption of the major food groups among adolescents in urban and rural areas in Cameroon. The consequences of poor dietary habits are well known and they are the major contributing factor to the increasing burden of non communicable chronic diseases.

Poor dietary patterns have been associated with chronic diseases such as certain cancers, obesity, osteoporosis, and heart disease (Quatromoni, Copenhafer, Demissie, D'Agostino *et al.*, 2002; Newby, Maras, Bakun, Muller, Ferrucci, & Tucker, 2007). Favorable dietary patterns have also been reported to promote healthy weight and good nutritional status (Ledikwe, Smiciklas-Wright, Mitchell, Miller, & Jensen, 2004).

The food pattern of individual can be positive and encourage enjoyment of appropriate dietary intake. Walqvist and Kouris-Blazos (1990) established the various diets and food pattern to good health and explained the importance of food study of the elderly as the one that helps to have a broad socio-cultural approach to food and health. In Nigeria, study has shown that the diet is mainly based on plant foods which are often deficient in mahy micronutrients (Olayiwola, Fadupin, Agbato & Soyewo, 2012).

Efforts to promote good dietary pattern are many. For instance, the Healthy Eating Index-

2005 was developed to promote good eating habits and food consumption in all age groups using the recommendations of the food pyramid and dietary reference intakes and attention was intesinfied on the elderly (Guenther, Reedy, Krebs-Smith, Reeve, & Basiotis, 2007). Walqvist and Kouris-Blazos (1990) also observed that food pattern study help to appreciate ecological and environment involvement in food intake. Food consumption pattern have been found to be strongly linked to age, educational level, and other lifestyle factors (van Dam, Grievink, Ocké, & Feskens, 2003).

Evidence has also shown that food pattern is predictive of health outcomes in the older population (Wahlqvist, Kouris-Blazos & Savige, 1998). As earlier indicated, the food habit and consumption pattern study can lead to the improved understanding of the emergence of chronic non-communicable diseases and explain geographical differences in the prevalence and magnitude of certain nutritional deficiencies and non communicable diseases. Food consumption data provide estimation on the quantity of each prepared food consumed by individuals. Food frequency questionnaire (FFQ) has been widely used to evaluate habitual food intake of population-based epidemiological studies. Interventions to modify dietary patterns have been reported to be effective in reducing risks of cardiovascular disease (van Dam *et al.*, 2003).

### 2.4.1 Food choice among the elderly

This section reflects on important factors that determine the food choice of the elderly, and consequently their food consumption. This is considered using the Falk, Bisogni & Sobal (1996) conceptual model of food choice among older population (Figure 2.4). The model illustrates the significance of social, cultural, physical environments and experiences in food choice. This encompasses the importance of childhood food experiences and preferences, which influence food habits and preferences in later years. Falk *et al.* (1996) posited that ideal; strongly held beliefs and attitudes are the major influence on food choice in the older age group. This assertion has been confirmed by other studies in different age groups (Buttriss, 1997; Verbeke, 2005).

Generally, food choice is affected by both smell and taste (Gariballa and Sinclair, 1998), however, ageing is accompanied by a decline in the sensitivity of these senses (Kaneda, Maeshima, Goto, Kobayakawa, Ayabe-Kanamura, & Saito, 2000; Schiffman & Graham, 2000). Therefore, the normal appeal or desire for a meal as a result of the aroma, flavour or taste is significantly reduced. Similarly, social frameworks strongly influence food choice process of the elderly such that socializing and companionship could override concerns about food desirability

(Falk *et al*., 1996; Furst *et al.*, 1996; Devine, 2005). Personal factors such as physiological or physical conditions also have a strong influence on food choice.

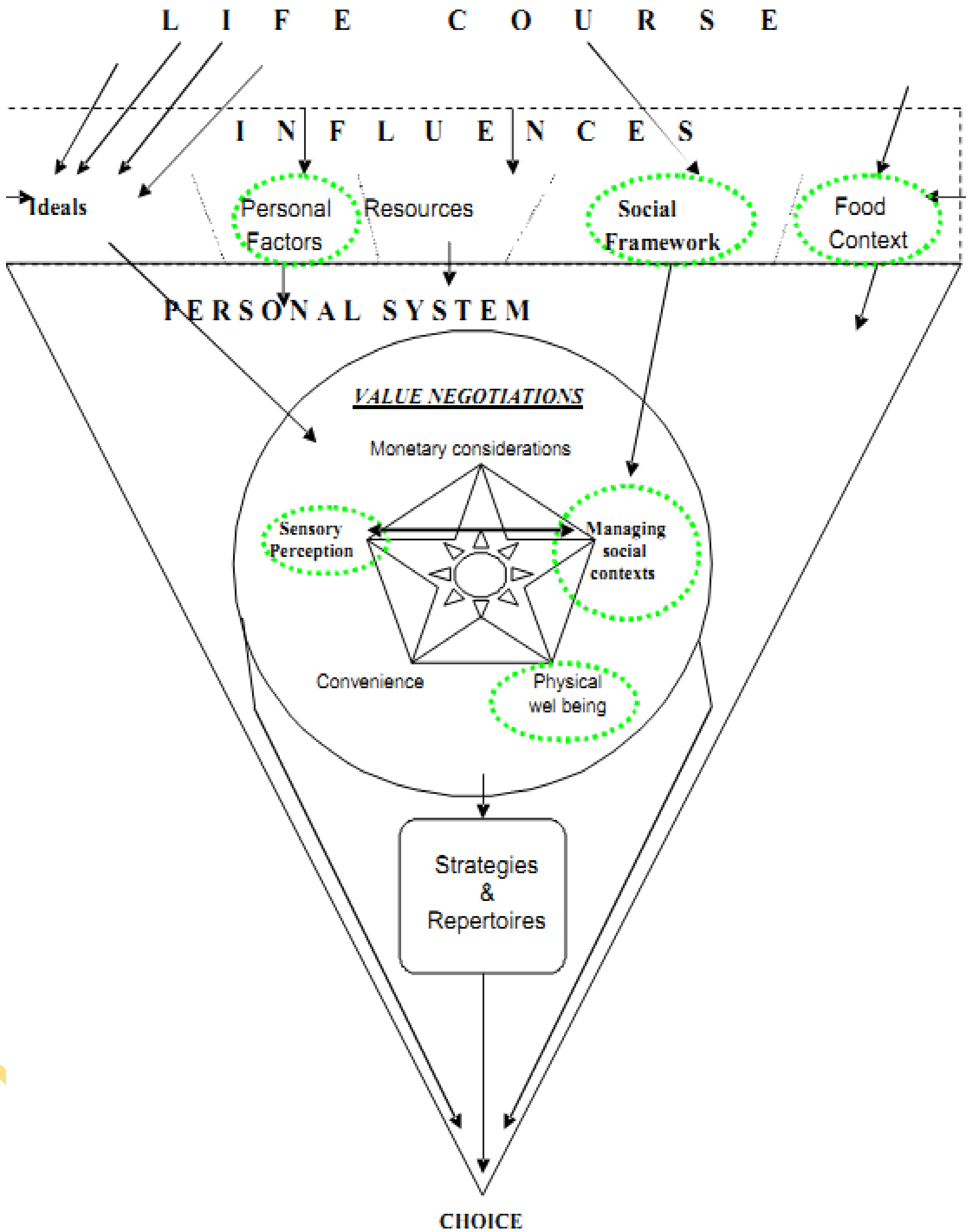
Falk *et al*. (1996) identified that problems with the digestion of certain foods, physical disabilities like arthritis, and limitations occassioned by poor dentition, influence food choice by narrowing the range of foods. Compromised dietary intakes in older adults can result from a multitude of factors: inability to purchase or prepare food, functional limitations, financial inadequacy, sensory changes, and oral health problems (Herne, 1995; Sheiham & Steele, 2001; Brownie, 2006). Important resources for the older group included available income and food preservation skills. Food context is related to social framework but encompasses the broader context of food supply factors including seasonality and market influences (Furst *et al*., 1996).

Personal systems for food choice are developed over time and this can be viewed using two components; value negotiations and strategies (Furst *et al*., 1996). Value negotiation describes the weighing of different factors when making food choices. Within these, taste was the sensory perception most frequently described as affecting food choice. Price and perceived worth were important factors especially where money was limited. The management of social context includes factors such as considering one's own needs and the needs of others, and for those living alone the practicalities of preparing meals for one and eating meals alone.

Physical wellbeing, cost and ease of procurement or preparation are more important than health and nutrition issues when making food choices among elderly (Falk *et al*., 1996; Dean, Raats, Grunert, Lumbers *et al*., 2009). When the elderly find meal preparation difficult, but are still trying to manage the task themselves, they are likely to find simple, quick and easy meal solutions.Strategies in handling difficult-to-prepare foods were elimination, limitation or substitution, and the establishment of routines (Furst *et al*., 1996).

Falk *et al*. (1996) found that the more health problems people had the more likely they were to have multiple strategies to use in different food choice situations. Taste and smell play a significant role in food choice. Sensory perception was the value most often mentioned in the Falk *et al.* (1996) study describing the elderly's food choice. Appearance, odour, texture, temperature and colour all affect food choice (Falk *et al.,* 1996). Sharkey, Branch, Zohoori, Giuliani, Busby-Whitehead, & Haines (2002) reported that a diminished sense of taste resulted in lower intakes of energy, protein, phosphorus, thiamine and riboflavin. Poor appetite has also been implicated as the likely major cause of malnutrition amongst the elderly (Hickson, 2006).

Figure 2.4: Conceptual model of the food choice processes of older adults




Source: Falk *et al.* (1996)

## 2.5 NUTRITION IN OLDER POPULATION

It is widely accepted that ëveryone irrespective of age has the inalienable right to be free from hunger and malnutrition to fully develop and maintain their physical and mental faculties. However, nutritional status of the elderly is compromised where food intake is inadequate and/or health status is poor. Old age is unnecessarily accompanied by series of health challenges and several factors limit food intakes, thus predisposing to malnutrition.

According to Hickson (2006), malnutrition is the state of being poorly nourished which can be caused by undernutrition or overnutrition. Chen *et al.* (2001) defined malnutrition in older people as the imbalance between food and nutrient intake and the body's needs concerning both undernutrition and overnutrition. Visvanathan, Penhall, & Chapman (2004) reported that malnutrition is common, frequently overlooked, and asociated with many negative health outcomes in the elderly.

The prevalence of malnutrition among older population varies with the population studied and the criteria used to define malnutrition (Chen, 2005). Johansson *et al*. (2009) found malnutrition in 4-14% of the community living elderly. Chen (2005) found that malnutrition is present in 2%-51% of community dwelling elderly depending on the definition and the population used. In high-income western countries hospitals, 25-60% of the elderly patients admitted are either malnourished or at risk of malnutrition (Persson, Brismar, Katzarski, Nordenström, & Cederholm, 2002).

In Nigeria, the prevalence of malnutrition among the elderly in hospital setting is worse with a study reporting a malnutrition prevalence of 61.9% (Adebusoye *et al.*, 2012). Among institutionalized elderly people, the reported prevalence varies between 38-62% (Pauly, Stehle, & Volkert, 2007; Kulnik & Elmadfa, 2008). A study in Japan reported the prevalence of malnutrition and risk of malnutrition among frail elderly to be 19% and 58% respectively (Kuzuya, Kanda, Koike, Suzuki, Satake, & Iguchi, 2005). In India, a study conducted by Arlappa, Balakrishna, Brahmam, & Vijayaraghavan (2006) found that two- third of Indian older adults had a body mass index (BMI) below 18.5 $kg/m^2$.

In Africa, Nyaruhucha, Msuya, & Matrida (2004) reported that malnutrition prevalence among the elderly in Tanzania varies between 23-39%. A study conducted by Chilima and Ismail (1998) found that the prevalence of under-nutrition among elderly refugees ranged from 19.5% in Rwanda to 36.1% in Malawi. Kimokoti and Hamer (2008) reported that almost half of older Africans in sub-Saharan Africa are malnourished.

In Nigeria, Olasunbo and Olubode (2006) found that 90 percent of male elderly and 96 percent of female elderly were vulnerable to malnutrition, while 37 percent and 42 percent respectively were malnourished. Nzeagwu and Uwaegbute (2010) reported that 75 percent of the elderly in a study in South East Nigeria were nutritionally vulnerable and vulnerability was higher in females than male respondents. Similar high prevalence of malnutrition among Nigerian elderly has been reported by other studies (Ojofeitimi *et al.*, 2002; Onimawo *et al.*, 2004; Ijarotimi & Keshinro, 2008). Fajemilehin *et al.* (2007) acknowledged the high incidence of malnutrition among Nigerian elderly and attributed it to lack of adequate social support.

### 2.5.1 Consequences of malnutrition in older population

Malnutrition has consequences for both individuals and society, and constitutes an increasing reason for morbidity and hospital admission (Van Nes *et al.*, 2001) and can cause delayed discharge and an increased dependence on social care and next of kin. Malnutrition predisposes the elderly to increased risk of falls, prolonged hospitalization, post operative complications, infection, complicated wound healing, reduced rates of drug metabolism and death (Chen *et al.*, 2001; Wissing *et al.*, 2001; Visvanathan *et al.*, 2003; Stratton *et al.*, 2003; Chapman, 2006). It endangers health, well-being and autonomy (Sahyoun, Serdula, Galuska, Zhang & Pamuk, 2003) and contributes to sarcopenia and reduced physical activity and functional capacity, decreased quality of life and increased morbidity (Chen, Schilling & Lyder, 2001; Van Nes, Herrmann, Gold, Michel & Rizzoli, 2001; Martin, Kayser-Jones, Stotts, Porter & Froelicher, 2005; Brownie, 2006; Oliveira, Fogaca & Leandro-Merhi, 2009). It also leads to decreased cognitive functioning (Lindeman *et al.*, 2000), reduced immunity and poor clinical outcomes (Walrand, Vasson, Lesourd, Fuller & Perdigón, 2003; Neumann, Miller, Daniels & Crotty, 2005; Lesourd, 2006) and being independent with shopping and eating (Wissing, Ek & Unosson, 2001; Visvanathan, Newbury & Chapman, 2004). Malnutrition indicated by low body-mass index (BMI) and unintentional weight loss are risk factors for increased mortality among the elderly (Dey, Rothenberg, Sundh, Bosaeus & Steen, 2001; Crogan & Pasvogel, 2003; Alibhai, Greenwood & Payette, 2005).

Quality of life is another important aspect of the life of the older people and this has been shown to be influenced negatively by malnutrition (Norman, Kirchner, Lochs, & Pirlich, 2006), eating alone and being dependent on help with shopping (Wissing *et al.*, 2001). Involuntary weight loss among the elderly occurs mostly as a result of malnutrition and was associated with disease, increased mortality, functional disability, functional limitations and health care utilization (Alibhai *et al*., 2005; Callen & Wells, 2005; Payette, 2005; Hickson, 2006). Furthermore, malnutrition induces impairments in physical performance such as reduced physical activity or work capacity (Chevalier, Saoud, Gray-Donald, & Morais, 2008), thereby, hampering the economic activity and predisposing them to another cycle of malnutrition. Stuck, Walthert, Nikolaus, Büla, Hohmann and Beck (1999) identified that a low BMI is a risk factor for impaired physical function in community living older individuals. Similarly, overweight and obesity are also associated with decreased functional capacity (Jensen & Friedmann, 2002) and economic strain (Chenoweth & Leutzinger, 2006).

Evidences also indicated that cognitive function at different periods of life is influenced by nutritional status (González-Gross, Marcos, & Pietrzik, 2001; Duthie, Whalley, Collins, Leaper, Berger, & Deary, 2002; Gureje *et al.*, 2006). The pattern of cognitive decline depends on demographic factors, lifestyle and disease related factors, and nutritional status. Studies have shown significant associations between quality of diet and cognitive functions (Marshall, Stumbo, Warren, & Xie, 2001; Haveman-Nies *et al*., 2003; Féart, Samieri, & Barberger-Gateau, 2010). Thus, individuals with poor quality diet are also likely to live with cognitive impairment. Similarly, deficiencies of vitamins B, C, E, folate and omega-3 fatty acids have been related to increased risk of cognitive deficits (González-Gross *et al*., 2001; Calvaresi & Bryan, 2001; Ruxton, Reed, Simpson, & Millington, 2004).

**2.5.2 Determinants of malnutrition**

Two frameworks have been developed to explain the aetiology of malnutrition in older people. These frameworks are the conceptual model of malnutrition in older people (HelpAge, 2001) and the framework of risk factors for poor nutritional status in the elderly (Ismail & Manandhar, 1999).

**2.5.2.1 Conceptual Model for causes of malnutrition in Older People**

The conceptual model for causes of malnutrition in older people developed by HelpAge International shows that malnutrition occurs as a result of a number of factors which act either directly or indirectly. The model identifies population level factors that potentially predispose the elderly to malnutrition. The immediate causes of malnutrition in old age are inadequate food intake and the presence of disease or chronic illness. Babatunde, Olagunju, Fakayode, & Sola-

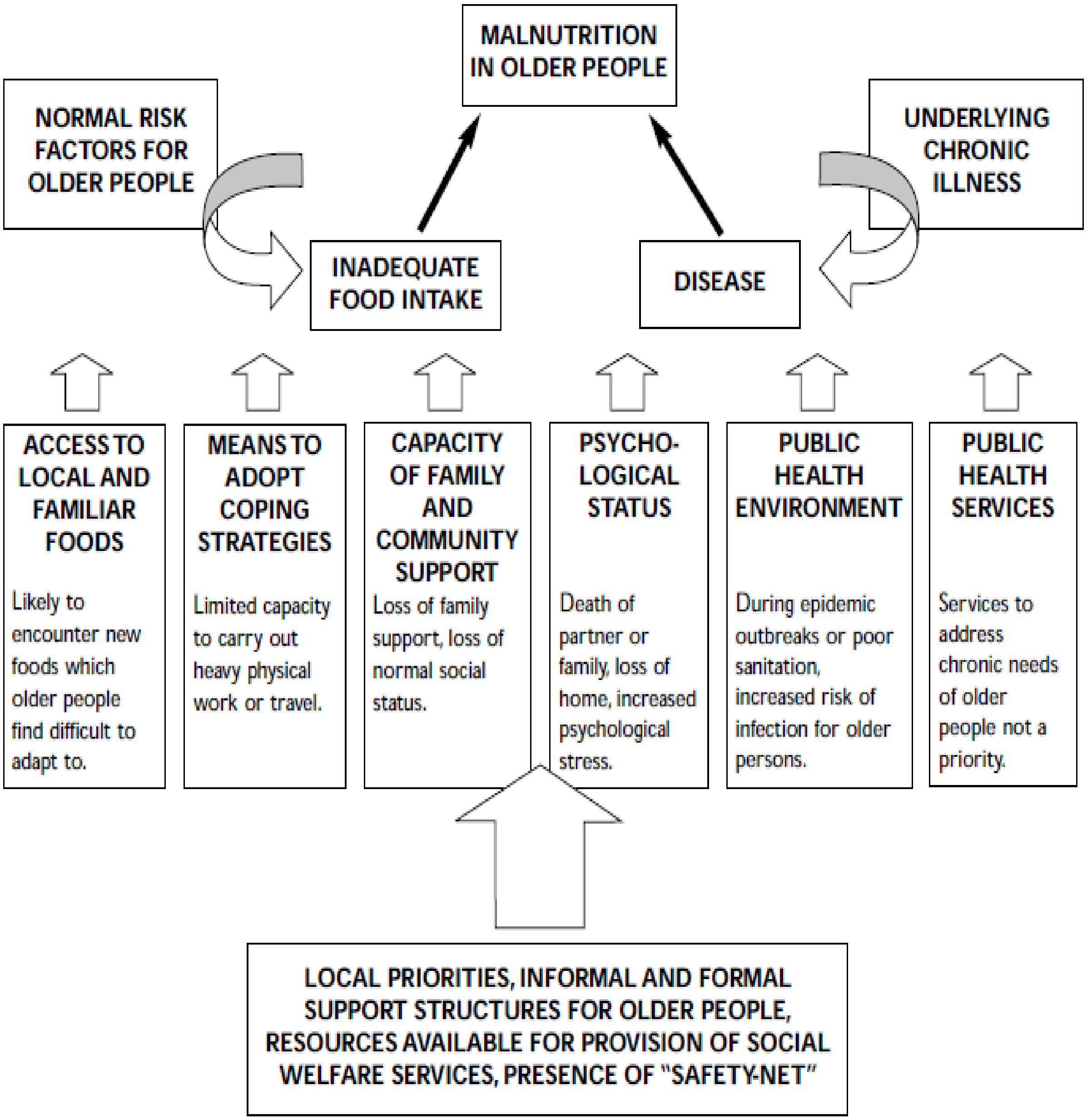
Ojo (2011) reported that malnutrition is widespread in rural areas in Nigeria partly due to inadequate food and nutrient supply. HelpAge (2002) observed that health including nutrition and material are priority concern for the elderly. Poverty as depicted by poor quality housing and living conditions among the elderly negatively impact on health. To many elderly, especially in rural areas, healthcare is poorly accessible, thus predisposing to diseases.

Food intake can be affected by myriads of factors such as capacity of family and community support which may be reduced by loss of family support and/or loss of social status; lack of means to adopt coping strategies and reduced access to local and familiar foods (HelpAge, 2001). The framework also identified the importance of adequate social support and community contribution towards enhancing health and well being of the elderly.

The elderly require supportive and enabling living environments to compensate for physical and social changes associated with ageing. These requirements are often unmet especially with the vanishing intergenerational support which offer care for older members of the community. Social support is a subjective feeling of belonging, being loved, esteemed, valued and needed. Several researchers had defined the concept of social support in various terms. Tang (2008) defined social support as a valuable resource comprising tangible and intangible forms of assistance that individuals receive from family and friends. Moraes and Souza (2005) reported that social support (mainly from the family) is an independent predictive factor for successful aging among the elderly.

Arising from these definitions, the elderly require support for healthy and actively ageing through lifestyle, dietary intake and other behaviours and where the support is not met, malnutrition often results. Several researchers regarded social support as consisting of structural, functional, and appraisal support (Oxman & Hull, 1997; Chen & Silverstein, 2000). The structural dimension of social support is the composition of the social network and the availability of people to help the elderly; the functional dimension represents the amount of instrumental, emotional, and financial backing, the appraisal dimension denotes subjective evaluation of the extent of satisfaction with the support.

Figure 2.5: Conceptual Model of Malnutrition in Older People




Source: HelpAge International (2001).

Social relationships have been shown to offer protective effect on the mortality of the older population by general social network index (Ceria, Masaki, Rodriguez, Chen, Yano, & Curb, 2001) and variables related to specific aspects of social relationships (Brown, Nesse, Vinokur, & Smith, 2003; Okamoto & Tanak, 2004; Giles, Glonek, Luszcz, & Andrews, 2005). Many older Africans live in poor economic circumstances and poorly defined social support or security to the elderly. The health and well being of the elderly largely depend on the integral existence of informal services, social support networks and kin support. According to Charlton and Rose (2001), only three African countries- South Africa, Namibia and Mauritius - provide formal economic support for older citizens. Ghana has an ageing policy but Nigeria has none. Studies in Nigeria have identified the importance of social security system in ensuring the welfare of the elderly (Wahab & Isiugo-Abanihe, 2008; Eboiyehi, 2010), however, indications showed worsening level of social support and social security. Gureje, Kola and Afolabi (2007) reported dwindling social and traditional support for Nigeria despite the harsh economic situation which the elderly are more susceptible to.

Peil (1991) reported that the Nigeria elderly are deprived of many of their roles and isolated from younger generations, who no longer listen to or support them. The study also reported that where support was available, women enjoyed higher economic help than men and elderly widows without children were the most likely group of elderly to lack enough resources and had inadequate assistance. Fadupin (2013) also reported a grossly inadequate level of social support for Nigeria elderly and that most financial and social support came from children.

Moreover, the environment support for the elderly is almost non-existent in Nigeria, facilities to suit the needs of the elderly are rarely provided in public places. The international community observed that making cities more age-friendly is a necessary and logical form of support to promote the wellbeing and contributions of older residents. To this end, the World Health Organization (WHO) Global Age-Friendly Cities Guide and Checklist of Essential Features of Age-Friendly Cities were designed to engage and assist cities to become more age-friendly (Plouffe & Kalache, 2010). Age-friendly initiative aims to improve the physical and social environments that surround the city's elders and help them remain healthy, active, and engaged in their communities for as long as possible (WHO, 2007). An Age-friendly city encourages active ageing by optimizing opportunities for health, participation and security in order to enhance quality of life as people age (Quinn, 2008; Kalache, 2009).

Akinyele (2009) attributed high prevalence of malnutrition in Nigeria to a myriad of factors, some of which also impact on older people including: the non implementation of the National Food and Nutrition Policy and the National Plan of Action for Food and Nutrition, high levels of poverty and household food insecurity in a country, lack of attention to nutrition as a critical determinant of development, low priority of nutrition on the government agenda and poor funding, poor understanding by policymakers of the content of nutrition programs in relation to other sectors, inadequate access to a healthy environment and health services, and poor environmental conditions (water, sanitation and hygiene).

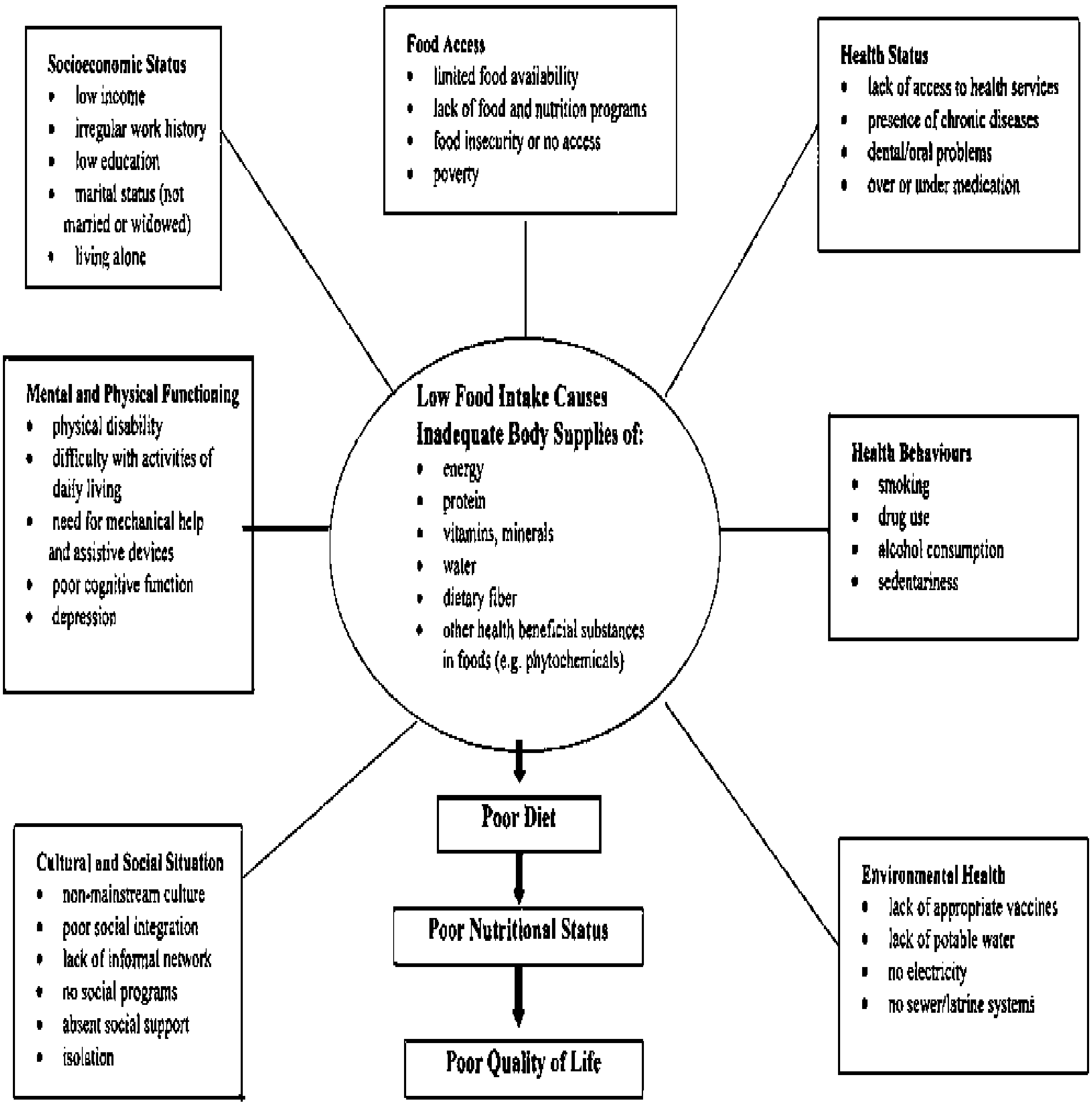
### 2.5.2.2 Risk factors for poor nutritional status in Older People

This model was developed by Suraiya and Manandhar (1999) and shows how series of demographic, environmental, social, cultural and economic factors interplay to influence nutritional status of older people.

Older adults are a particularly vulnerable group for nutrition risk and many factors could cause malnutrition among the elderly. These factors are interlinked and include physical, social, medical, and economic factors; however the most important determinants of malnutrition are poor diet and illness (Mamhidir, Ljunggren, Kihlgren, Kihlgren, & Wimo, 2005; Ferdous, Kabir, Wahlin, Streatfield, & Cederholm, 2009).

Poor diet and illness are related to access to food and influenced by socio-economic status. Malnutrition can occur as a result of chronic insufficient food intake due to unavailability or lack of affordability, or as a result of improper absorption of nutrients due to illness. Hickson (2006) categorized the causes of malnutrition into the three following categories: Medical factors such as gastrointestinal disorders, poor appetite, loss of smell and taste; social factors such as poverty, loneliness, lack of knowledge about food; psychiatric factors such as depression, dementia, and anxiety. Margetts, Thompson, Elia and Jackson, (2003) reported that the elderly at high risk for undernutrition were more likely to perceive ill health. The risk factors for poor nutritional status of the elderly according to Suraiya and Manandhar (1999) are summarized in Figure 2.6.

Figure 2.6: Risk factors for poor nutritional status




Source: Suraiya and Manandhar (1999)

#### 2.5.2.2.1 Socioeconomic status

Poverty is a strong predictor of poor health (Benzeval & Judge, 2001) and malnutrition is common among the poor elderly (Chen *et al.*, 2001; Pryer & Rogers 2006; Chen *et al.*, 2007). The positive effects of income, education, and employment on the physical health and psychological well-being of the elderly have been well documented. Visvanathan *et al.* (2004) identified that socioeconomic status and depression are predictors of nutritional risk.

Sahyoun and Basiotis (2001) also revealed that lower levels of economic resources are associated with a greater risk of experiencing hunger and food insufficiency. Ajani *et al.* (2006) reported the socioeconomic characteristics and resources as factors influencing food security status. Also, some researches have shown that it costs more to eat a more healthful diet (Blaylock, Smallwood, Kassel, Variyam, & Aldrich, 1999); thus low income can restrict not just the quantity but also the nutritional quality of food intake. Studies have found that poverty, malnutrition, household food insecurity and poor health were major problems among the elderly in the community (Charlton, 2000; Oldewage-Theron & Kruger, 2008). Schoenberg (2000) identified four pathways of nutritional risk for rural black elderly namely; changes in the physical and social importance of food, lack of access to necessary resources, increased physical limitations and misinformation about diet and nutrition.

Lee and Frongillo (2001) observed that food insecurity among the elderly is more complex than simply one of lack of access, because of inability to prepare and eat food available due to functional impairments. Ismail and Manandhar (1999) reported that majority of the elderly in developing nations enter old age after a life time of poverty and deprivation, a diet that is inadequate in quantity and quality, and poor access to health care. The risk factors for poor nutritional status in the elderly has been categorized into the food accessibility, mental and physical functioning, socioeconomic status, health indices, low food intake, health behaviours, culture and social situation and environmental indices.

#### 2.5.2.2.2 Mental and physical functioning

Studies have identified depression as a cause of weight loss and risk factor of malnutrition among the elderly (Cabrera, Mesas, Garcia, & de Andrade, 2007; German, Feldblum, Bilenko, Castel, Harman-Boehm, & Shahar, 2008). Johansson *et al.* (2009) described depression as one of the predictors for developing malnutrition among home living older Swedish. Cabrera *et al.* (2007) reported a similar finding among Brazilian elderly. Social isolation, eating alone and inadequate social interaction are factors identified to influence food intake (Brownie 2006). Chen *et al*. (2001) found that loss of loved ones causes social isolation and loneliness which in turn influence nutritional status.

Food consumption is believed to have a two-way relationship with cognition and depression. Cognitive ability is enhanced through a healthy diet, Ortega *et al.* (1997) reported that the elderly with better food habits and greater intakes of total food, fruits and vegetables, had better cognition scores. Overall it was found that a diet higher in carbohydrate, fibre, vitamins and minerals and lower in fat, saturated fat and cholesterol was likely to improved cognitive ability (Ortega *et al.*, 1997). A decline in mental status can lead to decreased consumption of food, and malnutrition itself can alter neurotransmission and cause deterioration of mental capacity (Donini, Savina, & Cannella, 2003). Likewise, the elderly with dementia are at risk of deterioration in nutritional status resulting from poor memory and confusion.

Those living independently may forget to shop and prepare meals, or they may choose foods of lower nutritional value (Gray, 1989). Deterioration of mental status can mean loss of memory of the last meal, loss of the ability to perform coordinated movements required for eating, difficulties in interpreting sensory data (vision, taste, smell, or touch) or distraction from eating a meal. Dementia caused by stroke will often involve difficulty in swallowing (Gray, 1989) and thereby affect food consumption.

#### 2.5.2.2.3 Cultural and social situation

Loneliness and social situation have been related to chronic illness, self-rated health, and quality of life in older adults (Alpass & Neville 2003; Gollub & Weddle 2004). The elderly living alone have reduced intake of energy giving food, also social isolation, loneliness and social myths increase susceptibility to consume an unbalanced diet therefore there is a need to emphasize the importance of a nutrient dense diet. Wylie, Copeman and Kirk (1999) adduced reasons why loneliness promotes malnutrition to decreased food intake as forgetting to eat proper meals, decreased motivation to prepare meals, not wanting a meal once prepared or wanting to eat with others rather than by themselves. Hughes, Bennett and Hetherington (2004) found differences in eating patterns between unmarried men living alone in the North West of England and those who were divorced or widowed. Horwath (1989) also found that widowed, divorced or separated people were more likely to miss meals or to have a cooked meal less than once a day and this was presumed to be due to the interruption of lifestyle patterns and routines.

Marital status affects emotional and economic well-being by influencing living provisions and the availability of caregivers for elderly (Jakobsson, Hallberg and Westergren, 2007).

Food consumption generally increases in a social setting. Studies have found that women eat more in the presence of men, and both men and women eat more when eating with family (Herman, Roth, & Polivy, 2003). Rolls (1994) found that young men and women consumed up to 50 percent more when eating with friends. de Castro (2002) found that meals eaten by people over 65 years of age in groups were up to 46 percent larger than meals eaten alone, and that the more people at the meal, the greater the intake. McAlpine, Harper, McMurdo, Bolton-Smith and Hetherington (2003) also found food consumption with familiar people by the elderly aged 60-79 years in a laboratory setting increased energy intake by 60 percent.

#### 2.5.2.2.4 Knowledge and skills of food preparation

Drummond and Smith (2006) found that ageing men lacked sufficient nutrition knowledge and cooking skills to adequately look after themselves. Alongside cooking skills, and possibly related to them, convenience and preparation time are important influences on the food choices of older men living alone (Horwath, 1989; Donkin *et al.*, 1998). Single men are more likely than single women or married men to seek out foods with the right portion size that are simple to open, prepare and cook (Donkin *et al.*, 1998).

## 2.6 Nutritional Status and Dental Health in the Elderly

A strong synergy has been established between dentition and good nutritional status in general population. Oral health problems reduce the range of foods eaten and the enjoyment of food, thus poor dentures and sore gums can influence the quality of food eaten, and reduce intake of foods such as fruit and vegetables (Sheiham & Steel., 2001; Marcenes, Steele, Sheiham, & Walls, 2003; Feldblum *et al.*, 2007; Nowjack-Raymer & Sheiham, 2007). Dental problem deprives older population access to some of the nutrients linked to bone health such as zinc, magnesium, potassium, fiber and Vitamin C in fruits and vegetables. Sheiham, Steele, Marcenes, Finch and Walls (1999) reported that denture wearers consumed vegetables, whole meal bread and dietary fibers less often than those who had some natural set of teeth.

Higher serum levels of ascorbic acid and beta carotenes and generally better nutritional status have been shown in individuals with more teeth (Nowjack-Raymer & Sheiham, 2007).

Westergren, Unosson, Ohlsson, Lorefält and Hallberg (2002) identified three components of eating difficulties among institutionalized elderly as ingestion, deglutition and energy intake. Predominant oral health problems of the elderly include dental caries, periodontal disease, dry mouth and oral cancer. Older adults with teeth appear to maintain nutritious diet than edentulous older adults. Edentulism has been shown to significantly reduce the intake of numerous nutrients and affect masticatory function (Mojon, Budtz-Jørgensen, & Rapin, 1999; Sheiham *et al*., 2001).

### 2.6.1 Nutrition support for the elderly living in the community

Nutrition support services aim to address the barriers associated with the procurement, preparation and consumption of a healthful diet and therefore enhance the elderly's health related quality of life. While the prevalence of informal care for the elderly in Nigeria is not known, the kinds of tasks these people take on are known to include both cooking and shopping. They may also take on the role of ensuring the elderly is eating a proper diet (Goodhead & McDonald, 2007). According to Keller (2006), both formal and informal nutrition support services assist the elderly to achieve adequate nutrition. Informal services are most often provided by spouses or daughters (Keller, 2006) whereas formal services may be provided by non-profit organizations, government-funded agencies or profit-making companies. Many non-governmental organizations with special interest in the welfare of the elderly are springing up in Nigeria, however documentation on their level of support is not available.

In some other parts of the world, nutrition support services provided for the elderly include Meals on Wheels and practical cooking demonstrations (Wrieden *et al.*, 2007), nutrition education or advice (Rousset, Droit-Volet & Boirie, 2006), and in-home assistance including meal preparation and shopping. Other services include provision of a minimal package of basic household tasks and fulltime carers. Meals on Wheels provide a hot meal in the middle of the day for up to five days a week to provide one-third of the elderly daily energy and protein requirements. Criteria for inclusion often include being at high risk of malnutrition (Krassie, Smart & Roberts, 2000; Timonen & O'Dwyer, 2010).

### 2.6.2 Nutrient Intake and Requirement of the Elderly

Each old adult has unique nutritional needs and these needs must be met for a healthy and productive living. Many approaches and recommendations have been designed to promote adequate dietary intake among the elderly. For example, the U.S Departments of Agriculture and

Health and Human Services have summarized dietary guidelines in the food guide pyramid. The pyramid suggests daily intake of 2 to 4 servings of fruits, 3 to 5 servings of vegetables, 6 to 11 servings of grain products, 2 to 3 serving of dairy foods, 2 to 3 servings of high protein foods, a sparing use of fats, oils and sweets. Theoretically, a diet that is consistent with the food guide pyramid will ensure consumption of the nutrients needed to maintain optimal health. Similarly, the Dietary reference intake (DRI) provides generous estimates of nutrients levels that should be ingested daily by healthy persons.

These recommendations are general and focused on health maintenance; they are not designed to meet the additional nutritional requirements necessitated by disease, infection, trauma, or other stressful condition some of which are associated with ageing. An appraisal of nutrient requirements and needs of the older population and level of nutrients that promote optimal health and prevent chronic diseases is presented below.

**2.6.2.1 Fluid intake**

The elderly are vulnerable to dehydration because of the reduced ability of their kidneys to conserve free water and concentrate urine, they often have reduced thirst sensation and they may limit fluid intake because of problems with bladder control (Chidester & Spangler, 1997; Bennett, 2000). These changes occur as a result of age-related physiologic changes resulting in altered thirst perception, reduced total body water as a portion of body weight, increased proportion of fat to muscle, impaired renal and conservation of water.

Total body water is around 72 percent of total body mass in younger adults but this decline with age. Studies have reported decline of total body water of older adults to about 60 percent and down to less than 50 percent of total body mass for people 65 years or more (Chidester & Spangler, 1997; Bennett 2000).

**2.6.2.2 Vitamins**

Oxidative mechanisms play an important role in the aging process. Russell, Rasmussen and Lichtenstein *(*1999) showed the relationship between health and nutrition, in relation to requirements for antioxidants vitamins such as vitamin A, D, and Vitamin C. Wakimoto and Block (2001) found that the intake of most B vitamins tended to decline with age. Russell and Suter (1993) reported that the elderly are at risk of vitamin malnutrition as a result of inadequate dietary intake. In Nigeria, Oguntona, Oguntona and William (1988) reported a grossly inadeaquate intake of all vitamins except vitamin A among the elderly in Borno, Nigeria. Olayiwola *et al*. (2012) also found inadequate levels of intake of vitamins and minerals among elderly Nigerians with consequences on their health and well being.

**2.6.2.2.1 Thiamin (Vitamin B1)**

Thiamin is one of the most unstable vitamins and is important in cellular respiration, carbohydrates metabolism and serves as a co-enzyme essential for decarboxylation and oxidation of pyruvic acid to yield energy. Thiamin deficiency results in either wet or dry beriberi (Mccormick, 1997). Symptoms of deficiency include anorexia, indigestion, constipation, nerve weakness, depression, reduced alertness, general fatigue and apathy. Thiamine requirement is based on carbohydrates intake, as thiamine need increases with carbohydrates intake. It is about 0.4-0.5mg per 1000kcal. Thiamin requirement in the elderly is increased by alcoholism (Hoyumpa, 1983). Though vitamin B1 is widespread in whole natural foods especially the seeds of plants, it is readily lost in the course of processing and food preparation. The recommended dietary intakes for the older population is the same as those for adults but higher in males than females; 1.2mg/day and 1.1mg/day respectively (DRI, 2002).

**2.6.2.2.2 Riboflavin (Vitamin B2)**

Riboflavin is soluble in water, stable to heat and acid but sensitive and destroyed by ultraviolet light and inactivated by alkali. It is a co-enzyme in carbohydrate and protein metabolism as well as in glutathione reductase (McCormick, 1994; 1997). Requirement is related to carbohydrate and protein intakes (about 0.55mg/1000Kcal), body size, metabolic rate and rate of growth. The lower the protein intake, the more riboflavin is excreted and lost. Deficiency causes angular stomatitis, nasolabial seborrhea, seborrheic dermatitis, cheilosis, sore throat, failure of cell growth, glossitis, normochromic, normocytic bone marrow and extreme sensitivity to bright light (McCormick, 1997).

Riboflavin interrelates with other B vitamins, notably niacin, which requires flavin adenine dinucleotide for its formation from tryptophan, and vitamin $B_6$, which requires flain mono nucleotide for conversion of the phosphates of pyridoxine and pyridoxamine to the co-enzyme pyridoxal 5'-phosphate. The Recommended Dietary Intakes (RDI) for the elderly is the same as those for adults but higher in males than females; 1.3mg/day and 1.1mg/day respectively

(DRI, 2002). Dietary sources include milk, eggs, liver, kidney, heart and dark green leafy vegetables.

**2.6.2.2.3 Niacin (Vitamin B3)**

Niacin is a water soluble vitamin and one of the most stable vitamins; it is resistant to heat, oxidation and alkalis. It is a constituent of the respiratory coenzymes; nicotinamide adenine dinucleotide and nicotinamide adenine dinucleotide phosphate in cellular oxidation reactions (Mccormick, 2010). It is essential in energy and fat metabolism. It is also essential for healthy skin, and normal functioning of the gastrointestinal tract and nervous tissues. Body can produce niacin when an amino acid tryptophan is available; 60mg of tryptophan are needed to replace 1mg of niacin in the body. Deficiency results in burns especially in light complexioned individuals, scales or sores in dark individuals, diarrhea, vomiting, forgetfulness, insomnia and culminates in pellagra (dermatitis, diarrhea, dementia and death) (Mccormick, 1997). Dietary sources include meat, fish, wholemeal cereals, peanuts, beans and other pulses. The recommended dietary intakes for the older population is the same as those for adults but higher in males than females; 16mgNE/day and 14mgNE/day respectively (DRI, 2002).

**2.6.2.2.4 Pyridoxal phosphate (Vitamin B6)**

Vitamin B6 activity occurs as alcohol (pyridoxine or pyridoxol), aldehyde (pyridoxal) and as amine (pyridoxamine). These are heat stable, light and alkalis sensitive. Pyridoxal 5'-phosphate functions as coenzyme in the deamination and transamination processes, conversion of tryptophan to niacin, synthesis of porphyrins and haem compounds, transportation of amino acids to the cell, synthesis of phospholipids, formation of antibodies, hormones, and immune systems (Mccormick, 1997). Deficiency and toxicity are rare but deficiency may lead to hypochromic micocytic anaemia and central nervous system disturbances while toxicity may cause lack of muscular coordination. Good dietary sources are liver, meat, vegetables, whole grains and nuts. However, the bioavailability of vitamin B6 from different food sources is influenced by the extent and type of processing to which the foods are subjected. Much of vitamin can be lost through processing, including heating, canning, milling, sterilization and freezing.

Many studies have demonstrated that older adults do not consume enough vitamin B6 (McCormick, 1997; Olayiwola *et al.*, 2012). Besides atrophic gastritis interferes with absorption, other conditions such as alcoholism and liver dysfunction also affect absorption of vitamin B6. The recommended dietary intakes for the older population is the same as those for adults but higher in males than females; 1.7mg/day and 1.5mg/day respectively (DRI, 2002).

**2.6.2.2.5 Ascorbic Acid (Vitamin C)**

Vitamin C is an antioxidant vitamin and all of its biochemical and molecular roles can be accounted for by this function. It acts as an electron donor for eight human enzymes and promotes absorption of soluble non-haem iron, thus a common feature of vitamin C deficiency is anaemia. The populations at risk of vitamin C deficiency are those for whom the fruit and vegetable supply is minimal and this applies to the elderly especially those with poor dentition. Also, vitamin C is rapidly lost during food processing and preparation thereby limiting intake except in rawly consumed fruits and vegetables (Keshinro & Ketiku, 1979).

Adequate vitamin C intake has been positively correlated with lower cancer risk (Byers & Perry, 1992; Ames, 1998). However, the elderly frequently have low plasma ascorbate values and intakes lower than those in younger people. The Recommended Dietary Intakes (RDI) for the elderly is therefore the same as those for adults; 75mg/day and 90mg/day for female and male respectively (DRI, 2002).

Table 2.2: Functions and consequences of Vitamins deficiencies in older population

| **Vitamin** | **Physiologic functions** | **Deficiency consequences in the elderly** |
|---|---|---|
| Thiamin ($B_1$) | Co-enzyme functions in metabolism of carbohydrates and branched-chain amino acids | Beriberi, polyneuritis, and Wernicke-Korsakoff syndrome |
| Riboflavin ($B_2$) | Co-enzyme functions in numerous oxidation and reduction reactions | Growth, cheilosis, angular stomatitis and dermatitis |
| Niacin | Co-substrate and co-enzyme for hydrogen transfer with numerous dehydrogenases | Pellagra with diarrhoea, dermatitis and dementia |
| Vitamin $B_6$ | Co-enzyme functions in metabolism of amino acids, glycogen and sphingoid bases | Naso-lateral seborrhoea, glossitis and peripheral neuropathy |
| Vitamin $B_5$ Pantothenic acid | Constituent of co-enzyme A and phosphopantetheine involved in fatty acid metabolism | Fatigue, sleep disturbances, impaired coordination and nausea |

**2.6.2.2.6 Vitamin B12**

Vitamin B12 deficiency is a common nutritional deficiency among the elderly with prevalence rates ranging from 10-70 percent (Wolters, Ströhle, & Hahn, 2004; Olayiwola *et al*., 2012). Common symptoms in patients with diagnosed vitamin B12 deficiency include decreased vibration sense, impaired sense of touch, memory loss and fatigue. Many neurologic symptoms have been shown to improve with vitamin B12 therapy (Lindenbaum *et al.*, 1988). Low vitamin B12 status contributes to dementia in the elderly through both the toxic effects of homocysteine on blood vessels, and because vitamin B12 is required for the production of myelin basic protein needed for the protection of nerves. Although vitamin B12 is found in all animal products, there is the need for several steps in the separation of vitamin B12 from food protein and preparation for absorption which make many older individuals with otherwise adequate intakes have difficulty absorbing vitamin B12, resulting in inadequate status. Common causes of vitamin B12 deficiency include atrophic gastritis, gastric or intestinal surgery, vegetarianism or persistent use of antacids. The reversal of cognitive and neurological symptoms after vitamin B12 therapy appears to be related to duration of symptoms, suggesting that early identification and treatment of vitamin B12 deficiency is of critical importance.

**2.6.2.2.7 Folate**

Folate is a water-soluble B-complex vitamin, which functions in single-carbon transfer reactions and exists in many chemical forms. Mild degree of anemia occurs as a result of folate deficiency especially in the elderly (Lindenbaum *et al.*, 1988).

Folate requirement depends on the bioavailability of folic acid and food folate, nutrient-nutrient interactions, interactions with other food components, smoking, folate-drug interactions and genetic variations. Some forms of fibers reduce the bioavailability of folate.

Folate status has not been shown to decline with age but numerous reports indicate that homocysteine concentration increases as a function of age (Selhub, Jacques, Wilson, Rush, & Rosenberg, 1993) which suggest an age-related decline in cystathionine β-synthase and other enzymes involved in homocysteine metabolism. Folate deficiency has been reported among elderly Nigerians (Olayiwola *et al*., 2012).

### 2.6.2.2.8 Retinol (Vitamin A)

Vitamin A is an essential nutrient needed in small amounts by humans for the normal functioning of the visual system; growth and development; and maintenance of epithelial cellular integrity, immune function, and reproduction (Eskild & Hansson, 1994; Morriss-Kay & Sokolova, 1996). Retinoic acid helps maintain both the normal structure and the functions of the epithelial cells and is needed for body's response to viral, parasitic and bacterial infections (Russell, 2000; Stephenson, 2001). Retinol and its derivatives are essential for reproduction processes in both males and females, support growth and cell differentiation and are important in cancer prevention (Wolf, 1991; Olson, 1992; Clagget-Dame & DeLuca, 2002). It is necessary for bone metabolism through involvement with osteoblasts (bone-forming cells) and osteoclasts (cells involved in bone resorption). Vitamin A is also involved in the immune function; retinoic acid stimulates phagocytic activity and cytokine production and maintains natural killer cells concentration (Ross, 1992; Stephenson, 2001).

Though vitamin A is widespread in food supply, vitamin A deficiency still constitutes one of the major public problems in developing countries. Preformed vitamin A in animal foods occurs as retinyl esters of fatty acids in association with membrane-bound cellular lipid and fat-containing storage cells. Pro-vitamin A carotenoids in foods of vegetable origin are also associated with cellular lipids but are embedded in complex cellular structures such as the cellulose-containing matrix of chloroplasts or the pigment-containing portion of chromoplasts.

### 2.6.2.2.9 Cholecalciferol (Vitamin D)

Vitamin D is of interest among the elderly because exposure to sunlight contributes significantly to this nutrient suppy in the entire population and the elderly have limited exposure to sunlight. Additionally, studies have reported an age-related decline in many key steps of vitamin D action: the rate of skin synthesis, rate of hydroxylation to the hormonal form and response of target tissues (Shearer, 1997). Vitamin D is essential to maintain normal blood levels of calcium and phosphate that are essential in the normal mineralization of bone, muscle contraction, nerve conduction and general cellular function in all cells of the body. Vitamin D is linked with skeletal growth and strong bones. Calcitriol (1, 25, dihydroxy vitamin $D_3$) functions primarily like a steroid hormone. It major functions involve interaction with cell membrane receptors and nuclear vitamin D receptor, proteins to affect gene transcription in a wide variety of tissues. More than 50 genes are known to be regulated by vitamin D (Omdahl, Morris, &

May, 2002) including the gene for the calcium-binding protein, calbindin.

Vitamin D deficiencies have been reported to be higher in community-dwelling older Caucasian and French population than other age groups (Chapuy, Meunier & Feldman, 1997; Holick, 2004). Vitamin D deficiency contributes to declining bone mass and increases the incidence of hip fractures (Dawson-Hughes *et al., 1997*). Studies have found that modest increases in vitamin D intakes (between 10 and 20 µg/day) reduce the rate of bone loss and the fracture rate (Shearer, 1997; Chapuy *et al.*, 1997). Dietary vitamin D is provided primarily by foods of animal origin. The requirement for vitamin D depends on the concentration of calcium and phosphorus in the diet, age, sex and degree of exposure to sunlight and amount of skin pigmentation. Adequate intake for vitamin D for the elderly is higher than in other age groups (15 µg/day) (DRI, 2002).

**2.6.2.2.10 Tocopherol (Vitamin E)**

Vitamin E is the major lipid-soluble antioxidant in the cell antioxidant defence system and is exclusively obtained from the diet. Vitamin E protects polyunsaturated fatty acids (PUFAs) and other components of cell membranes and low-density lipoprotein from oxidation by free radicals. Diplock (1994) indicated that reactive free radicals are involved in many diseases, including heart disease and cancers. Sies (1997) noted that oxidative stress occurs when exposures to free radicals exceed the protective capacity of the antioxidant defence system. Compromised immunity has been shown to be higher among the elderly possibly as a result of high incidence of malnutrition. Reduced risk of cancer and dementia as well as improved immunity and cognitive function has been associated with increase vitamin E intake and vitamin E supplementation in older population (Meydani *et al.*, 1990; Masaki *et al.*, 2000).

**2.6.2.3 Minerals**

Ageing produces physiologic changes that affect the need for several minerals, though obvious mineral deficiencies are not common in the healthy adult, subclinical nutrient deficiencies that affect metabolic function can develop. Poor mineral status in the older adults can be attributed to inadequate dietary intake, physiologic changes and reduced bioavailability, that affect the need for a nutrient and medications (Vaquero, 2002). Some of the minerals of special importance in old age are discussed below.

### 2.6.2.3.1 Calcium

Calcium is an essential micronutrient with a vital role in neuromuscular function, enzyme-mediated processes, blood clotting, and bone health. Calcium is the most common mineral in the human body and about 99 percent of the body calcium store is found in the bones and teeth while the remaining is found in the blood and soft tissue. Calcium levels in the blood and fluid surrounding the cells (extra cellular fluid) must be maintained within a very narrow concentration range for normal physiological functioning. Many studies have reported the necessity of adequate dietary calcium in maintaining bone health and prevent bone related disorders (Heaney, 1993; Cashman, 2002). Calcium intake is important for skeletal growth and peak bone mass development. Calcium absorption is influenced by Vitamin D and deficiency of Vitamin D has been shown to contribute to osteoporosis and bone fractures (Bischoff-Ferrari, Willett, Wong, Giovannucci, Dietrich, & Dawson-Hughes, 2005). Calcium also mediates in the constriction and relaxation of blood vessels, nerve impulse transmission, muscle contraction and the secretion of hormones such as insulin.

Calcium absorption decreases with age (Nordin, Need, Morris, D O'Loughlin, & Horowitz, 2004). Nigeria is known to have low calcium intake with low calcium rickets in children (Thacher *et al.*, 1999). Ariyo *et al.* (2012) and Olayiwola *et al*. (2012) reported high level of inadequate calcium intake and seldom consumption of calcium rich food sources by older adults in Ibadan. Calcium deficiency plays a major role in osteoporosis and increasing incidence of fractures in the elderly (Tang, Eslick, Nowson, Smith, & Bensoussan, 2007).
The level of adequate intake in the elderly was 1,200mg per day for man and women (DRI, 2002). Milk and milk products are the preferred source of calcium (Feskanich, Willett, & Colditz, 2003), because of their high content of calcium. Other foods such as salmon with bones, some legume and some green leafy vegetables are also good source of calcium.

### 2.6.2.3.2 Iron

Iron is a micronutrient with diverse essential functions in the body. It is a carrier of oxygen to the tissues, a transport medium for electrons within cells, and integrated part of important enzyme systems in various tissues. Ortega *et al*. (1997) reported the significance of iron along with other nutrients in promotive cognitive function and general health of the older population. Furthermore, iron absorption in the elderly have been reported to be adjusted to prevent increased iron store which have been linked with disturbed glucose homeostasis and increased risk of cardiovascular diseases and certain types of cancer (Garry, Hunt, & Baumgartner, 2000). In the human diet, the primary sources of heme iron are the haemoglobin and myoglobin from consumption of meat, poultry, and fish whereas non-heme iron is obtained from cereals, pulses, legumes, fruits, and vegetables. The absorption of heme iron can vary from about 40 percent during iron deficiency to about 10 percent during iron repletion (Hallberg, Hultén, & Gramatkovski, 1997). Heme iron can be degraded and converted to non-heme iron if foods are cooked at a high temperature for too long. Factors influencing dietary iron absorption are iron status, amount of dietary iron and food preparation and balance between enhancing and inhibiting factors. Calcium is the only dietary factor that negatively influences the absorption of iron (Hallberg, Rossander-Hulthèn, Brune, & Gleerup, 1993; Gleerup, Rossander-Hulthén, Gramatkovski, & Hallberg, 1995). Enhancing factors include ascorbic acid, animal protein and fermented vegetables (Siegenberg *et al*., 1991).

**2.6.2.3.3 Zinc**

Zinc is a nutrient of public health importance and present in all body tissues and fluids. The total body zinc content is about 30 µmol (2 g) with approximately 60 percent in skeletal muscles and approximately 30 percent in bone mass. Zinc is an essential component of more than 300 enzymes participating in the synthesis and degradation of carbohydrates, lipids, proteins, and nucleic acids as well as in the metabolism of other micronutrients. For the elderly zinc deficiency has been reported as one of the common micronutrient deficiencies because of reduced bioavailaity in old age (Vaquero, 2002). Studies have reported that marginal zinc deficiency is common in the elderly and adequate zinc intake promotes immunity, affecting a number of aspects of cellular and humoral immunity (Haase, Mocchegiani, & Rink, 2006; Olayiwola *et al*., 2012). Studies in Nigerian have reported zinc as one of the limiting micronutrients in the diet of the older people (Olayiwola *et al*., 2012; Olayiwola, Fadupin, Agbato & Soyewo, 2013). Prasad *et al.* (2007) observed that zinc is essential to reducing incidence of infection among the elderly and is important for a healthier community. The clinical features of severe zinc deficiency include growth retardation, delayed sexual and bone maturation, skin lesions, diarrhoea, alopecia, impaired appetite, increased susceptibility to infections.

Many dietary factors may complex with zinc and inhibit its absorption. Inhibitors include phytate, oxalate, polyphenols, fibers and nutrients. Interactions between zinc and nutrients such as the vitamin, folic acid and variety of divalent cations, may occur and inhibit zinc absorption. Zinc content of foods varies widely. Very good sources of zinc are red meats, sea foods, poultry, dairy products, whole grains and vegetable. The zinc requirement was based on the intake needed to maintain balance and estimates of zinc absorption and body losses. The RDA for zinc was set at 11mg and 8mg for the elderly men and women respectively (DRI, 2002).

#### 2.6.2.4 Energy Balance in Older Adults

Energy requirement depends on the body size, composition and activity level. Current recommendations on dietary energy intake define expected average amounts of metabolizable energy required for sustaining normal metabolic processes, together with desirable or expected levels of physical activity in healthy individuals (DRI, 2002). For the elderly, energy needs may be lower than in young adults because of the reduction in the number of metabolically active tissues resulting to decreased basal metabolic rate and loss of muscle strength (Evans & Cyr-Campbell, 1997).

Some studies have reported a reduction in energy and macronutrient intake with increasing age (Barton, Beigg, Macdonald, & Allison, 2000; Marshall, Stumbo, Warren, & Xie, 2001). Dumartheray, Krieg, Cornuz, Whittamore, Lanham-New, & Burckhardt (2006) found that the mean energy intake of older Swiss women was below RDA and mean protein intake was 65.2g, while 58.4% was from animal source. Morley (1998) showed consumption of a greater percentage of energy as carbohydrate and significantly less absolute amounts of fat. Additionally, total daily energy intake declined with age for both men and women. Lower energy intakes were associated with consumption of smaller meals eaten at a slower rate in older adult compared with younger adults. Ageing reduces overall energy intake and changes the pattern and rate of food intake. Energy needs is believed to decrease with age while the needs for most other nutrients remain relatively unchanged resulting in an increased risk of malnutrition.

There are indications that the energy expenditure among older individuals in Africa may be higher than the estimation because of various activities they are engaged in such as caring for grandchildren and performing some hosuhold chores. Negative energy balance may therefore occur when intake is reduced based on the recommendation and that could result in negative nitrogen balance as the lean tissue is mobilized along with fat and glycogen.

### 2.6.2.5 Protein Balance in Older Adults

A number of studies have been conducted to evaluate the level of protein in the older population and have consistently shown that at least some elderly have difficulty in maintaining nitrogen balance when consuming protein at least level. Therefore it is necessary for the elderly to increase protein intake above the indicated level for young adults. Campbell and Evans (1996) evaluated nitrogen balance in seven healthy men age 60 to 70 years and found that three of the seven were unable to achieve nitrogen balance equilibrium, while consuming 0.8g protein per kg body weight. Another study demonstrated that at the level of intake recommended for adults, protein intake was inadequate to mainatain skeletal muscles (Campbell, Trappe, Wolfe, & Evans, 2001). Kurpad and Vaz (2000) reported that protein requirements for healthy elderly are greater over the age of 70 years.

Also, some studies have demonstrated that an intake 1g/kg body weight is needed to maintain a positive nitrogen balance in an older adult. A protein intake of 1 to 1.25g/kg is generally accepted as safe daily intake for older adults and it should be of high quality protein. Higher levels of protein are needed for situation creating metabolic stress and for prevention or healing of pressure ulcers.

## 2.7 NUTRITIONAL ASSESSMENT

Nutritional assessment is an in-depth evaluation of both objective and subjective data related to an individual's food and nutrient intake, lifestyle, and medical history. It may involve the measurement of body size, body composition or body function, intended to diagnose single or multiple nutrient deficiencies (Mahan and Escott-Stump, 2004). It is also a structured way to establish nutritional status and nutrient-requirements by objective measurements and parameters in relation to specific disease-indications. A wide range of nutrition assessment tools is available. These include anthropometric measurements, biochemical analyses, clinical assessment tools and dietary assessment tools. Besides these, there an indirect assessment tools that have been widely applied in the nutritional assessment on a wider scale. The merits and the demerits of each tool with respect to the study population have been well explored. This section considers the merits and demerits of the assessment tools used in this study.

### 2.7.1 Anthropometric Assessment

Anthropometric assessment means the objective physical measurements of human body dimensions of bone, muscle, and adipose (fat) tissue and relating them to standards that reflect the growth and development of the individual. Anthropometry is the study of the measurement of the human body in terms of the dimensions of the bone, muscle, and adipose tissues (Wang, Thornton, Kolesnik & Pierson, 2000). Anthropometric values are closely related to nutrition, genetic make up, environmental characteristics, social and cultural conditions, lifestyle, functional status and health. Parameters that can be measured include height, weight, length, skinfold, body fat distribution, halfspan, knee height, crown rump, sitting height, weight, growth chart percentile, growth rate, and rate of weight change, muscle and fat. Anthropometric evaluation is an essential feature of geriatric nutritional evaluation (Sánchez-García, García-Peña, Duque-López, Juárez-Cedillo, Cortés-Núñez, & Reyes-Beaman, 2007). The derivatives of these anthropometric parameters are widely used in nutritional assessment.

Anthropometric evaluation is inexpensive, non-invasive and provides detailed information on the different components of body structure, especially muscular and fat components, and can assist in assessing the nutritional status of a population (Baumgartner, 2000). This method requires minimal training; it is easily reproducible and can be widely applied to many variables of nutritional significance (Height, Weight, Mid Upper Arm Circumference, Head Circumference, skin fold thickness, waist and hip ratio, and Body Mass Index).

Anthropometric measures are reliable for determining the nutritional status when compared with sophisticated methodologies, the use of which is restricted by complexity and cost (Kyle, Genton, & Pichard, 2002). Though anthropometric is the most widely used method of nutritional assessment; it is prone to inter-observers errors, has limited nutritional diagnosis and can be affected by hydration status of an individual (Kraemer, 2006). Furthermore, it is unable to detect small changes over small period of time and is not valuable for assessing effect of illnesses on nutrition status in acute diseases.The ageing process affects some of the anthropometric parameters as a result of physiological and nutritional changes. Ageing process may involve loss of height, weight and muscular mass while redistribiution of adipose tissue may occur with fat accumulation in the trunk and viscera.

### 2.7.2 Body Mass Index

Body mass index (BMI) is a measure expressing body weight as a function of height (BMI = weight (kg)/height (m)$^2$) that may be used to identify overweight and obese individuals (Bray, 1987). The BMI represents the easiest and most frequently used index to identify adult subjects at risk of malnutrition (Rosnah & Sharifah-Norazizan, 2009). The body mass index can also be calculated from the halfspan used in lieu of height and the cut-off points are as indicated in Table 2.3. BMI is a reliable measure of the appropriateness of weight for height, and reflects protein and fat reserves, which in turn reflect functional reserves including the ability to survive nutritional deficit and some diseases.

Body Mass Index is commonly used for population-level assessments of chronic undernutrition because it is simple to conduct and is well-correlated with body-fat percentage. However, BMI is less useful in the elderly because of the common decrease in stature in old age (Ismail and Manandhar, 1999; Cook, Kirk, Lawrenson, & Sandford, 2005) which may lead to an increased BMI (Omran and Morley, 2000). Cook *et al.* (2005) also reported that BMI is not ideal for screening the elderly because it is likely to be inaccurate. The perceived error in the use of height can be corrected by using armspan which is less affected by age-related spinal deformities such as kyphosis (spinal curvature), alterations in height and shape of the vertebral discs, and vertebral compression (de Lucia *et al*., 2002).

Many studies in Africa have used armspan as a proxy for height to estimate BMI. de Lucia *et al*. (2002) used it in a cross-sectional study of Ethiopians aged 18-50 years from four different ethnic groups and reported sex and ethnicity differences. Datta-Banik (2011) in a study of the interrelationship between height and arm span among Indians aged 10-59 years found the height-arm span ratio of 0.98-0.99, indicating height to be slightly less than arm span in both sexes. These studies have shown that armspan is a good alternative to height measurement and it is less affected by age-related spinal changes. Armspan measurements have been reported to exceed height measurements in all the ethnic groups and in both sexes (de Lucia *et al.*, 2002).

Therefore, in situations where height could not be measured directly, it can be estimated using the armspan measurement and the regression equations of Chilima *and Ismail (1998)* for the elderly of African descent:

*African males: height, cm = 51.5 + (0.64 x armspan)*

*African females: height, cm = 45.9 + (0.66 x armspan)*

Several studies have shown that a higher BMI is associated with lower mortality rates among older population (Janssen, Katzmarzyk & Ross, 2005; Breeze, Clarke, Shipley, Marmot & Fletcher, 2006). Flicker *et al.* (2010) reported that the elderly who are obese (BMI above 30) or underweight (BMI of 18 and below) have increased risk of mortality.

There is also an increasing body of evidence that low BMI is related to impaired physical function in community living older individuals (Stuck, Walthert, Nikolaus, Büla, Hohmann, & Beck, 1999), increases in morbidity and mortality (Van Nes *et al.*, 2001) and functional limitations (Bannerman *et al.*, 2002).

Studies have indicated that the conventional BMI cut-offs for defining Chronic Energy Deficiency (CED) may not be appropriate for the elderly above 70 years, because of age-related changes in body composition (Shetty & James, 1994; WHO, 1995). There also exist practical problems with obtaining accurate BMI measurements because of curvature of the spine This study therefore used the armspan and the height as suggested by Ismail *et al.* (1999) in deducing the Body mass Index. To this end, two sets of body mass indices were calculated for each respondent. The first was based on height and the other on the armspan.

**Table 2.3: Classes of Nutritional Status using Body Mass Index (BMI)**

| **Classification of Nutritional Status** | **BMI(kg m$^{-2}$)** | **BMI(kg m$^{-2}$)** |
|---|---|---|
| | **weight-for-height** | **weight-for-armspan** |
| Severe Malnutrition (Red Colour) | <16.0 | ≤14.7 |
| Moderate Malnutrition (Yellow Colour) | 16.0 - 16.99 | 14.71 - 15.89 |
| Mild malnutrition (Blue Colour) | 17.0 - 18.49 | 15.9 - 17.29 |
| Normal (Green Colour) | 18.5 – 24.99 | 17.3 – 23.69 |
| Overweight (Purple Colour) | 25.0 – 40.0 | 23.7 – 40.0 |

Source: Suraiya and Manandhar (1999)

### 2.7.3 Mid-Upper Arm Circumference (MUAC)

Mid upper arm circumference (MUAC) has emerged in the literature as a potential screening tool for poor nutritional status. James *et al.* (1994) analyzed its usefulness in adults, and calculated cut-offs equivalent to body mass index (BMI) and cut-offs for chronic energy deficiency (CED), using a range of data sets from developing countries. However, accurate MUAC measurements in the elderly can be problematic, but with good training a high reliability (99% error free) is possible.

Mid upper arm circumference (MUAC) is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium). The MUAC measurement requires little equipment and is easy to perform even on the most debilitated individuals. It is increasingly being used to assess both children and adult undernutrition during famine (Rodrigues, Rao, & Lena, 1994; Collins, 1996). Measurements of adult MUAC have long been known to reflect changes in adult body weight and the major determinants of MUAC, arm muscle and sub-cutaneous fat, are both important determinants of survival in starvation (Leiter & Marliss, 1982). As MUAC is less affected than BMI by the localized accumulation of excess fluid, it is assumed to be a more sensitive index of tissue atrophy than low body weight. It is also relatively independent of height (Olukoya, 1990). Ferro-Luzzi and James (1996) proposed MUAC cut-off points for use in screening acute adult undernutrition based on extrapolation from more normally nourished populations in developing countries, without reference to data from acutely undernourished adults during famine. The cut-off points for the sub-sahara African population are as indicated in Table 2.4.

**Table 2.4: Classes of Nutritional Status using MUAC**

| Classification of Nutritional Status (Sub-Saharan) | MUAC Range (Both sexes /cm) |
|---|---|
| Severe malnutrition | Below 22.1 |
| Moderate Undernutrition | 22.1 – 23.0 |
| Mild Undernutrition | 23.1 – 24.0 |
| Normal | > 24.0 |

Source: Suraiya and Manandhar (1999). Better Nutrition for The elderly: Assessment and Action Manual. HelpAge /LSHTM

### 2.7.4 Dietary Assessment Methods

The dietary method of nutritional assessment examines adequacy of the diet for micronutrient as well as macronutrient composition, factors affecting adequate intake and food intolerances that may affect intake. Assessment of social, psychological, and financial resources that may affect an individual's ability to obtain, prepare, and eat food are also important in evaluating nutritional risk factors. Dietary assessment encompasses food consumption at the national level (food supply and production), household level and individual level. Dietary assessment can provide both qualitative and quantitative information of dietary intake. There are many ways to document dietary intake: questioning and observation to know the actual intake. This review will consider the methods utilized for the present study.

**A. Weighed Food Records or Diary**

This is a prospective tool in which the respondent or interviewer weighs and records every item of food and drink prior to consumption for a specific time period, usually one or more days. Food records require correct detailed description of foods and amounts consumed, including the name of the food (variety or brand name), preparation methods, recipes for food mixtures and portion sizes. Left-over is also recorded where it occurs. The weighed food record method has the potential for providing quantitatively accurate information on food consumed during the recording period. Recording foods as they are consumed lessens the problem of omission and the foods are more fully described. Measurement of amounts of food consumed at each occasion provides accurate portion sizes than if the respondents were recalling portion sizes of foods previously eaten. A major disadvantage of the dietary record method is that it is subject to bias both in the selection of the sample and in the measurement of the diet.

The prospective food records are usually carried out for 3 to 7 days (including a combination of weekend and weekdays) and provide the most accurate assessment of actual intake. Food records are labor intensive and time consuming. The records are analyzed and compared to the dietary reference intakes (DRIs). There are five types of weighed food records namely; One day record, 3 day food record, 4 day food record, 5 day food record, and 7-day food record. The major advantages of food record include direct consideration of actual intake and non-reliance on memory. However, it has a high respondent burden, higher likelihood of mis-reporting, labour intensive and time consuming, affects eating behavior, require extensive respondent training and motivation, and prone to high attrition rate.

**B. 24-Hour Dietary Recall**

This is a quick retrospective tool used to ask respondent about food and drink intake during the previous 24 hours. The respondent is prompted to remember and report all the foods and drinks consumed in the preceding 24 hours or in the preceding day. The recall can be conducted by interview, in person or by telephone and can be either computer assisted or using a paper-and-pencil form. Well-trained interviewers are required to administer a 24-hour recall because much of the dietary information is collected by asking probing questions. Interviewers must have the knowledge of foods available in the marketplace, preparation practices including prevalent regional or ethnic foods and portion sizes. The 24-hour recall method relies on an accurate memory of intake, reliability of the respondent not to under / misreport and an ability to estimate portion size. The interviewer records the dietary information which at the end is checked for omission/errors and is then coded for analysis. In contrast to record methods, dietary recalls occur after the food has been consumed, so there is less potential for the assessment method to interfere with dietary behavior. The primary limitation of this method is that recording consumption for a single day is seldom representative of a person's usual intake due to day-to-day variation.

A technological advance in 24-hour dietary recall methodology is the increasing development of automated data collection systems. Computerized software systems allow direct coding of the foods reported during the interview. The potential benefits of automated software include substantial cost reductions for processing dietary data, less missing data, and greater standardization of interviews.

The principal use of a single 24-hour recall is to describe the average dietary intake of a group. 24-hour recall is quick and inexpensive, has relatively low respondent burden and does not affect dietary or eating behavior. However, it is prone to errors of estimation of portion sizes, memory and interview situation dependent, has high investigator cost and require the use of food models.

**C. Food Frequency Questionnaire (FFQ)**

Cade, Thompson, Burley and Warm (2002) described food frequency as a questionnaire in which the respondent is presented with a list of foods and is required to say how often each is eaten in broad terms such as x times per day/per week/per month, etc. Foods chosen are usually chosen for the specific purposes of a study and may not assess total diet. Food frequency questionnaire (FFQ) is usually the preferred method because it is cheap, easy to administer and requires minimal effort from the subjects (Subar, 2004). Food frequency questionnaire is a useful method to evaluate mean population intake or to categorise intake of individuals based on their food consumption (Kelemen *et al.*, 2003). It has also been used to assess dietary intake of individuals or population in the prevention of diseases. Food frequency questionnaire is a retrospective assessment tool that asks respondents to complete a survey about food intake over a specific time period. Food frequency questionnaires gather information on the usual frequency of consumption of specific foods (times per day, daily, weekly, monthly) from a list of foods for a specified time frame (past 2-3 months, 1 year or longer) and are useful in the clinical setting to identify usual eating patterns.

Qualitative FFQs considers the frequency of consumption only and do not assess the amount of food that is eaten; semi-quantitative FFQ incorporate portion size questions or specify portion sizes as part of each question in addition to frequency of consumption (Willett & Buzzard, 1998). Overall nutrient intake estimates are derived by summing, over all foods, the products of the reported frequency of each food by the amount of nutrient in a specified (or assumed) serving of that food to produce an estimated daily intake of nutrients, dietary constituents, and food groups.

FFQS can be created or adapted to measure a variety of dietary components. FFQs can be nutrient-specific or food(s)-specific (Thompson, Midthune, Subar, Kahle, Schatzkin, & Kipnis, 2004). They can be modified to assess overall dietary intake or change in intake over time (Haveman-Nies, Tucker, De Groot, Wilson, & Van Staveren, 2001). FFQs are cost-effective because it can be self-administered and are generally intended for large samples. They do not affect eating behavior and are not time consuming. However, FFQs may create participant burden, and may be confusing to complete and memory dependent. This technique requires literacy and physical ability to complete.

# CHAPTER THREE

## Materials and Methods

### 3.1. Study Design

The study was comparative cross-sectional community-based survey in design. It involved the elderly in two out of five urban Local Government Areas (LGAs) and two out of six rural LGAs in Ibadan metropolis, Nigeria. The study assessed and compared variables such as socioeconomic status, lifestyle, social support, environmental characteristics, food security and nutritional vulnerability, food consumption pattern, dietary intake and anthropometric indices.

### 3.2. Sampling Procedure and Unit

This study employed a three-stage sampling technique in selecting the study Local Government Areas, study communities and study participants. Ibadan, Oyo state was selected as the study area by purposive sampling technique, being one of the States with highest life expectancy in Nigeria and containing the largest number of older people using National census figure of 2006.

In the first stage of sampling, the eleven LGAs in Ibadan metropolis were stratified into five urban and six rural LGAs. The urban LGAs are Ibadan North, Ibadan South-East, Ibadan South-West, Ibadan North-East and Ibadan North-West. The rural LGAs are Egbeda, Akinyele, Ido, Ona-Ara, Oluyole, and Lagelu. Two LGAs were chosen by simple random sampling from each stratum to ensure that all LGAs have equal chances of being selected. Consequently, Ibadan South West and Ibadan North West were chosen from the five urban LGAs while Ido and Egbeda were chosen from the rural LGAs.

In the second stage of sampling, a list of communities in each of the selected LGAs was generated from the Enumeration Area Maps obtained from the National Population Commission. These communities were clustered into urban and rural settings. Clustering was based on rural-urban classification with the assistance of a town planner from each LGA town planning office. A community was considered rural if agriculture was dominant and basic amenities such as tarred roads and pipe borne water were not dominant and population was below 10,000 persons.

The third stage of sampling involved the selection of the study population using simple random sampling technique for the first respondent and systematical random sampling for the rest. The list of households with at least one member aged 65 years and above who had resided in the selected communities for at least five years was generated with the assistance of the local guides recruited for the study. The generated households' names were checked to cross-out repetition and each household was allocated a unique number with which the list of random numbers was generated. Participating households were thereafter systematically selected and where a selected household or respondent was not physically present, the nearest spare household was selected.

## 3.3. Description of the Study Area

### 3.3.1. Brief Description of Oyo State

Oyo state with coordinates (8°00′N 4°00′E8°N 4°E) is in the moist savannah agro-ecological zone of Nigeria and is mainly inhabited by the Yorubas. Yorubas are primarily agrarian but have a fondness for living in high density urban centers, however many are involved in various other occupations. The indigenes mainly comprise the Oyos, the Oke-Oguns, the Ibadans and the Ibarapas, all belonging to the Yoruba family and peoples of Africa city in Africa, south of the Sahara, people from within and outside the country trade and settle in the state mostly in the urban areas. Oyo State is an inland state with its capital at Ibadan. It is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. The state was created in 1976 and covers approximately an area of 28,454 square kilometers with a population of 5, 580, 894 (NPC, 2006) and population density of 196.1/Km$^2$. Oyo state ranked second among the states with high population of the elderly with individuals aged 65 years and above using 2006 Nigerian census numbering 213,803 representing approximately 3.8% of the state population (NPC, 2006). The state climate is equatorial, the dry season lasts from November to March and the wet season starts from April and ends in October with relatively high humidity; thereby favoring the cultivation of crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce, cashew etc. Average daily temperature ranges between 25 degrees Celsius and 35 degrees Celsius, almost throughout the year.

Figure 3.1: Map of Nigeria showing the state of study

### 3.3.2 Brief Description of Ibadan

The study was conducted in Ibadan Metropolis, a cosmopolitan city dominated by Yoruba speaking people of South West Nigeria and a good mix of other nationals and foreigners. The selection of Ibadan, Oyo state for the study was based on purposeful sampling technique which is a non-probability sampling characterized by the use of judgment and deliberate effort to obtain a representative sample by including presumably typical area or groups in the sample (Kerlinger & Lee, 2000). Nigeria has a joint life expectancy of 52.1 years, Oyo state with a life expectancy of 64.8 years is one of the four states in the country with a life expectancy of approximately 65 years, other states with high life expectancy are Akwa Ibom and Ondo states with 65.5 years each, and Cross River state with 64.3 years (NDHS, 1991). Ibadan is the capital of Oyo state and inhabits the bulk of the state population.

Ibadan was the most populous city in black Africa at independence of Nigeria (Awe, 1967), the third largest city in Nigeria by population after Lagos and Port Harcourt and the largest city in geographical area in West Africa. Ibadan with a population of 2,550,592 people covers a total of 3,123.30 square kilometers out of which the urbanized zone covers about 463.33 square kilometers. The city is made-up of 11 Local Government Areas with five (5) Local Governments (Ibadan North, Ibadan North East, Ibadan North-West, Ibadan South-East and Ibadan South-West) located within the metropolis and six (6) Local Governments (Akinyele, Ido, Lagelu, Oluyole, Egbeda, and Ona-Ara) at the periphery. The study LGAs are Ido and Egbeda at the periphery and Ibadan South West and Ibadan North West within the metropolis.

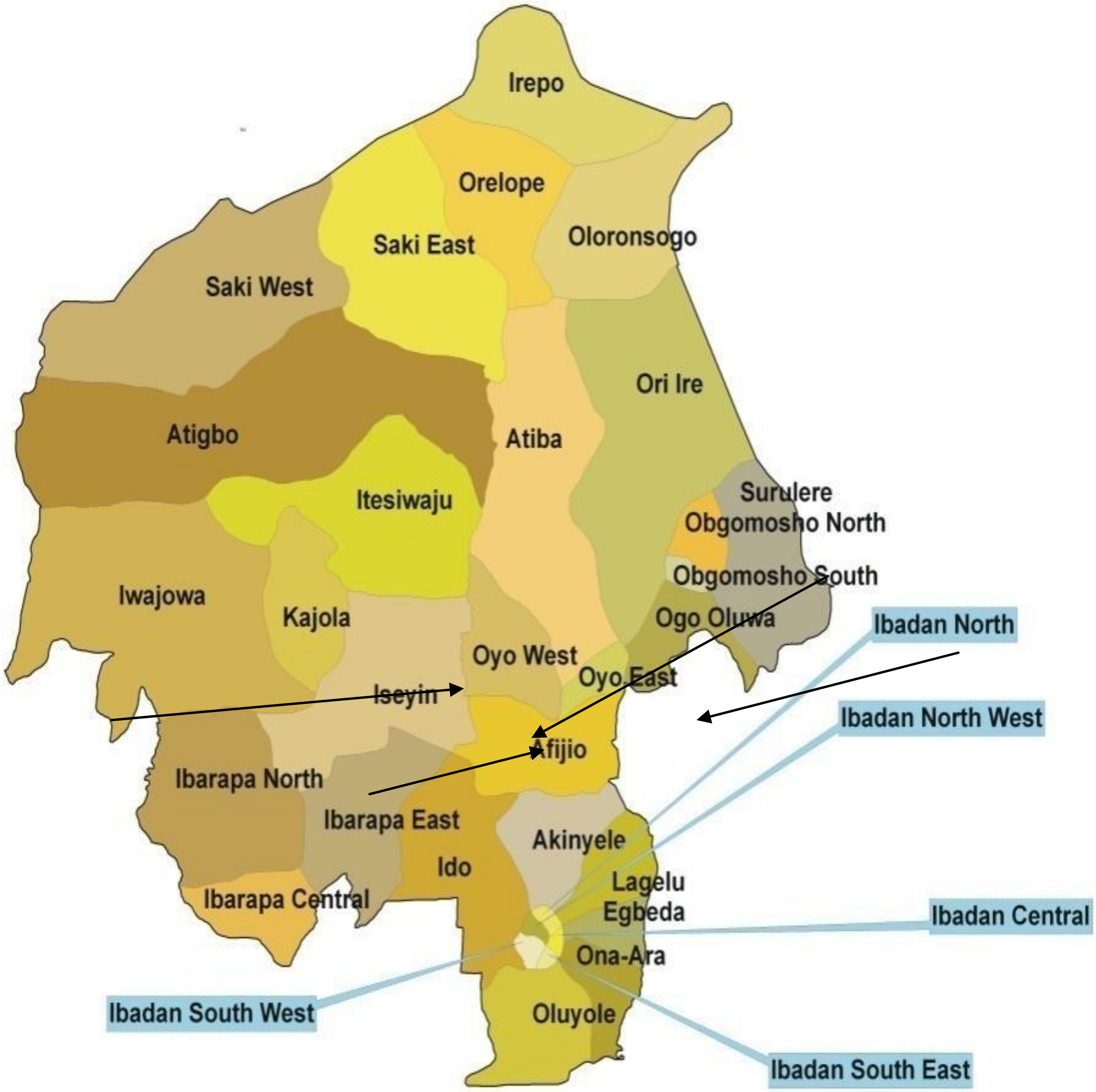



Figure 3.2: Oyo State map showing the selected local governments

### 3.3.3 Brief Description of Ibadan North-West Local Government

Ibadan North West Local Government is an urban centre in Ibadan Metropolis with the Administrative Headquarters situated at Onireke, Ibadan. It covers a land area of 26.228 square kilometer and consists of eleven (11) wards. The Local Government Area consists of 154,029 people composed of 75,410 males and 78,619 females according to 2006 Nigerian census (NPC, 2006). The LGA is bounded on the north by Ido LGA, on the south by Ibadan South East LGA, on the west by Ibadan South West LGA and on the east by Ibadan North East LGA. The people's occupations are diverse including farming, trading, artisans and civil service. The settlements in the local government are stratified along inner core (indigenous/slum-like), transitory (developed with little or no space for further development) and peripheral communities (developed with more space for development) (Arulogun & Adefioye, 2010).

### 3.3.4 Brief Description of Ibadan South-West Local Government

Ibadan South West Local Government Area was carved out of the defunct Ibadan Municipal Government (IMG) in 1991. The Administrative Headquarter is located at Oluyole Estate. It covers a landmass of 133.5 square kilometers with a population density of 2,117 persons per square kilometer. The Nigerian 2006 census population for the area was 282,585 people with 139,515 males and 143,070 females (NPC, 2006). The Local Government Area is bounded by Ibadan North West and Ido Local Government Areas to the north, Oluyole Local Government in the south, Ido Local Government Area in west and Ibadan North and South East in the east. The area is largely urban with very small farming activities, however, most of the agricultural products planted outside the area are processed in the LGA because the LGA is a home for small, medium and large scale industries. The Local Government Area consists of eleven (11) wards and is dominated by the Yorubas and other tribes who engaged in different type of economic activities.

### 3.3.5 Brief Description of Egbeda Local Government

Egbeda Local Government Area was created in 1989 with the Administrative Headquarters at Egbeda town. It covers a landmass of 185.508 square kilometer with a population density of 1,517 persons per square kilometer. The Nigerian 2006 population figure of the Local Government was 281,573 with 138,298 males and 143,275 females (NPC, 2006).

The LGA shares boundaries with Osun State to the east, Lagelu Local Government area to the north, Ibadan North East Local Government Area to the west and Ona Ara Local Government to the south. It is dominated by Yorubas and has a wide expanse of land for the production of livestock and arable farming. About half of the Local Government area is rural in nature and suburb to Ibadan Metropolis. Subsistence farming is common among the people. The fertile soil and climate favoured the growing of maize, cassava, yams, cocoa, oil palm vegetables and citrus fruits. Among the notable communities located in the Local Government Area are Ajoda New Town, Egbeda, Majawe, Osun Abolowojaye, Olodo, New Gbagi, Old Ife road, Akingbade, Ogungbade, Adegbayi, Olode, Kumapayi, Arolu, Adeleye, Efun, Alakia, Isebo, among others.

### 3.3.6 Brief Description of Ido Local Government

Ido Local Government Area was created in 1989 with the Administrative Headquarters located at Ido. It shares boundaries with Iseyin and Afijio Local Government Area to the North, Akinyele Local Government Area to the East, Ibarapa East Local Government Area to the West. It also shares boundaries with Ogun State to the south. The Local Government Area is largely rural and opens to the hinterland of the state. It has a landmass of 1,010.954 square kilometers with the 2006 population of 103,261 composed of 51,750 males and 51,511 females (NPC, 2006). It has a population density of 102 persons per square kilometer making the LGA the least population dense of the studied areas. The residents of the Local Government Area are mostly farmers, traders, transporters and civil servants. Soil fertility in the area enhances the production of maize, cocoa, oil palm, kolanuts, cassava and vegetables.

## 3.4 Study Population

The study population comprised of male and female Nigerians aged 65 years and above and who had resided in the study location for at least five years. Other inclusion criteria included being a Nigerian, home resident, mentally fit for communicative interaction, healthy and not on any medical regimen, non-participation in any other study at present and willingness to participate. All the elderly who satisfied the conditions above and had signed the informed consent form were included in the study. Selected subjects were visited in their homes by at least two trained field assistsants.

### 3.5 Sample Size Determination

The sample size was calculated using the proportion sample size formula

$$n = \frac{\bar{p}(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

where:

n = minimum sample size required

$p_1 - p_2$ = clinically meaningful difference in dependent proportions

$Z_{\beta}$ = corresponds to power (.84 = 80% power)

$Z_{\alpha/2}$ = corresponds to two-tailed significance level (1.96 for $\alpha = 0.05$)

Chen (2005) reported the prevalence of malnutrition among community dwelling elderly as 2%-51%. This range also covers the prevalence are of 39.5% reported among Yoruba elderly (Olasunbo and Olubode, 2006).

$$n = \frac{(0.02+0.51)/2 \times (1-(0.02+0.51)/2)(0.84+1.96)^2}{(0.51-0.02)^2}$$

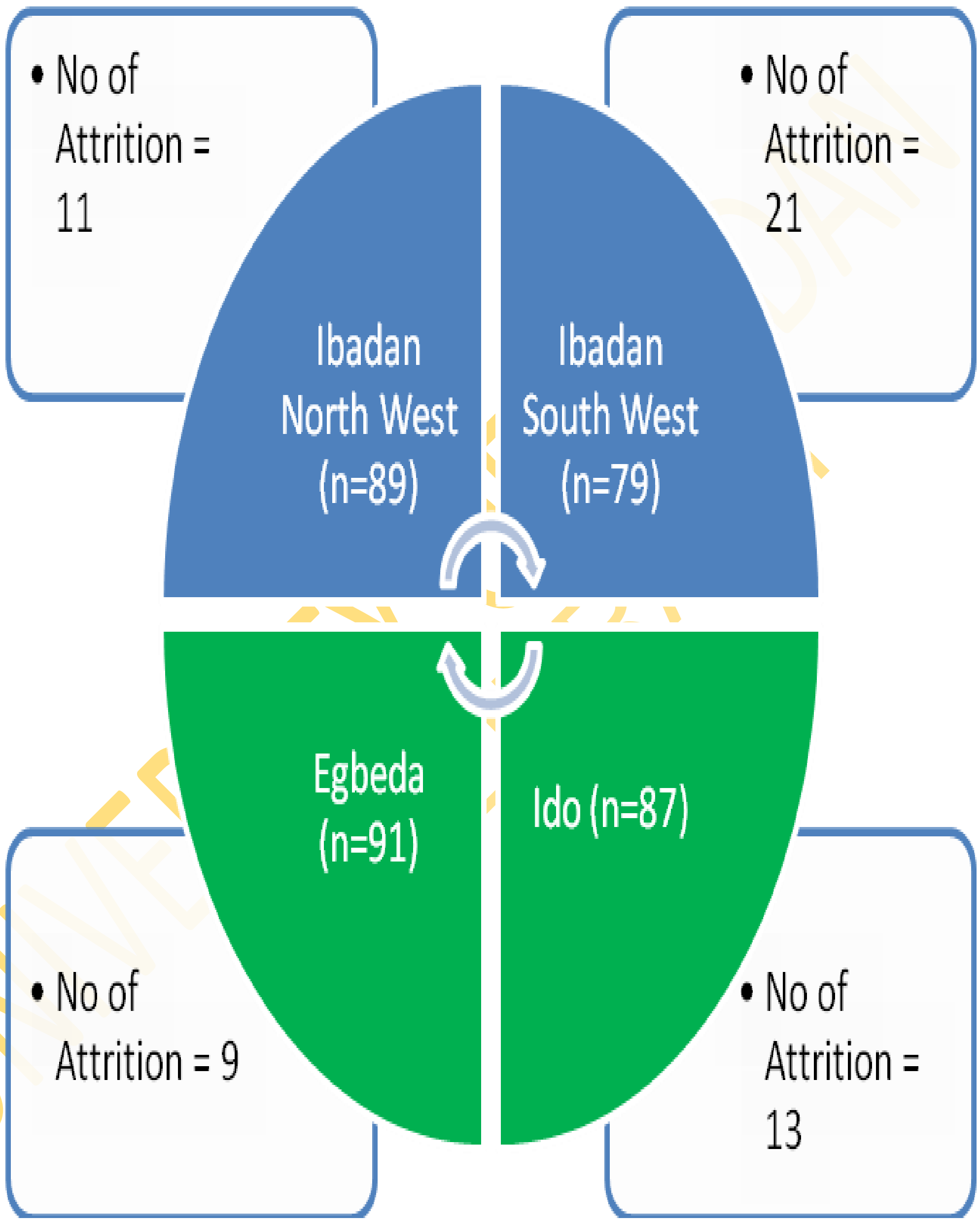
$$n = \frac{0.265 \times (1-0.265) \times (2.8)^2}{(0.49)^2}$$

$$n = \frac{1.527036}{0.0241} \quad = \frac{1.527036}{0.0241} \quad = 63 \, respondents \, per \, LGA = 252 \, minimum \, study \, respondents$$

20% of the required sample size was added to cater for non-response making the sample of (23 + (20% x 252)) = (252 + 50.4) = 302, this was increased to 400.

A total of four hundred (400) households, one hundred (100) households from each of the four Local Government Areas (LGAs) were selected. There were variations however in the number of respondents that completed the study in each of these LGAs. A total of 346 households completed the study. In Ibadan North East 89 households, Ibadan South West 79 households, Egbeda 91 households and Ido 87 households completed the study. Statistically, this sample is considered sufficient for valid inferences and description of the target population in Ibadan metropolis and its suburbs.

**Figure 3.3: Overview of Number of respondent by LGA**



### 3.6. Ethical consideration

Ethical approval to conduct the study was obtained from the Ethical committee of the Oyo State Ministry of Health, Ibadan. The principles of respect for autonomy, human dignity, beneficence and non-maleficence were adhered to in the conduct of this study. Informed consent of all the respondents was obtained and confidentiality was ensured. Participants were informed of their right to withdraw from the study whenever they wanted.

### 3.7. Validation and Reliability test of Research Instruments

The study instruments were validated through content validity. They were translated into Yoruba language and backtranslated into English language and non-misinterpretation of the desired information was ensured. Pilot study areas to pre-test the study instruments was conducted in areas with similar characteristics as the described study areas. Thirty respondents aged 65 years and above were randomly selected from these pilot study communities to check the level of understanding and desirability to answer the questions. Focus group discussion was conducted to identify other foods added to the adopted food frequency questionnaire. Questionnaires were appropriately adjusted in response to the observations made following the pre-testing.

### 3.8 Data Collection

The variables affecting the lifestyle, food security, nutritional vulnerability, and nutritional status as measured by anthropometric and dietary assessments of the elderly in the study area were determined using both the quantitative and qualitative data collections techniques. A pre-tested, semi-structured interviewer-administered questionnaire consisting of eight parts was used to collect required information from the respondents. The first part included "socioeconomic and demographic characteristics", the second part considered the lifestyle, household and environmental variables while the third part assessed the community age friendliness and social support. The fourth, fifth and sixth parts of the questionnaire were designed to measure food habit and consumption pattern, food security and nutritional vulnerability as well as 2-day weighed food intake respectively. The seventh and eighth parts obtained information on anthropometric parameters and food consumption frequency of the respondents.

**Preliminary visits and Training**

Preliminary visits were made to the communities used and informed consent was obtained from the respondents prior to the data collection. To harmonize the methodologies, training workshop for research assistants was held and the questionnaire was translated into Yoruba language, back-translated to English and checked for similarity and divergence. Two research assistants and two local guides per LGA were responsible for data collection.

### 3.8.1 Socio-economic and Demographic Data

Interview method using a semi-structured questionnaire was employed to collect information on socio-demographic and socio-economic characteristics, and other socio-cultural information of the subjects. Information was obtained on indicators such as age, sex, marital status, religion, level of education, household monthly income, type of house, housing type, source of cooking fuel, type of toilet facility, source of water and waste management method among others. Socio-economic and demographic characteristics of the subjects were allocated scores to generate Socio-Economic Status (SES) categories. The subjects were scored for socioeconomic status using factors such as level of income, property ownership, type of house, housing type, source of cooking fuel, source of water, control of household income, employment status, and level of education to score the respondents and classify them into low (6-13), moderate (14-21) and high (22-29) socioeconomic status as described by Oyedeji (1985). Respondents with high score were considered as having high SES and respondents with low scores were considered to have low SES. The least level of the various variables were scored zero point and the scoring continues by adding one point with every succesive level to the highest level.

### 3.8.2 Lifestyle, household and environmental variables

The healthy lifestyle index was computed using principal component analysis. The pattern of all lifestyle characteristics was defined as a single healthy lifestyle indicator (good or poor lifestyle). The variables used were current smoking status, alcohol consumption, hours spent on watching television, hours of sleep, frequency of consumption of fruits and vegetables, activity level as measured by perceived energy status, and BMI. Current smoking was defined as smoking cigarettes or any other physchoactive substances every day or some days in the last 30 days. Moderate alcohol consumption was defined as an average daily alcohol consumption of ≤1 drink per day where one drink is defined as one shot of spirits (such as Bourbon, Scotch, Vodka, Gin, etc.), one glass of wine or a bottle of beer. Heavy drinking was defined as consuming alcohol in excess of moderate levels. Sleep was asssessed using a question from the Multiethnic Cohort Study that asked about the average number of hours per day spent sleeping (Kolonel *et al.*, 2000). Poor fruits and vegetable intake was defined as frequency of fruits and/or vegetables (cooked or uncooked) consumption less than 4-7 times weekly. Inadequate physical inactivity was defined as lack of regular and sustained activity as a proxy for <30 minutes of moderate activity per day for at least 3 days/week. Respondents who reported no physical activity in form of a formal exercise regimen and whose activities were mostly done sitting or standing were classified as having inadequate physical activity. Healthy weight was defined as a body mass index (BMI) between 18.5 and 24.9 (kg/m$^2$).

Thus the lifestyle was considered healthy when the respondent is a non-smoker, did not consume more than one bottle of drink per day (>70g daily), television watching did not exceed six hours, sleeping hours was 8 or more, fruits and vegetables consumption was up to 4-7 times per week, was involved a physical activity or exercise daily or had average activity level, and had healthy weight. All data were based on self-reports except the BMI.

The household and environmental characteristics are pointers to distinguishing features of the respondents and respondents' households. The household characteristics considered were method of obtaining food, the individual responsible for food preparation, food preparation, access to clean water, waste management, change of house within the last 12 months, availability of steady income, fall in household income and access to home garden/farm among others.

The social support and welfare packages available to the respondents were assessed using standardized questions. Age-friendliness of the study areas was assessed with modified and localized version of World Health Organization (WHO) Age-friendly city's checklist (WHO, 2007). The checklist was designed to view communities and communities' development from the perspective of the elderly, in order to identify where and how they can become more age-friendly and assess localities strengths and gaps in matching experiences and expectations of the elderly. Some aspects of the checklist were administered by direct observation but active involvement of the respondents. The checklist was meant to evaluate the adaptive nature of structures and services within a locality to the varying needs and capacities of the elderly. Eight areas of living were captured in the checklist, these were outdoor spaces and buildings, transportation, housing, social participation, respect and social inclusion, civic participation and employment, communication and information; and community support and health services.

### 3.8.3 Food Pattern and the Nutrient Intake of the Subjects

Information on food consumption pattern and dietary intake of the subjects was collected using food frequency questionnaire and a 2-day direct weighing method.

#### 3.8.3.1 Food habit and consumption pattern

Food habit and consumption pattern was assessed through a series of questions and the use of non-quantitative food frequency questionnaire involving the compilation of meal pattern, water consumption and commonly consumed meals and their frequencies. Information was gathered regarding eating habits at various meal occasions; factors that influence food choice. The food habit score was computed using principal component analysis of respondents' positive responses to selected variables. Variables used in computing food habit scores included number of meals consumed per day, meal skipping, reasons for meal skipping, place of food preparation and consumption, water consumption less than 3 liters per day, beverage consumption, food restriction, eating alone and snacking habit. A total component score of 14 or more was considered good or health promoting food habit while a component score below 14 was considered poor food habit. All questions were answered dichotomously, either yes or no.

Frequency of food consumption over the past week was assessed through the use of a non-quantitative food frequency questionnaire, a form of food list based on dietary history, involving the compilation of long list of foods. The food frequency was used because it is easy and cheap to conduct. The food frequency questionnaire was adapted from Nigeria Food Consumption and Nutrition Survey 2001-2003 (Maziya-Dixon, 2004) and additional foodlist generated during the pre-test of the study instruments were added. The food items were aggregated into the major food groups such as fruits, vegetables, legumes, cereals, roots and tubers while all animal food products were grouped together as meat/fish/milk products. The subject's consumption of the foods per week was determined and classified into three namely; 'never consumed' (0 time in the past week), 'moderate consumption' (1-3 times in the past week) and 'frequent consumption' (4-7 times in the past week). The food frequency questionnaire was self-reported by asking the elderly how many times per day and per week they consumed a particular food item. Prompting questions were used to aid recall. No information about the amount of consumption was collected. Information on food restrictions was obtained.

#### 3.8.3.2 Direct weighing of food intake

A-weekday and a-weekend direct weighing method was used for the dietary intake assessment. Direct dietary weighing method was adopted because it is accurate and useful for both families and individuals especially in the older population and is not influenced by fading memory (Olusanya, 1977; Asselberg & Sabry, 1988; den Hartog, Van Staveren, & Brouwer, 1995; Gaillard, Alix, Boirie, Berrut & Ritz, 2008). The use of direct weighing was to reduce memory related errors which often occur in 24-hour dietary recall. It also removed the need for portion size estimation and respondents' burden in detailed description of meal and size consumed using equivalent portions sizes.

Food was weighed using Salter scale at meal times and recorded appropriately in the respondent's questionnaire. The respondents were instructed not to alter what they ate or drank during this time. The interviewer recorded all the foods ate and drank during one week day and one week end. The food was weighed per portion before consumption and was adjusted for the amount of leftovers if any. The same procedure was followed for snacks and beverage consumption. Five households within the same localities were covered together at a time for direct food weighing.

The food intake data were converted to nutrient intake using the locally adapted Total Dietary Assessment Software Version 3.0 (Total Dietary Assessment, 2002). The mean nutrient(s) values and the percentage of Dietary Reference Intake of nutrients of interest were calculated using the Total Diet Assessment Software Version 3.0. When a specific food item eaten was missing in the Total Diet Assessment Software data base, information from Food Composition Tables by Oguntona and Akinyele (1995) was used to update data about nutrient content. The food record was analyzed for identified limiting nutrients in the diets of the elderly; energy, protein, carbohydrate, fibre, fat, vitamin B1 and A, calcium, zinc, iron and magnesium (Hewitt *et al.*, 2006). Mean nutrient intake and percentile distribution of intakes were calculated for the respondents. The level of nutrient adequacy was considered inadequate when it was below 80.0 percent of nutritional requirement, adequate when it fell between 80.0 – 10.0 percent and excess when above 120.0 percent of nutritional requirement.

### 3.8.4 Food security and nutritional vulnerability assessment

The food security status of the respondents was assessed using the adapted United States Department of Agriculture's Household Food Security Survey Module. Responses to variables known to be associated with food insecurity as identified in the United States Department of Agriculture's Guide to Measuring Household Food Security were scored and graded using standard procedure (Bickel *et al.*, 2000). The variables used were working status, availability of adequate funds for food purchase or production, availability of someone to shop for household food when needed, percentages of household income spent on food, healthcare and alcohol, availability of cold storage facility, respondent or household member work in farming/agriculture, keeping animals, missed meals due to not enough food, sleep hungry due to not enough food, being worried about having enough food in the house, non availability of preferred foods, being compelled to any foods that you typically do not eat, experienced limited choice of familiar foods and losing weight due to not enough food? These variables were broadly grouped into food access and food affordability, two of the major pillars of food security. The aggregate of the responses was broadly summed into three food security classes using Bickel *et al.* (2000) model; food secure, food insecure with hunger and food insecure without hunger. The respondents whose food intake have reduced to an extent and have repeatedly experienced the physical sensation of hunger were classified as food insecure with hunger. The respondents who reported little or no reduction in food intake but had evident food insecurity with respect to adequacy in food supply were categorized as food insecure without hunger while the respondents with no or minimal evidence of food insecurity were grouped as food secure (Nord, 2003).

The nutritional vulnerability was measured using a modified and locally pre-tested derivative of nutritional vulnerability risk factor checklist of Help Age International and the London School of Hygiene and Tropical Medicine. A total of thirty-eight items were used in the vulnerability assessment and each item was scored one point if the subject was susceptible to the item to arrive at a total of 38 points. These items were broadly categorized into seven subtopics namely; health, food intake, economics, disability, functional ability, family life and psychological or emotional life. A respondent can gather a maximum of thirty eight points if all items in the checklist were scored. The scores show the degree of vulnerability; the higher the score the more vulnerable the elderly was likely to become. In interpreting the scores of different respondents, nutritional vulnerability was categorised as non-vulnerable (0-5), moderately vulnerable (6-14) and highly vulnerable (15-38). The listed factors were carefully explained to the respondents and choices were made based on the understanding of the interviewer's interpretation. This module assessed why malnutrition occurs and can help to deduce actions that can reduce or halt malnutrition.

### 3.8.5 Anthropometric Measurements of the Subjects

Anthropometric measurements such as body weight, body height, mid-upper arm circumference (MUAC), body armspan and body halfspan, were collected from the respondents in the mornings before breakfast. The methodologies for the anthropometric measurements were as described by Ismail *et al.* (1999) in the HelpAge /LSHTM manual titled Better Nutrition for The elderly: Assessment and Action Manual. The measurements were taken using SECA electronic weighing scale, local stadiometer and non-stretch flexible tape rule. Each measurement was taken twice to check for accuracy; where the two measurements are same or very close, the average was used but when otherwise; a new set of measurement was taken. Maximum error margins used were 0.1kg, 1cm, 1cm, 0.5cm and 0.1cm for weight, height, armspan, halfspan and mid-upper arm circumference respectively.

Body weight, armspan, halfspan and height were measured during the home visit and used to deduce the body mass index (BMI: weight/height$^2$; weight/armspan$^2$)**.** Ismail *et al.* (1999) reported difficulty in accurate measurement of height in the elderly and proffer the use of armspan or halfspan instead.

Body weight measurements were performed with an electronic (SECA) scale taken on a smooth level surface, near a wall or doorpost so that the subject can support himself or herself when getting on or off the scale. The respondents were made to stand erect, on the scale, barefooted and with light clothing. The weight measurement were displayed and read after stabilization. There was no obvious sign of edema in any of the respondents.

Standing body height was measured using a locally constructed stadiometer. The subjects were made to stand erect with fully straightened legs on the base plate, without shoes, with the head bar resting lightly on their head. The bare feet were placed slightly apart and the back of the head, shoulder blades, buttocks, calves, and heels touched the vertical board. Legs were kept straight and the feet flat. The headboard was pulled down to rest firmly on top of the head and compressed the hair and the height readings were taken to the nearest 1cm (Nagy *et al.*, 2008).

Long bone measures (armspan and halfspan (demispan or hemispan) were used as proxies for height (Mitchell & Lipschitz, 1982) with adequate consideration in the ethnic variation of relationship of these long bone measures with height (Gallagher, Visser, Sepulveda, Pierson, Harris & Heymsfield, 1996). Armspan was measured as the length between the tips of the Digitus medius of the right and left arm and was measured when the respondent can stretch out arms, hands and fingers in a straight line (Ismail *et al.*, 1999). Where bent back made it difficult to stretch both arms, the halfspan was used. Halfspan is adjudged better than the height in old age because of the weakening of the muscles of the back (Trapezius, Latissimus Dorsi, Levator Scapulae, Rhombus minor ands major, Seratus Posterior Inferior, Oblique Externus and Internus etc), muscles of the legs (Iliacus, Vastus medialis, sartorius, Rectus femoris, Abductor longus, Adductor magnus, Gracilis and Adductor brevis) and bending of the Vertebral column. This weakening leads to loss in height due to the curvature of the spine. Halfspan was taken as the length between the Suprasternal (Jugular) notch and the tip of the Digitus medius (middle finger) of the left arm or the right arm where the latter is better. Where halfspan only was taken, it is multiplied by two to get the armspan. The armspan and halfspan measurements were taken using a Non-stretch flexible measuring tape to the nearest 1cm and 0.5cm respectively. The respondents were made to stand erect with both arms fully stretched and measurement was taken from the back.

### 3.8.6 Mid-Upper Arm Circumference (MUAC)

Mid-upper arm circumference was measured to provide an indirect measure of quantity of body mass and body fat (Frisancho, 1974; Ferro-Luzzi & James, 1996). Mid-upper arm circumference is widely used in assessing the nutritional status of the elderly in emergencies and when time factor, resources or medical reasons prevent the combination of weight with height, armspan or halfspan. It has emerged as a potential screening tool for poor nutritional status. James, Mascie-Taylor, Norgan, Bristrian, Shetty and Ferro-Luzzi (1994) analyzed its usefulness in adults, and calculated cut-offs equivalent to body mass index (BMI) and cut-offs for chronic energy deficiency (CED), using a range of data sets from developing countries. London School of Hygiene and Tropical Medicine found that a MUAC cut off of 21.7 cm had a sensitivity of nearly 86% in relation to the BMI cutoff of 16 kg/m$^2$ and proposed it as an alternative to BMI as part of a screening tool in the acute phase of an emergency. Mid-upper arm circumference is usually taken on the non dominant arm usually the left arm but the right arm can also be used. The midpoint of the upper arm was identified by measuring the arm from the acromion to the olecranon while the subject held the forearm in horizontal position. The measurement was taken using an inelastic flexible measurement tape calibrated in centimetres. Subject stood erect with the head in horizontal plane, arms relaxed and legs apart, while an inelastic tape was placed at the midpoint of the upper arm between the acromion process and the tip of the olecranon (Symreng, 1982; Burr & Phillips, 1984). After locating the mid-point, the tape was wrapped gently but firmly without compressing the skin, around the arm at the midpoint. The measurement was recorded to the nearest 0.1 cm and the mean value of two repeated measurements was evaluated. The measurement is thereafter classified as indicated in Table 2.4. Mid upper arm circumference was classified as severe malnutrition when the value was 22.1 cm, moderate malnutrition when value was within 22.1 to 23.0 cm, mild malnutrition when within 23.1 to 24.0 cm and normal when the value was greater than 24.0 cm.

### 3.8.7 Body Mass Index

Body mass index (kg/m$^2$) is most often used in assessing underweight and overweight in the elderly, where Body weight and height and/or armspam are measured. Body Mass Index (BMI) of subjects was used to classify the subjects according to their degree of malnutrition; this has been widely used among different age group of the population (Olasunbo & Olubode, 2006; Ariyo *et al.*, 2012). Body mass index based on height was calculated by dividing the measured body weight in kilograms by the square of the body height in meters and categorized into four weight classes; >18.5 (underweight), 18.5-24.9 (normal or desirable weight), 25.0-29.9 (overweight), and ≥30.0 (obese) (Gibson, 2005).

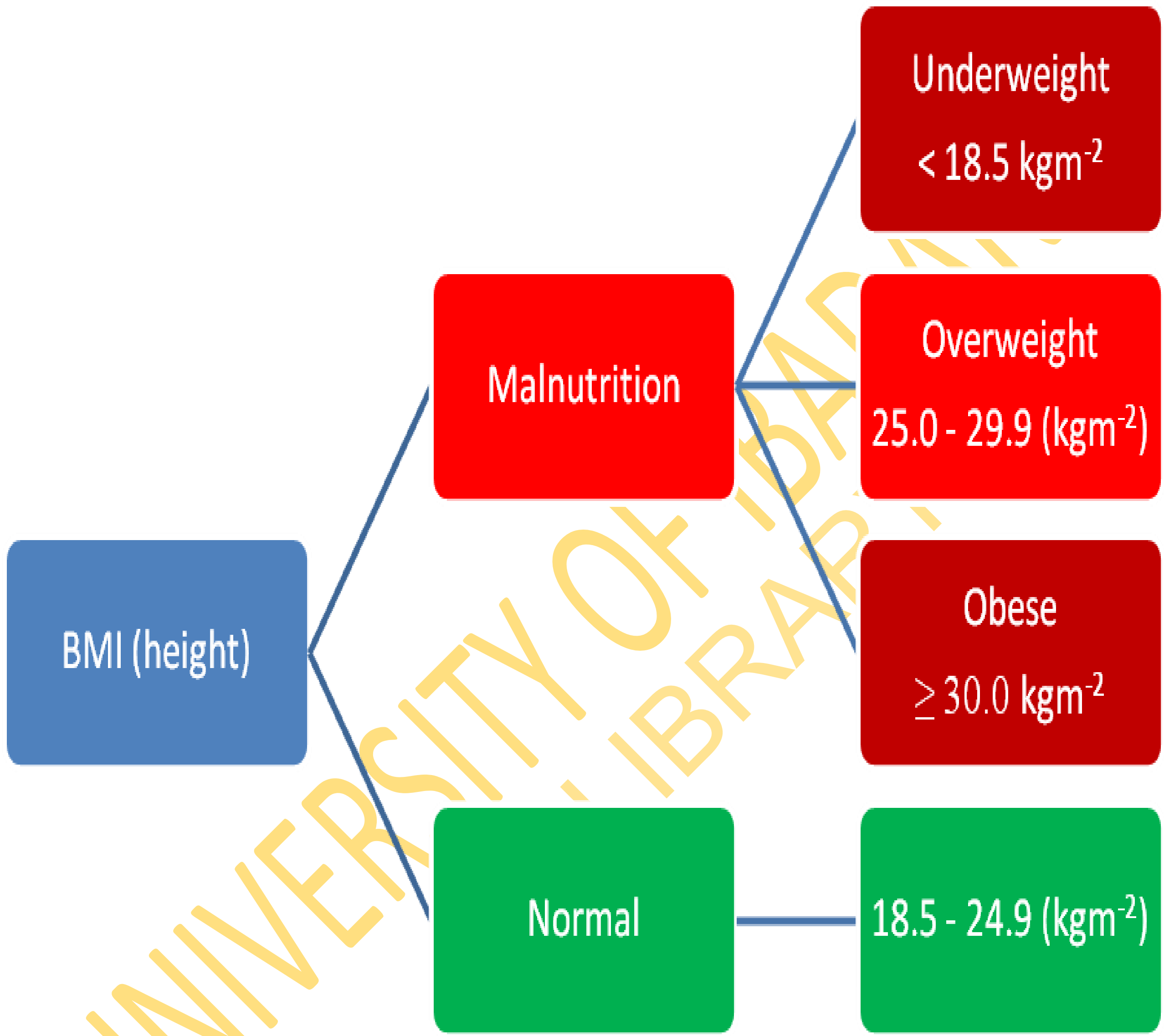
$$BMI_{(height)} = \frac{Weight(Kg)}{Height(m)^2}$$

Body mass index based on armspan can be calculated by dividing the measured body weight in kilograms by the square of the body armspan in meters using the appropriate correlation factor based on population means. However, in the elderly, significant error occurs in the estimation of height using the correction factor and this error is further maginfied by the squaring of the height in calculating BMI.

$$BMI_{(armspan)} = \frac{Weight(Kg)}{Armspan(m)^2}$$

To avoid this error, BMI based on armspan was deduced by the use of HelpAge International and London School of Hygiene and Tropical Medicine BMI/armspan Chart 3 (weight and armspan). Weight and armspan were categorised as underweight (<16.5 Kg/m$^2$), normal-weight (16.5-22.9 Kg/m$^2$) and overweight (≥23.0 Kg/m$^2$).

Figure 3.4: Classification of Body Mass Index (BMI) based on height




(Drawn from Gibson, 2005)

### 3.9 Method of Data Analysis

Data were analyzed using Statistical Package for Social Sciences Version 14.0 (SPSS 14.0) at p-value <0.05 level of statistical significance to actualize the study objectives. The tools of analysis are descriptive, correlation and regression statistics. Data collected on lifestyle, household, socio-economic and demographic characteristics were analyzed using simple descriptive statistics such as frequency, percentages and mean. Relative frequencies were compared with Chi-square test. The descriptive statistics included the use of tables and charts, frequencies and percentage; also measures of central tendencies such as means with their standard deviation were used to describe the characteristics of subjects. Interval and ordinal data were described with mean values and standard deviations. Nominal values were presented with number and percentages.

The study population was divided into groups by location. Differences by rural/urban sector were analyzed by t-test for independent samples (two-tailed probability), frequency comparisons were made using the Chi-square test. For normally distributed variables, between group differences in means were analyzed with student's t-test. Differences by urban-rural sector classification were analyzed by t-test for independent samples (two-tailed probability). Non-normally distributed variables, between-group differences were analyzed using the Mann-Whitney or Kruskall-Wallis tests and comparison between continuous variables was made by regression analysis.

To compare the nutritional risks result between rural and urban sectors, t-test for independent samples (two-tailed probability) was undertaken. When comparing the nutritional risks result in relation to background variables and health-related variables, Chi-square test (two-tailed probability) was used to identify possible predictors of food security, nutritional status and being at nutritional risk. Differences in body mass index based on height and armspan were assessed using t-test and relationship with mid upper arm circumference was evaluated using Chi-square test.

A multiple forward stepwise logistic regression was used to investigate to what extent the identified predictors of food security, nutritional status and being at nutritional risks is significant in explaining the urban/rual variations. Odd ratios (OR) and 95% confidence intervals (CI) were presented. Statistical significance was set at 5%.

The dependent variables are food security, nutritional status and nutritional risks while the independent variables are socioeconomic, household and lifestyle variables. For regressional analysis, gender was measured as a dichotomous variable with male as the reference. Marital status was recoded to be binary: married or non-married with the former serving as reference. Similarly, food security was dichotomised to food secure and food insecure with food secure as the reference. Socioeconomic status was dichotomised into at least moderate SES and below moderate SES with the former as the reference. For factor analysis, the independent variables were scrutinised for underlying patterns via factor analytic procedures. A prerequisite for including a variable was that the level of response to each item was sufficient to avoid destabilisation of the analysis. The factors identified in this fashion correspond to the primary topics or latent variables (called factors) to which correspondents seem to be responding in terms of various related items.

The protocol adopted here for factor analysis was to use Principal Component Analysis (PCA) and to rotate the matrix of loadings to obtain orthogonal (independent) factors (Varimax rotation). The prime goal of this factor analysis is to identity simple items loadings >0.399 on only one factor that are interpretable, assuming that items are factorable. Thereafter, the relationship between responses to these factors and various independent variables are examined via multiple linear regression.

### 3.10 STUDY LIMITATION

There are three principal limitations with this study.

The primary limitation of the study is that it is cross-sectional. The exposure and outcome were assessed simultaneously and a causal relationship claim between the dependent and independet cannot be established. Also, the measure of socio-economic status, nutritional vulnerablity and food security status used in this study are proxy indicators estimated from household level data.

Another potential limitation to this study is the self-reporting used in nutritional vulnerability, food frequency and food security which may have affected the quality of the results. Data collected using self-reporting methods is potentially prone to bias as a result of social desirability, recall bias and respondents'expectations.

Lastly, the geographic variable used to define urban and rural areas was simplistic and did not take into account the heterogeneity that exists in rural areas. Moreover, the focus is on Ibadan area and thus the results may not be true for other parts of the state or the country.

# CHAPTER FOUR

# RESULTS

## 4.1 Section A: Socio-demographic and Socio-economic characteristics of Respondents

### 4.1.1 Socio-demographic characteristics of the Respondents

The demographic characteristics of the respondents are shown in Table 4.1. Personal characteristics such age, sex, religion, among others were reported based on location of residence according to the study objectives. The mean age of the respondents was 69.4±5.3 years. The mean age was higher in rural (69.7±4.4 years) than urban (68.9±4.7 years). The respondents between the ages of 65-69 years constituted the largest proportion of the sample, with 64.7% falling into this category. About one-quarter (24.3%) were aged between 70-74 years, 6.1% were aged 75-79 years, 2.6% were aged 80-84 years and respondents aged 85 years and above were the least represented (2.3%). Segregation by locality showed that there were more respondents within 65-69 year age group in urban (67.9%) than rural (61.8%) areas. More respondents were in 70-74 year group in rural (28.1%) than urban (20.2%) areas and respondents aged 84 years and above were nearly twice as many in urban (3.0%) than rural (1.7%) areas. There was no significant rural/urban difference in the age of the respondents ($P>0.05$).

The male and female respondents accounted for 59.5% and 40.5% respectively. Segregation by locality shows that there were more male respondents in both rural (60.1%) and urban (58.9%) areas as against female respondents in urban (41.1%) and rural (39.9%) areas. However, this difference was not statistically significant ($p>0.05$).

Most of the respondents (77.7%) were married, some 15.9% were widows and respondents who were single and separated/divorced accounted for 3.8% and 2.6% respectively. Married respondents were higher in urban (79.8%) than rural areas (75.8%). There were also more widows in the urban (16.7%) than rural (15.2%) areas and single respondents were about twice in rural (5.1%) than urban (2.4%) areas. The separated/divorced were about three times more in rural (3.9%) than urban (1.2%) areas.

Religious disposition of the respondents showed that more than half (51.7%) were Christians, 43.6% were Muslims while traditional religionists were 4.7% (Table 4.1). Segregation by locality showed that in the urban localities, there were more Muslims (53.6%) than Christians (44.6%) while few (1.8%) were Traditionalists. However in the rural locality, religion was more diversified with more Christians (58.4%) than Muslims (34.3%) while Traditionalists accounted for 7.3%. There was a significant difference in the religious disposition of the respondents by locality (p = 0.01).

Table 4.1: **Socio-demographic characteristics of the Respondents**

| Variables | Overall N (%) | Urban N (%) | Rural N (%) | $\chi^2$ | P-value |
|---|---|---|---|---|---|
| **Age (in years)** | | | | | |
| 65-69 | 224 (64.7) | 114 (67.9) | 110 (61.8) | | |
| 70-74 | 84 (24.3) | 34 (20.2) | 50 (28.1) | 3.556 | 0.47 |
| 75-79 | 21 (6.1) | 11 (6.5) | 10 (5.6) | | |
| 80-84 | 9 (2.6) | 4 (2.4) | 5 (2.8) | | |
| >84 | 8 (2.3) | 5 (3.0) | 3 (1.7) | | |
| Mean | 69.4±5.3 | 68.9±4.7 | 69.7±4.4 | | |
| **Sex** | | | | | |
| Male | 206 (59.5) | 99 (58.9) | 107 (60.1) | 0.050 | 0.82 |
| Female | 140 (40.5) | 69 (41.1) | 71 (39.9) | | |
| **Marital Status** | | | | | |
| Single | 13 (3.8) | 4 (2.4) | 9 (5.1) | | |
| Married | 269 (77.7) | 134 (79.8) | 135 (75.8) | 5.579 | 0.23 |
| Widow | 55 (15.9) | 28 (16.7) | 27 (15.2) | | |
| Separated/Divorc | 9 (2.6) | 2 (1.2) | 7 (3.9) | | |
| **Religion** | | | | | |
| Christianity | 179 (51.7) | 75 (44.6) | 104 (58.4) | 16.280 | |
| Islam | 151 (43.6) | 90 (53.6) | 61 (34.3) | | 0.01 |
| Traditional | 16 (4.7) | 3 (1.8) | 13 (7.3) | | |
| **Total** | **346 (100%)** | **168(100%)** | **178 (100%)** | | |

### 4.1.2 Socio-economic characteristics of the Respondents

Respondents' educational status was measured by the highest level of education attained as presented in Table 4.2. Above one-quarter of the respondents (26.0%) had tertiary education, one-quarter (25.1%) each had secondary education and primary education while respondents without any form of formal education accounted for 23.7%. When segregated by locality, respondents with tertiary education were about three times higher in rural (38.2%) than urban (13.1%) areas and respondents without formal education were also higher in the rural (24.7%) than urban areas (22.6%). Respondents with at least primary education were about twice higher in urban (64.2%) than rural areas (37.0%). There was a significant difference ($p<0.05$) in the level of education by locality.

The elderly were engaged in economic activities as shown in Table 4.2. Overall occupational distribution showed that more than one-third (37.0%) were retirees, 33.5% were artisans, 13.6% were traders, 12.1% farmers, while 3.8% were involved in other forms of occupations. Segregation by locality showed that retirees were about 1.7 times higher in the rural (46.1%) than urban areas (27.4%) and artisans were almost 3.5 times higher in urban (53.0%) than rural areas (15.2%). Also, there were about twice as much traders (18.0%; 8.9%) and farmers (16.3%; 7.7%) in the rural than urban areas respectively. There was a significant difference ($p<0.05$) in occupation by locality.

As presented in Table 4.2, distribution of respondents by household income shows that nearly one-third (30.3%) were within N15001-N20000 income group, about one-fifth (20.2%) were in the N10001-N15000 income group, 15.3% earned between N20001-N25000 and 13.9% earned between N5000-N10000 while respondents in income group greater than N25000 and those in the income level below N5000 accounted for 10.1% each. Breakdown by locality showed that income group of N15001-N20000 was the most common in both areas, however more respondents in urban (41.7%) than rural areas (19.7%) earned between N15001-N20000. Similarly, there were more respondents earning within N10001-N15000 in the urban (21.4%) than the rural areas (19.1%). Respondents earning between N20001-N25000 accounted for 20.2% in the urban and 10.7% in the rural areas. Generally, income tends to be higher in urban than rural areas, there was a significant difference in the level of household income by locality ($p<0.05$).

Overall, kerosene was the major (80.3%) cooking fuel, followed by firewood (17.6%), gas (1.7%) and electricity (0.7%) as shown in Table 4.2. Segregation by locality shows that kerosene was the major fuel in both urban (91.7%) and rural locality (69.7%). The use of firewood was about 3.5 times higher in the rural (27.0%) than urban areas (7.7%). There was a significant difference ($p<0.05$) in the sources of cooking fuel by locality.

The housing type is as indicated in Table 4.2, more than half (53.8%) of the respondents lived in flats, nearly one-quarter (24.9%) lived in one-room apartment and some (15.9%) lived in rooming housing type and few (5.5%) lived in duplex. By locality, respondents that lived in flats were more in urban areas (56.0%) than rural areas (51.7%) and respondents that lived in one room apartment were 1.6 times higher in urban (31.1%) than rural areas (19.1%). Respondents living in rooming housing type were 2.5 times higher in rural (22.5%) than urban areas (8.9%) and respondents that lived in duplex housing were higher in rural (6.7%) than urban areas (4.2%). There was a significant difference in the type of housing by locality ($p = 0.001$).

As shown in Table 4.2, more than three-fifth of the total respondents (64.5%) used water closet toilet, above one-quarter (29.8%) were using latrine toilet, few (4.0%) used stream/bush while others (1.7%) used communal latrine. Breakdown by locality showed close levels of utilization of water closet toilet type (67.3%; 61.8%) and latrine (31.5%; 28.1%) in urban and rural areas respectively. Use of stream/bush was about 13 times higher in the rural (3.8%) than urban areas (0.3%) while respondents that used communal latrine were almost five times higher in rural (1.4%) than urban areas (0.3%). There was a significant difference in the type of toilet used by locality ($p = 0.01$). The higher level of communal latrines in rural areas could be attributed to various interventions to promote hygiene and environmental sanitation.

Overall, the primary sources of water were deep well (78.0%), borehole (15.3%), public tap (4.9%) and rain harvesting (1.7%) as presented in Table 4.2. Deep well was the major source of water in both areas, however access was higher in urban (79.2%) than rural (77.0%) areas. Access to public tap was generally low but three times higher in rural (7.4%) than urban areas (2.4%) while access to borehole was higher in the urban (17.3%) than rural areas (13.5%). The use of rain water was about twice higher in rural (2.2%) than urban areas (1.2%). There was no significant rural/úrban difference ($P>0.05$) in the sources of water.

**Table 4.2: Socio-economic characteristics of the respondents**

| Variables | Overall N | (%) | Urban N | (%) | Rural N | (%) | $\chi^2$ | P |
|---|---|---|---|---|---|---|---|---|
| **Level of Education** | | | | | | | | |
| None | 82 | (23.7) | 38 | (22.6) | 44 | (24.7) | | |
| Primary | 87 | (25.1) | 54 | (32.1) | 33 | (18.5) | 33.83 | 0.03 |
| Secondary | 87 | (25.1) | 54 | (32.1) | 33 | (18.5) | | |
| Tertiary | 90 | (26.0) | 22 | (13.1) | 68 | (38.2) | | |
| **Occupation** | | | | | | | | |
| Retiree | 128 | (37.0) | 46 | (27.4) | 82 | (46.1) | | |
| Artisan | 116 | (33.5) | 89 | (53.0) | 27 | (15.2) | 55.96 | 0.00 |
| Farmer | 42 | (12.1) | 13 | (7.7) | 29 | (16.3) | | |
| Trader | 47 | (13.6) | 15 | (8.9) | 32 | (18.0) | | |
| Others | 13 | (3.8) | 5 | (3.0) | 8 | (4.5) | | |
| **Income** | | | | | | | | |
| <N5000 | 35 | (10.1) | 5 | (3.0) | 30 | (16.9) | | |
| N5000-N10000 | 48 | (13.9) | 15 | (8.9) | 33 | (18.5) | | |
| N10001-15000 | 70 | (20.2) | 36 | (21.4) | 34 | (19.1) | 50.65 | 0.01 |
| N15001-N20000 | 105 | (30.3) | 70 | (41.7) | 35 | (19.7) | | |
| N20001-N25000 | 53 | (15.3) | 34 | (20.2) | 19 | (10.7) | | |
| >N25000 | 35 | (10.1) | 8 | (4.8) | 27 | (15.2) | | |
| **Sources of Fuel** | | | | | | | | |
| Firewood | 61 | (17.6) | 13 | (7.7) | 48 | (27.0) | 30.93 | 0.02 |
| Kerosene | 278 | (80.3) | 154 | (91.7) | 124 | (69.7) | | |
| Electricity | 1 | (0.7) | 1 | (0.6) | 0 | (0.0) | | |
| Gas | 6 | (1.7) | 0 | (0.0) | 6 | (3.4) | | |
| **House Type** | | | | | | | | |
| Duplex | 19 | (5.5) | 7 | (4.2) | 12 | (6.7) | | |
| Flat | 186 | (53.8) | 94 | (56.0) | 92 | (51.7) | 16.20 | 0.001 |
| One room apartment | 86 | (24.9) | 52 | (31.0) | 34 | (19.1) | | |
| Rooming type | 55 | (15.9) | 15 | (8.9) | 40 | (22.5) | | |
| **Toilet Type** | | | | | | | | |
| Water closet | 223 | (64.5) | 113 | (67.3) | 110 | (61.8) | | |
| Latrine | 103 | (29.8) | 53 | (31.5) | 50 | (28.1) | 13.38 | 0.01 |
| Communal latrine | 6 | (1.7) | 1 | (0.6) | 5 | (2.8) | | |
| Stream/bush | 14 | (4.0) | 1 | (0.6) | 13 | (7.3) | | |
| **Sources of cooking** | | | | | | | | |
| Rain | 6 | (1.7) | 2 | (1.2) | 4 | (2.2) | 6.22 | 0.25 |
| Public tap | 17 | (4.9) | 4 | (2.4) | 13 | (7.4) | | |
| Deep Well | 270 | (78.0) | 133 | (79.2) | 137 | (77.0) | | |
| Bore hole | 53 | (15.3) | 29 | (17.3) | 24 | (13.5) | | |
| **Total** | **346** | | **168** | | **178** | | | |

### 4.1.3 Wealth Characteristics of the Respondents

The wealth characteristics as depicted by selected variables are as shown in Figures 4.2 to 4.8. Overall, most respondents (93.6%) lived in brick houses, few (5.2%) lived in mud house and 1.2% lived in thatched roof houses (Figure 4.1). There was a significant difference ($p<0.05$) in the type of house by locality. There were more brick house in the urban (97.6%) than rural areas (89.9%) and respondents in mud house were about five times higher in rural (8.4%) than urban areas (1.8%) while those in thatched roof houses were about three times more in rural (1.7%) than urban areas (0.6%).

Majority of respondents (79.8%) owned house and/or land property. House/land ownership was significantly higher in urban (85.1%) than rural areas (74.7%) ($p<0.05$) (Figure 4.2).

On the whole, 97.1% disaggregated as 97.6% and 96.6% in urban and rural localities respectively had soap for washing, bathing and other household chores (Figure 4.3). There was no significant different ($p>0.05$) by locality.

Generally, most respondents (91.0%) had no household debts. However, indebted respondents were higher in rural (10.1%) than in urban (7.7%) areas (Figure 4.4). Overall, majority of the respondents had refrigerator (69.9%) and television (78.3%) (Figures 4.5 and 4.6). Respondents who had refrigerator were significantly higher in urban (75.6%) than rural areas (64.6%). Also, respondents who had television were higher in urban (80.4%) than rural areas (76.4%). More than half of the respondents (58.1%) raised animals (Figure 4.7), with higher percentage of respondents in urban (61.3%) than rural areas (55.1%).

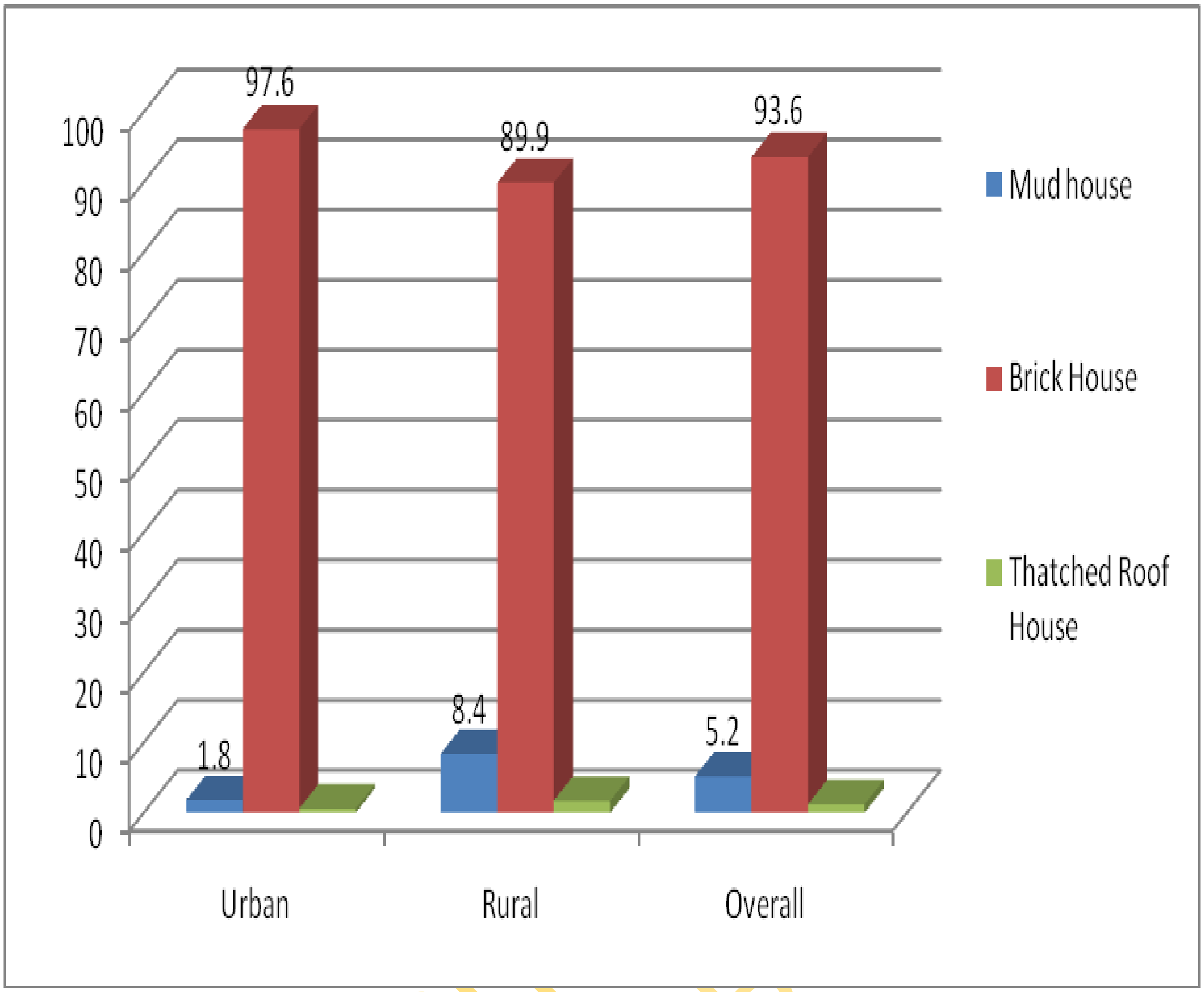



Figure 4.1: Respondents' type of house (p = 0.02)

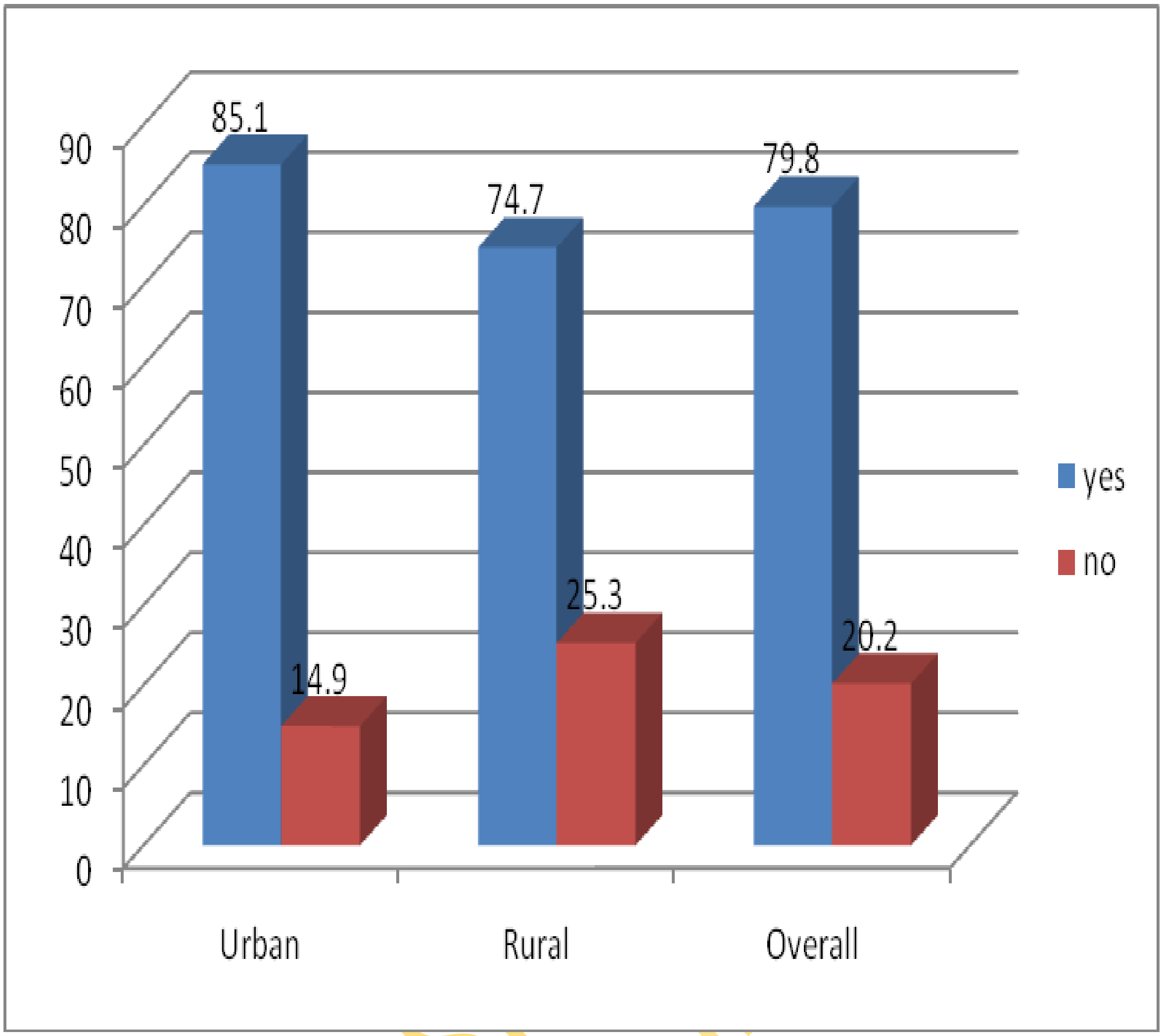



Figure 4.2: Respondents' family owned house/land (p = 0.02)

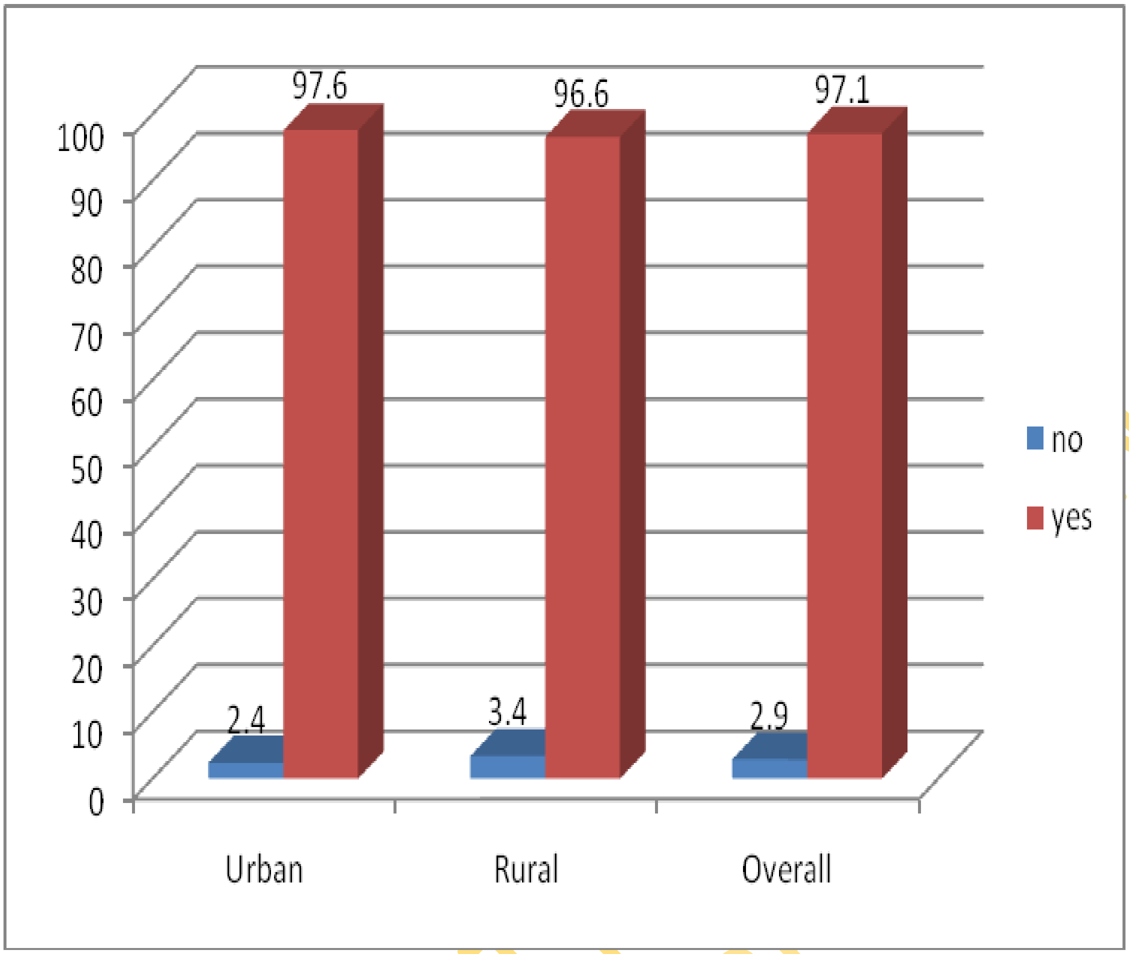



Figure 4.3: Respondent had soap for household tasks (p = 0.58)

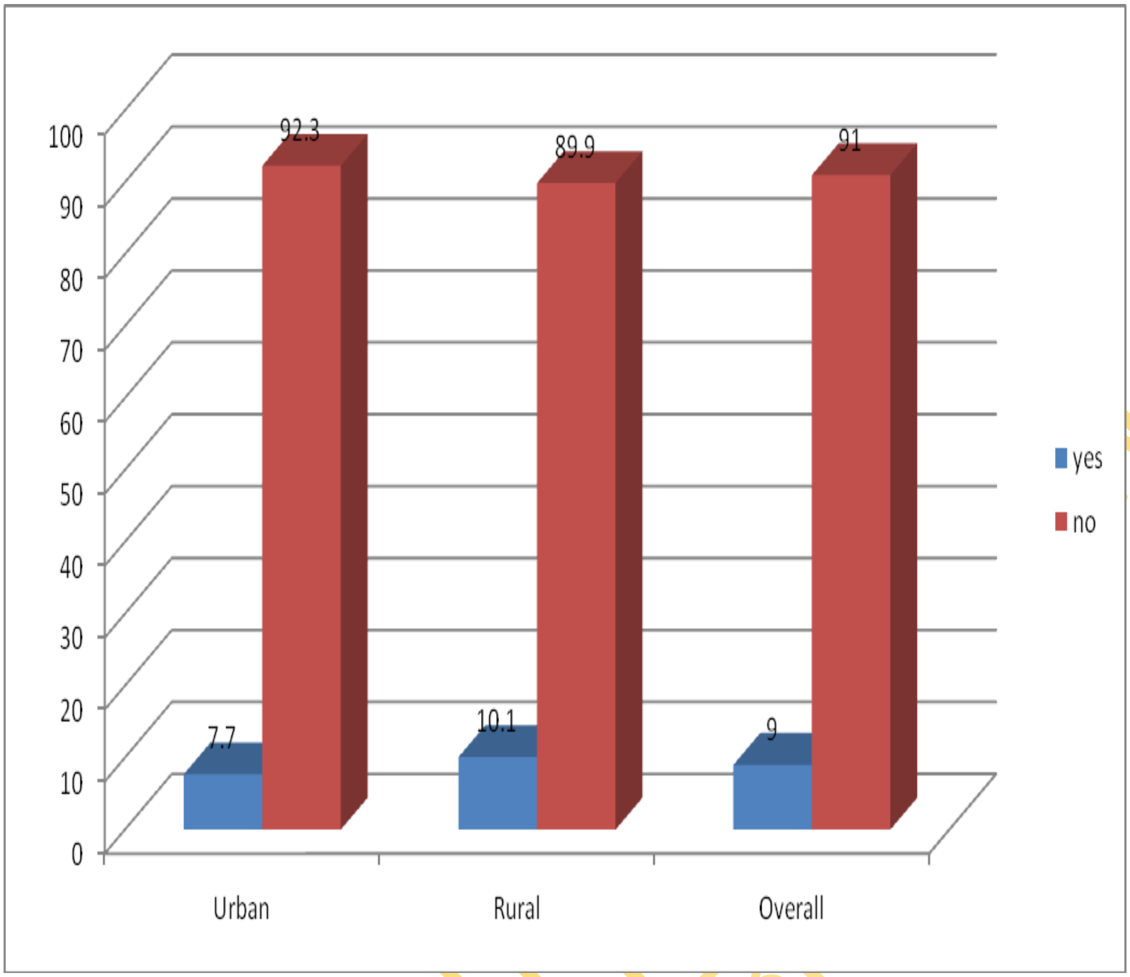


Figure 4.4: Household had some debt (p = 0.44)

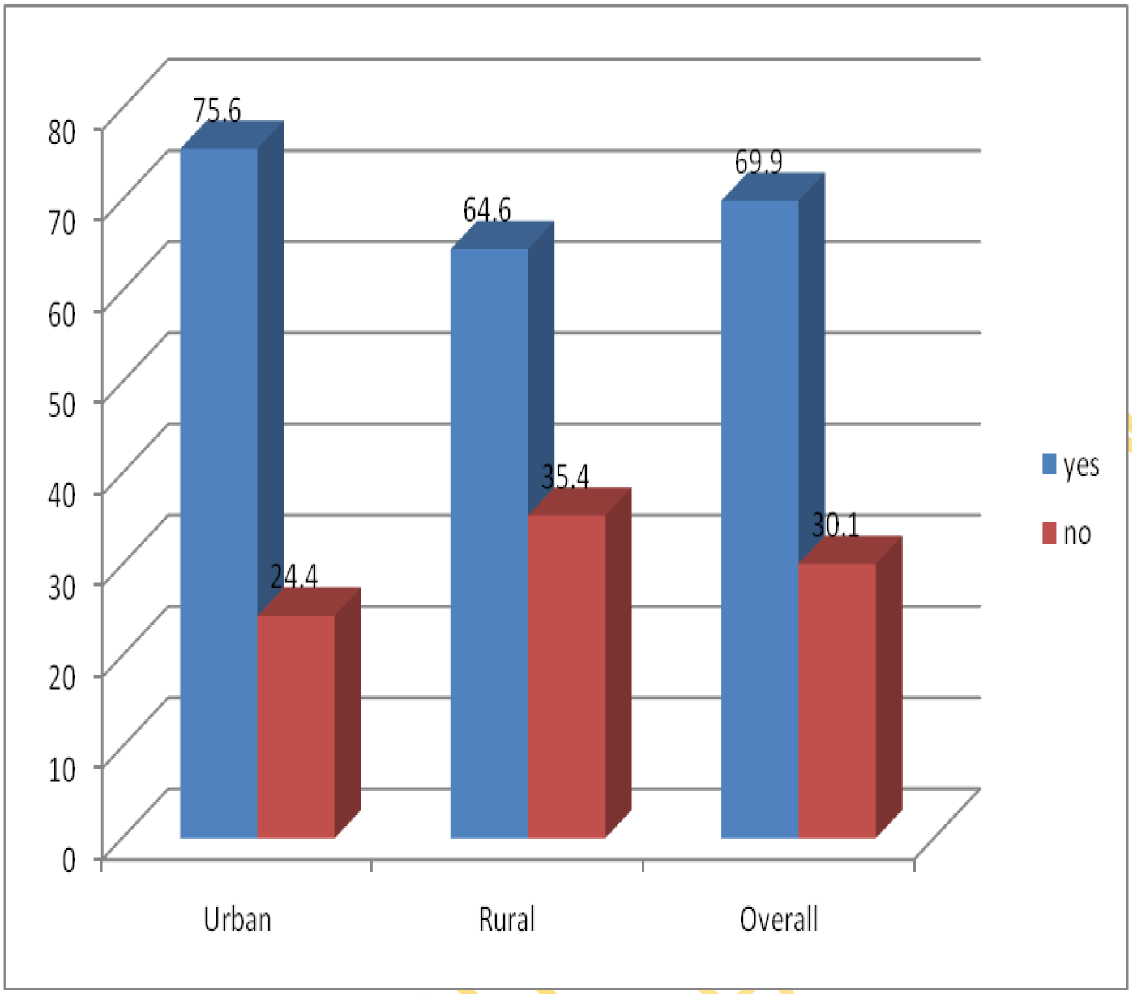


Figure 4.5: Household had refrigerator (p = 0.03)

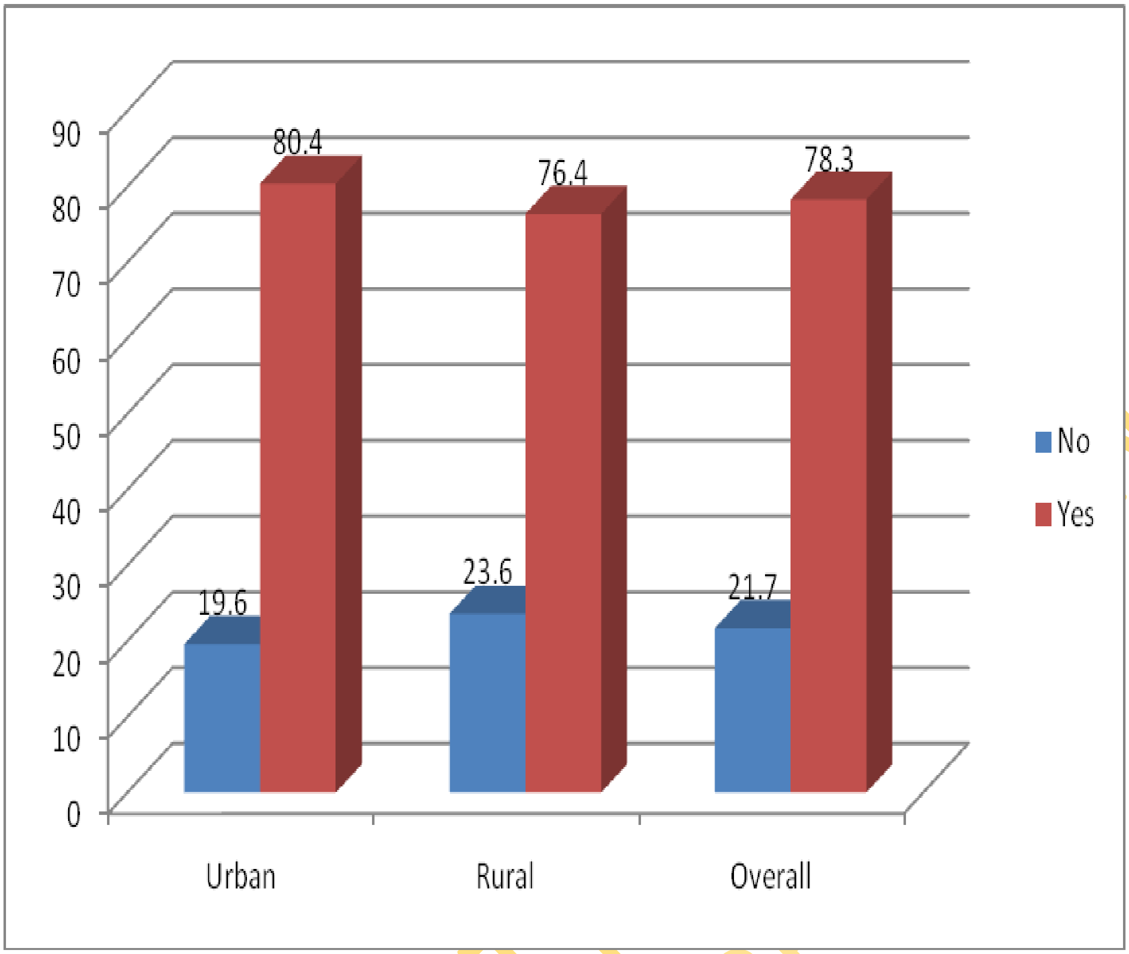


Figure 4.6: Household had television (p = 0.37)

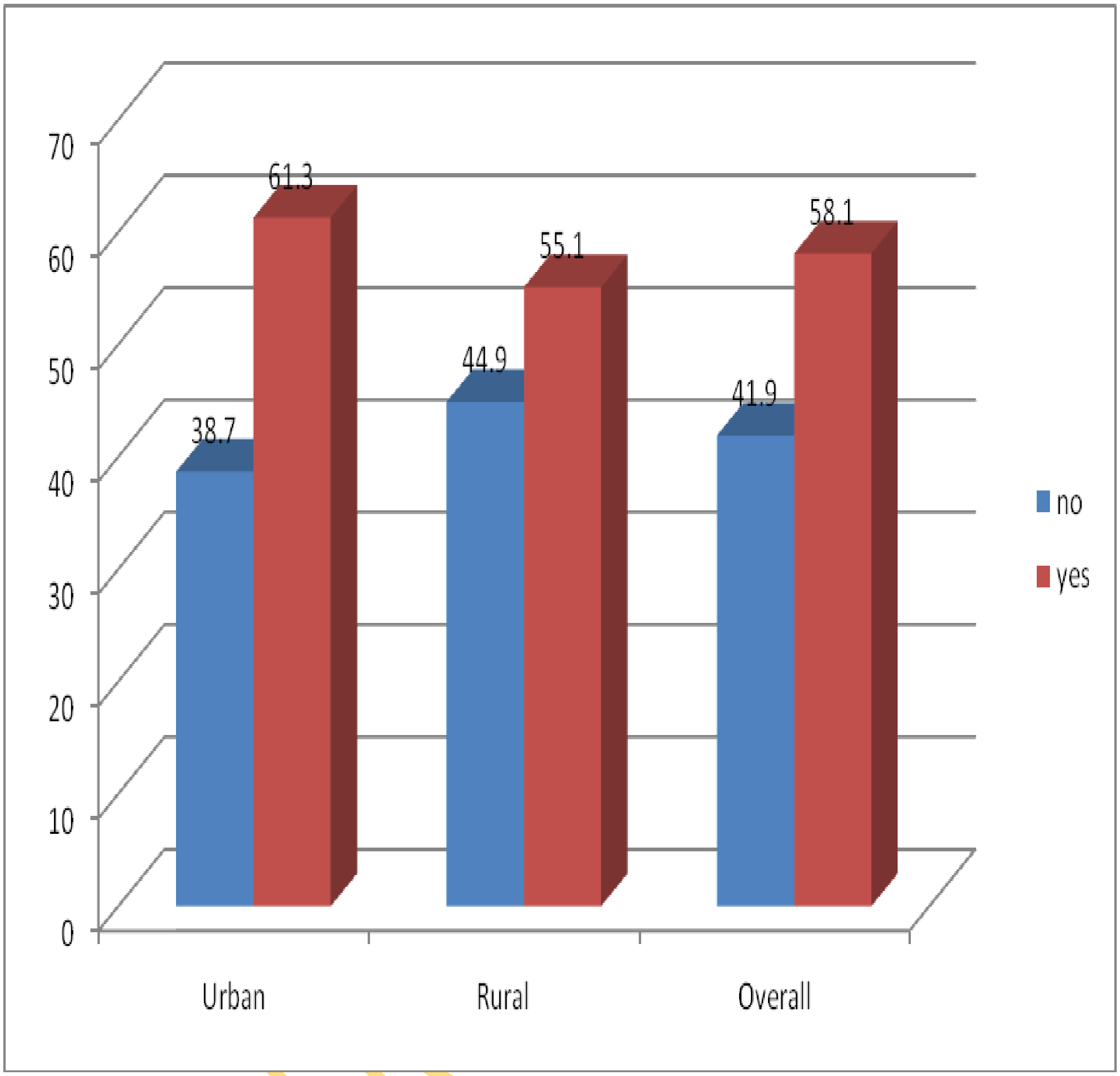



Figure 4.7: Respondent's family owned or raised animals (p = 0.24)

## 4.2. Section B: Household and Environmental characteristics of the Respondents

The section considers the various features of the respondents' household such as household size, number of children, and number of people sharing house among others. The household characteristics of the respondents are as shown in Table 4.3.

### 4.2.1 Household characteristics of the Respondents

Most of the respondents (98.8%) had children. Overall, very few respondents (4.0%) had more than nine children, about one-fifth (20.5%) had 7-9 children, nearly half (48.6%) had 4-6 children and 25.7% had 1-3 children. Respondents who had 4-6 children were higher in rural (55.6%) than urban (41.1%) areas. The number of children per respondent followed the same trend in both areas and there was a significant difference ($p<0.05$) by locality.

Overall, many respondents (66.5%) disaggregated as 70.8% in urban and 62.4% in rural areas had a medium household size (6-10 people), 19.1% had household size of more than 10 people. There were more of large household sizes in the rural (21.9%) than urban (16.1%) areas. There was no significant rural/urban difference in household size ($p>0.05$).

Generally, majority of respondents (64.7%) shared house with between 4-6 people, 19.9% shared house with 1-3 people, 8.4% and 6.9% shared house with 7-9 and more than 9 people respectively. There were more respondents who shared house with 4-6 people in urban (69.0%) than rural areas (60.7%) while more respondents in rural (27.0%) than urban (12.5%) shared house with 1-3 people. Sharing housing with 7-9 people was higher in urban (8.9%) than rural (7.9%) while respondents who shared house with more than 9 people were twice higher in urban (9.5%) than rural (4.5%) areas with a significant difference ($p<0.05$). Most respondents' households (75.7%) had steady income. There were more respondents' households with regular income in the urban locality (84.5%) than the rural locality (67.4%) ($p<0.05$).

**Table 4.3: Household characteristics of the Respondents**

| Variable | Overall | | Urban | | Rural | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|
| | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | | |
| **No of Children** | | | | | | | | |
| 0 | 4 | (1.2) | 0 | (0.0) | 4 | (2.2) | | |
| 1-3 | 89 | (25.7) | 47 | (28.0) | 42 | (23.6) | 13.33 | 0.01 |
| 4-6 | 168 | (48.6) | 69 | (41.1) | 99 | (55.6) | | |
| 7-9 | 71 | (20.5) | 43 | (25.6) | 28 | (15.7) | | |
| 10-20 | 14 | (4.0) | 9 | (5.4) | 5 | (2.8) | | |
| **Household size** | | | | | | | | |
| Small (1-5) | 50 | (14.5) | 22 | (13.1) | 28 | (15.7) | | 0.38 |
| Medium (6-10) | 230 | (66.5) | 119 | (70.8) | 111 | (62.4) | | |
| Large (>10) | 66 | (19.1) | 27 | (16.1) | 39 | (21.9) | | |
| **No of people residing in same household** | | | | | | | | |
| 1-3 | 69 | (19.9) | 21 | (12.5) | 48 | (27.0) | | 0.02 |
| 4-6 | 224 | (64.7) | 116 | (69.0) | 108 | (60.7) | | |
| 7-9 | 29 | (8.4) | 15 | (8.9) | 14 | (7.9) | | |
| >9 | 34 | (6.9) | 16 | (9.5) | 8 | (4.5) | | |
| **Steadiness of Income** | | | | | | | | |
| Yes | 262 | (75.7) | 142 | (84.5) | 120 | (67.4) | 13.76 | 0.01 |
| No | 84 | (24.3) | 26 | (15.5) | 58 | (32.6) | | |
| **Total** | **346** | (100.0) | **168** | (100.0) | **178** | (100.0) | | |

### 4.2.2 Environmental characteristics of the Respondents

The household environmental characteristics of the study population as depicted by access to potable water, waste disposal, access to home garden or farm and housing change within the last 12 months are as described in Table 4.4.

Overall, respondents access to potable water was poor (Table 4.4). Less than half (46.3%) had potable water located more than 100m away from their homes, 34.4% had water access within 10m distance to their homes and 10.4% had potable water between 10 m and 30m distance to their homes while 4.6% had access to potable water inside their homes. Breakdown by locality shows that majority of urban respondents (65.5%) had no access to potable water within 100 m distance to their homes as against 28.1% in rural areas. Distance to clean water was highly diversified in the rural locality, 36.0% had water access within 10m distance, 18.5% within 10 – 30m distance and 9.0% had water access within the home. There was a significant difference ($p<0.05$) in the access distance to clean water by locality.

Overall, respondents' maids fetched water for nearly three-fifth (59.5%) of the respondents, children fetched water for about one-fifth (19.9%), and 16.8% fetched water by themselves. Fetching by grandchildren and use of commercial tanker accounted for 3.2% and 0.6% respectively. The use of maid was one and half times more in urban (72.6%) than rural areas (47.2%) and fetching by children was about 20 times more in rural (37.1%) than urban areas (1.8%). Self-fetching was twice more in urban (23.8%) than rural areas (10.1%) and fetching by grandchildren was twice more in rural (4.5%) than urban (1.8%) areas. A significant difference occurred in the distribution of who fetches water by locality.

Generally, waste was diposed by dumping (63.0%), burning (24.3%), and burying (4.0%) while few (8.7%) did not know how the wastes were managed (Table 4.4). Waste dumping was twice higher in urban (85.1%) than rural (42.1%) areas and waste burning was eight times more in rural areas (42.1%) than urban areas (5.4%). Also, waste burying was twice higher in rural (5.6%) than urban (2.4%) while more respondents in the rural (10.1%) than urban areas (7.1%) did not know how the household wastes were managed. Significant difference ($p<0.05$) was found in the method of waste management by locality.

Two-third (66.2%) of the overall respondents had access to home gardens, access was higher in the urban (69.6%) than rural areas (61.8%). Of the total study population, most respondents (65.6%) had not change housing in the last 12 months. 70.8% and 60.1% of rural and urban respondents had not change housing in the last 12 months (Table 4.4).

**Table 4.4: Household and Environmental characteristics of Respondents**

| | Overall | | Urban | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **P** |
| **Distance to clean water** | | | | | | | | |
| Inside | 16 | (4.6) | 0 | (0.0) | 16 | (9.0) | 88.02 | 0.01 |
| <10m | 119 | (34.4) | 55 | (32.7) | 64 | (36.0) | | |
| 10-30m | 36 | (10.4) | 3 | (1.8) | 33 | (18.5) | | |
| 30-100m | 15 | (4.3) | 0 | (0.0) | 15 | (8.4) | | |
| >100m | 160 | (46.3) | 110 | (65.5) | 50 | (28.1) | | |
| **Who fetches water?** | | | | | | | | |
| Children | 69 | (19.9) | 3 | (1.8) | 66 | (37.1) | | |
| Maid | 206 | (59.5) | 122 | (72.6) | 84 | (47.2) | | |
| Self | 58 | (16.8) | 40 | (23.8) | 18 | (10.1) | 90.65 | 0.00 |
| Grandchildren | 11 | (3.2) | 3 | (1.8) | 8 | (4.5) | | |
| Commercial tanker | 2 | (0.6) | 0 | (0.0) | 2 | (0.7) | | |
| **Waste management** | | | | | | | | |
| Buried | 14 | (4.0) | 4 | (2.4) | 10 | (5.6) | 83.17 | 0.01 |
| Dumped | 218 | (63.0) | 143 | (85.1) | 75 | (42.1) | | |
| Burned | 84 | (24.3) | 9 | (5.4) | 75 | (42.1) | | |
| Do not know | 30 | (8.7) | 12 | (7.1) | 18 | (10.1) | | |
| **Access to home garden/farms** | | | | | | | 15.73 | 0.18 |
| Yes | 227 | (66.2) | 117 | (69.6) | 110 | (61.8) | | |
| No | 116 | (33.8) | 51 | (30.4) | 68 | (38.2) | | |
| **Housing change in 12months** | | | | | | | 13.47 | 0.04 |
| No | 227 | (65.6) | 101 | (60.1) | 126 | (70.8) | | |
| Yes | 119 | (34.4) | 67 | (39.9) | 52 | (29.2) | | |
| **Total** | **346** | (100.0) | **168** | (100.0) | **178** | (100.0) | | |

### 4.3 Social and welfare support characteristics of the Respondents

The rural-urban differences in the availability of care giving and welfare support, as well as the intergenerational supports from the community and family are presented in this section.

#### 4.3.1 Care giving and welfare support to the Respondents

The reported level of care giving and welfare support available to the respondents is shown in Table 4.5. About two-fifth of the total respondents (43.1%) had extended family within five kilometer distance to their place of abode. More respondents in the urban locality (46.4%) than the rural locality (39.9%) had extended family within five kilometer distance, there was no significant difference ($p>0.05$) by locality.

On the whole, very few respondents (1.2%) lived alone. Respondents who lived alone were almost three times higher in rural (1.7%) than urban areas (0.6%). There was no significant difference ($p>0.05$) by locality (Table 4.5). Respondents without regular caregiver were few (11.0%) overall. Respondents without regular caregiver were however 34 times higher in rural (20.8%) than urban areas (0.6%). Overall, about one-tenth (12.4%) of the respondents were looking after small children, this was 12.5 times higher in rural (22.5%) than urban areas (1.8%).

Nearly about one-tenth (9.5%) had adult children far way, such case was about four times higher in rural (15.2%) than urban areas (3.6%) (Table 4.5). There was significant rural-urban differences ($p<0.05$) in the availability of regular caregiver, care giving for small children and having adult children far away by locality.

Nearly half (48.8%) of the total respondents enjoyed welfare package. More respondents in urban (60.7%) than rural areas (37.6%) enjoyed welfare package. There is a significant difference in the level of access to welfare package by locality. Overall, relations formed the bulk (92.4%) of the reported source of welfare packages, other sources are friends (5.9%), religious bodies (0.6%) and government assistance (0.6%). Breakdown by location showed that support from relations was high in both localities, it was higher in the urban (94.1%) than rural areas (91.0%). Support from friends was twice higher in rural areas (9.0%) than urban areas (3.9%) while support from religious bodies (0.6%) and government (0.6%) were reported in urban areas.

**Table 4.5: Caregiving and Welfare Supports to Respondents**

| Variables | Overall | | Urban | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | $X^2$ | P |
| **Extended Family lived as near as <5km** | | | | | | | | |
| No | 197 | (56.9) | 90 | (53.6) | 107 | (60.1) | 1.51 | 0.22 |
| Yes | 149 | (43.1) | 78 | (46.4) | 71 | (39.9) | | |
| **Respondent lived alone** | | | | | | | | |
| Yes | 4 | (1.2) | 1 | (0.6) | 3 | (1.7) | 0.95 | 0.33 |
| No | 342 | (98.8) | 167 | (99.4) | 175 | (98.3) | | |
| **Respondent had no regular Caregiver** | | | | | | | 45.34 | 0.01 |
| Yes | 38 | (11.0) | 1 | (0.6) | 37 | (20.8) | | |
| No | 308 | (89.0) | 167 | (99.4) | 141 | (79.2) | | |
| **Respondent looked after Children** | | | | | | | 39.97 | 0.00 |
| No | 303 | (87.6) | 165 | (98.2) | 138 | (77.5) | | |
| Yes | 43 | (12.4) | 3 | (1.8) | 40 | (22.5) | | |
| **Adult Children were far** | | | | | | | | |
| Yes | 33 | (9.5) | 6 | (3.6) | 27 | (15.2) | | |
| No | 313 | (90.5) | 162 | (96.4) | 151 | (84.8) | | |
| **Enjoyed Welfare Package** | | | | | | | | |
| No | 177 | (51.2) | 66 | (39.3) | 111 | (62.4) | | |
| Yes | 169 | (48.8) | 102 | (60.7) | 67 | (37.6) | 18.42 | 0.01 |
| **Sources of Welfare support** | | | | | | | | |
| Relations | 157 | (92.4) | 96 | (94.1) | 61 | (91.0) | | |
| Friends | 10 | (5.9) | 4 | (3.9) | 6 | (9.0) | | 0.33 |
| Religious body | 1 | (0.6) | 1 | (1.0) | 0 | (0.0) | | |
| Government | 1 | (0.6) | 1 | (1.0) | 0 | (0.0) | | |
| **Total** | **346** | (100.0) | **168** | (100.0) | **178** | (100.0) | | |

### 4.3.2 Community Age friendliness of the respondents' area of residence

This section presents the responses on the perceived level of social support as shown in Table 4.6. The community level of responsiveness to the special needs of the older people using the World Health Organization (WHO) eight key features of age friendly cities was used as a proxy for social support. An age friendly initiative encourages active ageing by optimizing opportunities for health, participation and security to enhance quality of life as people age. An age friendly city adapts its structures and services to be accessible to and inclusive of older people with varying needs and capabilities.

Overall, about two-fifth of the respondents (41.3%) indicated that the community and health services were not adapted to the needs of the elderly. Health services were however more age friendly in the rural (42.1%) than urban areas (40.5%). Similarly, less than half (47.4%) disaggregated as 47.6% in urban and 47.2% in rural areas found the methods of communication and information dissemination suitable for the elderly. About half (52.9%) of the total respondents rated civic participation and employment to be age friendly. The perceived age friendly level was higher in urban (56.5%) than rural areas (49.4%).

Likewise, about two-fifth of the respondents (41.9%) reported having appropriate levels of respect and social inclusion. There were more respondent in the rural (42.7%) than urban areas (41.1%) that reported having appropriate levels of respect and social inclusion. Social participation was higher in urban (51.2%) than rural areas (48.3%) and housing was perceived to be more age friendly in urban (53.6%) than rural areas (45.5%). Overall perception of social participation and age-friendliness of housing was 49.7% and 49.4% respectively.

Less than half of the entire respondents reported that transportation (43.6%) and outdoor spaces and buildings (45.4%) suitable for the elderly. Transportation was slightly better in rural (43.8%) than urban areas (43.5%). Similarly, outdoor spaces and buildings were found age-friendly in rural (48.3%) than urban areas (42.3%).

**Table 4.6: Summary of Perceived levels Social Support by the elderly**

| Social Support for the aged | Overall | | Urban | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | $X^2$ | P |
| **Community and Health Services** | | | | | | | | |
| Not age-Friendly | 203 | (58.7) | 10 | (59.5) | 10 | (57.9) | 0.10 | 0.75 |
| Age friendly | 143 | (41.3) | 68 | (40.5) | 75 | (42.1) | | |
| **Communication and Information** | | | | | | | | |
| Not age-Friendly | 182 | (52.6) | 88 | (52.4) | 94 | (52.8) | 0.01 | 0.94 |
| Age friendly | 164 | (47.4) | 80 | (47.6) | 84 | (47.2) | | |
| **Civic Participation and Employment** | | | | | | | 1.75 | 0.19 |
| Not age-Friendly | 163 | (47.1) | 73 | (43.5) | 90 | (50.6) | | |
| Age friendly | 183 | (52.9) | 95 | (56.5) | 88 | (49.4) | | |
| **Respect and social Inclusion** | | | | | | | | |
| Not age-Friendly | 201 | (58.1) | 99 | (58.9) | 10 | (57.3) | 0.094 | 0.42 |
| Age friendly | 145 | (41.9) | 69 | (41.1) | 76 | (42.7) | | |
| **Social Participation** | | | | | | | | |
| Not age-Friendly | 174 | (50.3) | 82 | (48.8) | 92 | (51.7) | 0.29 | 0.59 |
| Age friendly | 172 | (49.7) | 86 | (51.2) | 86 | (48.3) | | |
| **Housing** | | | | | | | 2.25 | 0.13 |
| Not age-Friendly | 175 | (50.6) | 78 | (46.4) | 97 | (54.5) | | |
| Age friendly | 171 | (49.4) | 90 | (53.6) | 81 | (45.5) | | |
| **Transportation** | | | | | | | | |
| Not age-Friendly | 195 | (56.4) | 95 | (56.5) | 10 | (56.2) | 0.01 | 0.95 |
| Age friendly | 151 | (43.6) | 73 | (43.5) | 78 | (43.8) | | |
| **Outdoor spaces and buildings** | | | | | | | | |
| Not age-Friendly | 189 | (54.6) | 97 | (57.7) | 92 | (51.7) | 1.28 | 0.26 |
| Age friendly | 157 | (45.4) | 71 | (42.3) | 86 | (48.3) | | |

## 4.4 Lifestyle of the Respondents

This section presents the variation in the lifestyle of the respondents by location as measured by selected variables. Lifestyle was assessed using the current smoking status, levels of alcohol consumotion, numbers of hours used watching television per day, number of hours used in sleeping per day, levels of fruits and vegetable consumption and physical activity.

### 4.4.1 Smoking Status of the Respondents

As indicated in Table 4.7, less than one-tenth of the general respondents (9.2%) were current cigarette smokers. The proportion of current smokers was about three times higher in the rural (13.5%) than urban areas (4.8%). There was a significantly difference ($p<0.05$) by location.

### 4.4.2 Alcohol Intake of the Respondents

Overall, few respondents (16.5%) disaggregated as 16.9% in rural and 16.1% in urban areas consumed alcohol heavily. There was no significant difference ($p>0.05$) in the alcohol consumption status by location (Table 4.7).

### 4.4.3 Hours spent Watching Television by Respondents

The number of hours spent in watching television was one of the measures used as a proxy for sedentary lifestyle as presented in Table 4.7. Overall, nearly three-fifth (58.4%) disaggregated as 60.1% in urban and 56.7% in rural areas watched television for less than four (1-3.59) hours daily while about one-fifth (19.9%) disaggregated as 20.2% in urban and 19.7% in rural areas watched television for at least four hours daily. There were more respondents who rarely watched television in the rural (23.6%) than urban areas (19.6%). There was no significant difference ($p>0.05$) in the number of hours spent watching television by locality.

### 4.4.4 Hours of Sleep of Respondents

Table 4.7 below shows the variation in the number of sleeping hours. Overall, nearly three of every five (59.0%) slept for 5–7.9 hours per day, about two of every five (40.5%) slept for at least 8 hours while very few (0.6%) slept for less than five hours per day. The trend in the numbers of hours used sleeping is the same in both areas and no significant difference ($p>0.05$) was found by locality.

### 4.4.5 Frequency of Fruits and Vegetables intake by the Elderly

As shown in Table 4.7 below, more than half of the entire respondents (52.5%) consumed at least four servings of fruits weekly while most respondents (83.8%) consumed at least four servings of vegetables weekly. Respondents that consumed at least four servings of fruits per week were higher in urban (55.4%) than rural areas (50.0%). Also, respondents that consumed at least four servings of vegetables per week was higher in urban (91.7%) than rural areas (76.4%). No significant difference ($p>0.05$) was found in consumption of fruits but significant difference ($p<0.05$) was found in the consumption of vegetables by locality.

### 4.4.6 Reported Activity level among the Elderly

The self-reported activity level in Table 4.7 shows that most respondents (80.9%) were involved in moderate physical activity, some (13.3%) were in highly active and few (5.8%) were sedentary in activity level. sedentary respondents were five times more in rural (9.6%) than urban areas (1.8%) while moderately and highly active respondents were higher in urban (98.2%) than rural areas (90.4%). There was a significant difference ($p<0.05$) in activity levels by location.

**Table 4.7: Lifestyle factors of the Respondents**

| Lifestyle variables | Overall | | Urban | | Rural | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | $X^2$ | df | P |
| **Smoking Status** | | | | | | | | | |
| Yes (Current smokers) | 32 | (9.2) | 8 | (4.8) | 24 | (13.5) | 7.83 | 1 | 0.01 |
| No (Non Smokers) | 314 | (90.8) | 160 | (95.2) | 154 | (86.5) | | | |
| **Respondents drank Alcohol** | | | | | | | 0.04 | 1 | 0.85 |
| Yes | 57 | (16.5) | 27 | (16.1) | 30 | (16.9) | | | |
| No | 289 | (83.5) | 141 | (83.9) | 148 | (83.1) | | | |
| **Hours spent on Watching TV** | | | | | | | | | |
| 0 hour | 75 | (21.7) | 33 | (19.6) | 42 | (23.6) | 0.81 | 2 | 0.67 |
| 1 – 3.59 hours | 202 | (58.4) | 101 | (60.1) | 101 | (56.7) | | | |
| ≥4 hours | 69 | (19.9) | 34 | (20.2) | 35 | (19.7) | | | |
| **Hours of Sleep** | | | | | | | | | |
| 2-4.9 | 2 | (0.6) | 0 | (0.0) | 2 | (1.1) | 3.48 | 2 | 0.12 |
| 5-7.9 | 204 | (59.0) | 106 | (63.1) | 98 | (55.1) | | | |
| 8-10.9 | 140 | (40.5) | 62 | (36.9) | 78 | (43.8) | | | |
| **Fruits intake up to 4 – 7 times per week** | | | | | | | 5.18 | 2 | 0.08 |
| Yes | 182 | (52.5) | 93 | (55.4) | 89 | (50.0) | | | |
| No | 164 | (47.4) | 75 | (44.6) | 89 | (50.0) | | | |
| **Vegetable intake up to 4 – 7 times per week** | | | | | | | 15.26 | 2 | 0.00 |
| Yes | 290 | (83.8) | 154 | (91.7) | 136 | (76.4) | | | |
| No | 56 | (16.2) | 14 | (8.3) | 42 | (23.6) | | | |
| **Activity Level** | | | | | | | 9.98 | 2 | 0.01 |
| Sedentary (Levels 1-3) | 20 | (5.8) | 3 | (1.8) | 17 | (9.6) | | | |
| Moderately Active (Levels 4-7) | 280 | (80.9) | 142 | (84.5) | 138 | (77.5) | | | |
| Highly Active (Levels 8-10) | 46 | (13.3) | 23 | (13.7) | 23 | (12.9) | | | |
| **Total** | **346** | (100.0) | **168** | (100.0) | **178** | (100.0) | | | |

## 4.5 Summary of Socioeconomic, Social Support and Lifestyle variables of respondents

The socioeconomic, social/welfare support and lifestyle variables of the respondents distributed by locality are as shown in Figures 4.8 – 4.10.

**NULL HYPOTHESIS**

Hypothesis 1: There is no significant rural/urban difference in the lifestyles, socioeconomic variables and social support of Nigerian elderly

### 4.5.1 Socio-economic Status of respondents

The summary of the socio-economic variables is as presented in Figure 4.8 below. Most respondents (74.9%) were in middle socioeconomic class, about one of every five respondents (20.5%) was in high socioeconomic class and few (4.6%) were in low socioeconomic class. A similar trend occurred in both areas. Respondents in middle or moderate socioeconomic class were higher in urban (85.7%) than rural areas (74.9%). The proportion of respondents in high socio-economic class was higher in rural (20.5%) than urban areas (11.9%) while those in low socioeconomic class were about twice higher in rural (6.7%) than urban areas (2.4%). Socioeconomic status was found to be significantly different ($p<0.05$) by locality.

### 4.5.2 Levels of Social Support available to respondents

The summarized levels of social and welfare support is as shown in Figure 4.9 below. Overall, most respondents (68.8%) had a high level of social support. High level of social support was about 1.5 times higher in urban (83.3%)) than rural areas areas (55.1%). A significant rural-urban difference ($p<0.05$) in the levels of social support was found.

### 4.5.3 Lifestyle Status of respondents

As indicated in Figure 4.10, most of the overall respondents (86.4%) had a healthy or good lifestyle characterised by non-smoking, moderate consumption of alcohol, hours spent in viewing television per day and hours used in sleeping per day, weekly consumption of at least four servings of fruits and vegetable and non-sedentary lifestyle. Though there was no significant rural-urban difference ($p>0.05$) in lifestyle by locality, there were more respondents with healthy lifestyle in urban (88.1%) than rural areas (84.8%).

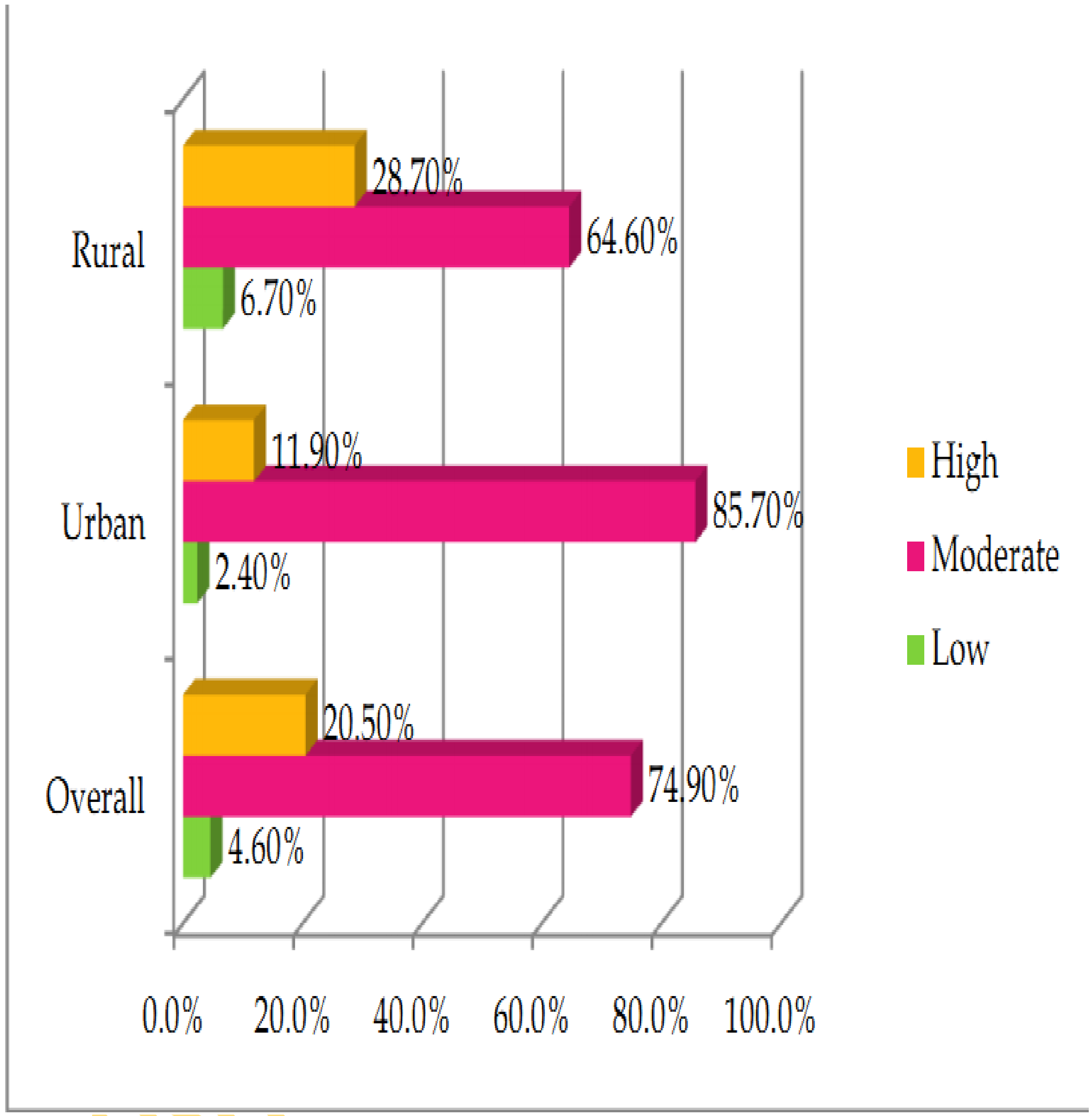



**Figure 4.8: Socioeconomic class of Respondents**

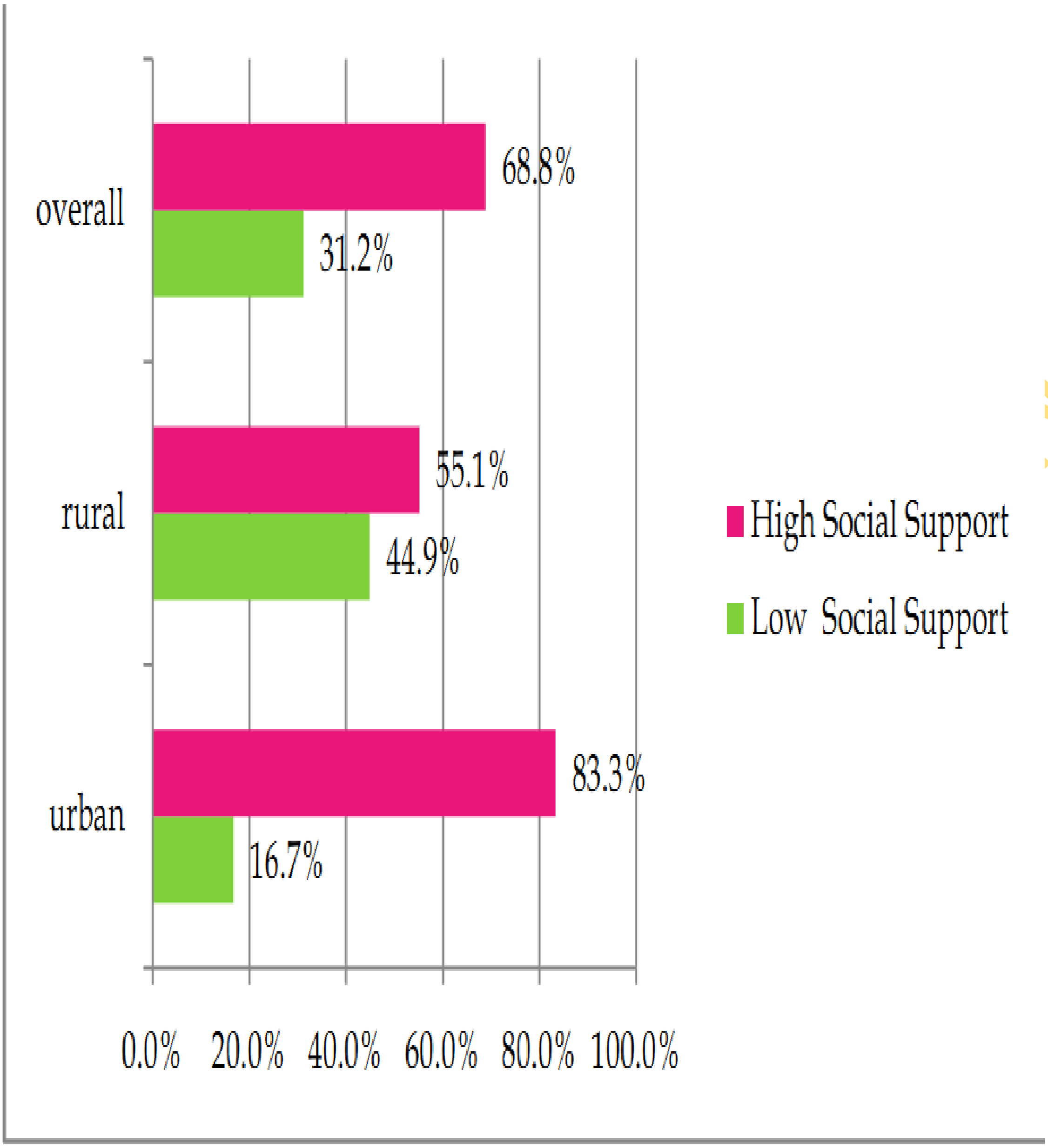



**Figure 4.9: Levels of social support available to the Respondents**

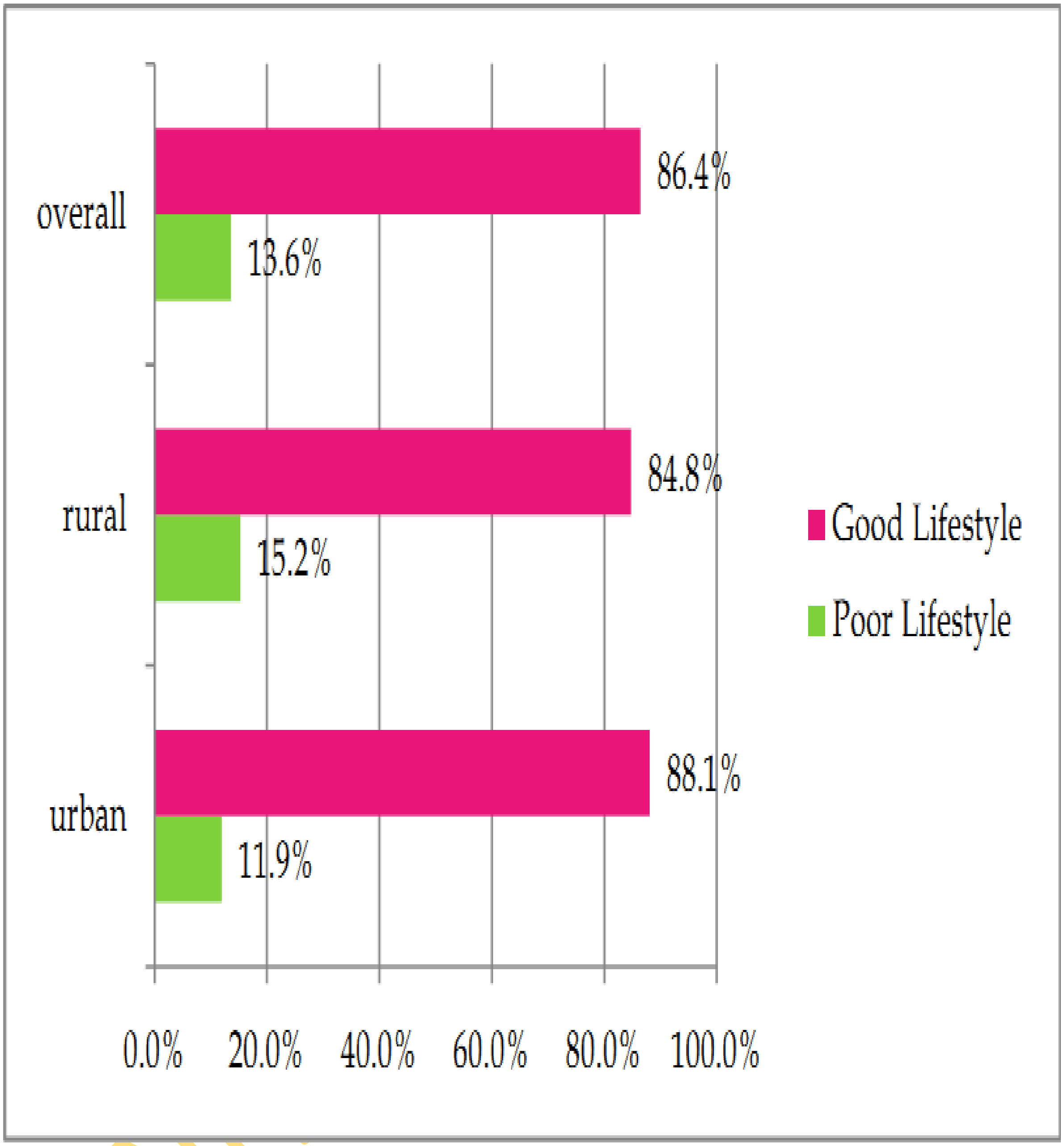



**Figure 4.10: Lifestyle categories of Respondents**

## 4.6 Comparison of Food Habits and Consumption Pattern of the Respondents

This section discussed the food habits and food consumption pattern of the respondents. Food habits and food consumption pattern are imperative in ensuring good nutritional status because nutritional status is an outcome of dietary intake among other factors. Food intakes are considered as aggregate using the seven major food groups.

### 4.6.1 Food Habits of the respondents

Food habits are learned and result from diverse factors such as cultural background, family orientation and personal experience among others.

#### 4.6.1.1 Number of Meals consumed per day by the respondents

The number of meals consumed per day is shown in Figure 4.11. Overall, most respondents (88.4%) ate three times daily, some (6.4%) ate twice daily and few (5.2%) ate more than three times daily. Respondents that ate three times daily were higher in urban (98.8%) than rural areas (78.7%) while respondents that ate only twice daily were ten times higher in rural (11.2%) than urban areas (1.2%). All the respondents that ate more than three times daily resided in the rural area and accounted for 10.1% of the rural respondents. There was a significant rural-urban difference ($P<0.05$) in the number of meals consumed daily.

#### 4.6.1.2 Meals skipping and Meals taken by the respondents

Meal skipping among respondents is shown in Figure 4.12. Overall, more than one-quarter (27.5%) had skipped meals in the past month. Respondents that had skipped meals in the past month were about twice higher in rural (36.0%) than urban areas (18.5%). There was a significant difference ($P<0.05$) in meal skipping by locality. Figure 4.13 describes the meal often skipped. Overall, the most skipped meal was lunch (44.7%), followed by breakfast (39.4%) while dinner was the least skipped meal (16.0%). Segregation by locality shows that lunch (58.7%) was the most skipped meal in the rural area and dinner (45.2%) was the most skipped in the urban area while very few respondents (1.6%) skipped dinner in the rural area.

#### 4.6.1.3 Snacking Pattern of the respondents

The snacking pattern of the respondents is shown in Figure 4.14. Only one-quarter (25.1%) of the overall respondents regularly consumed snacks, there were more respondents who consumed snacks in the rural area (30.9%) than the urban area (19.0%) ($P<0.05$).

#### 4.6.1.4 Place of Food Preparation and Consumption by respondents

Figure 4.15 shows the place of food preparation and consumption by respondents. Foods were mostly prepared and consumed at home in both urban (96.4%) and rural areas (95.5%). There was no significant different ($P>0.05$) by locality.

#### 4.6.1.5 Water Intake of respondents

The level of water intake per day by the respondents is as shown in Figure 4.16. Overall, less than half (47.7%) of the respondents consumed more than three liters of water per day while respondents that consumed one to three liters and those consuming less than one liter accounted for 43.9% and 8.4% respectively. Respondents consuming more than three liters of water per day were about twice higher in urban (63.7%) than rural areas (32.6%) while respondents consuming at least 1 litre but not more than three litres were 2.2 times higher in rural (60.1%) than urban areas (26.8%). Few respondents in both urban (9.5%) and rural (7.3%) areas consumed less than one liters of water per day. There was a significant urban-rural difference in water intake ($P<0.05$).

#### 4.6.1.6 Pattern of Sugar-sweetened Beverages Consumption by the respondents

The pattern of beverage consumption by respondents is shown in Figure 4.17. Nearly half (45.1%) of the entire respondents consumed about one to three liters of soda beverages weekly, almost one-quarter (24.6%) consumed less than one liter of soda beverages weekly, and few (11.8%) consumed more than three liter of soda beverages weekly. Segregation by locality shows that consumption in the range of one to three liters weekly was the most common in both localities but higher in urban (48.8%) than rural areas (41.6%). Respondents who consumed more than three liters weekly were five times higher in rural (19.7%) than urban areas (3.6%) and consumption below 1 litre weekly was about twice higher in urban (32.7%) than rural areas (16.9%). There was a significant urban-rural difference ($P<0.05$) in the pattern of consumption of soda beverages.

#### 4.6.1.7 Food Restriction among the respondents

The pattern of food restriction among the respondents is as shown in Figure 4.18. Overall, more than one-third (36.1%) had food restrictions; food restriction/avoidance was higher among respondents in the rural (41.0%) than urban areas (31.0%).

#### 4.6.1.8 Eating Pattern of the respondents

The eating pattern of the respondents is presented in Figure 4.19. Above one-quarter (28.0%) ate alone most times, eating alone was about three times higher among respondents in the rural (40.4%) than urban areas (14.9%). There was a significant difference ($p<0.05$) in the eating pattern by locality.

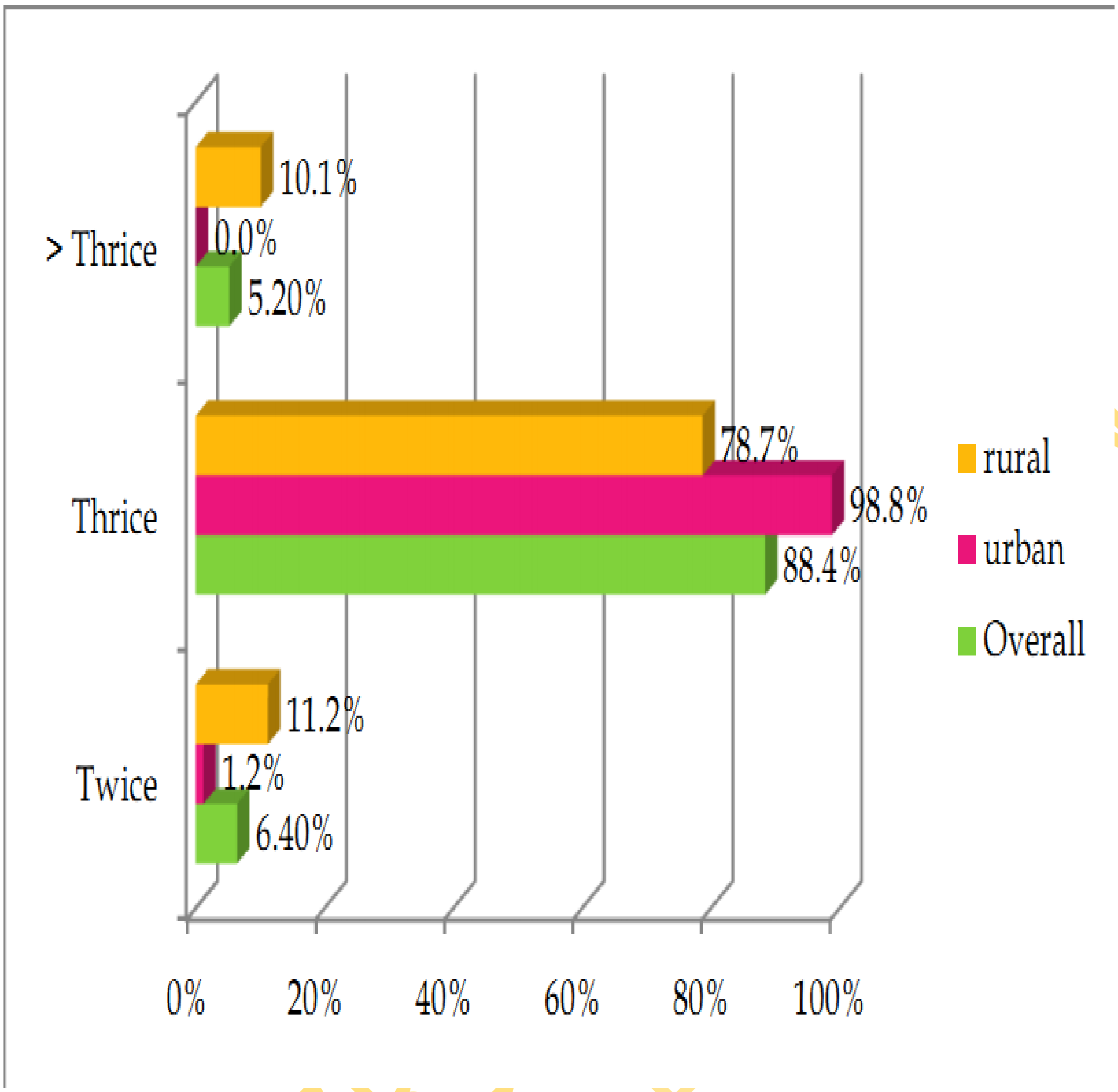



**Figure 4.11: Frequency of meals consumed per day by respondents**

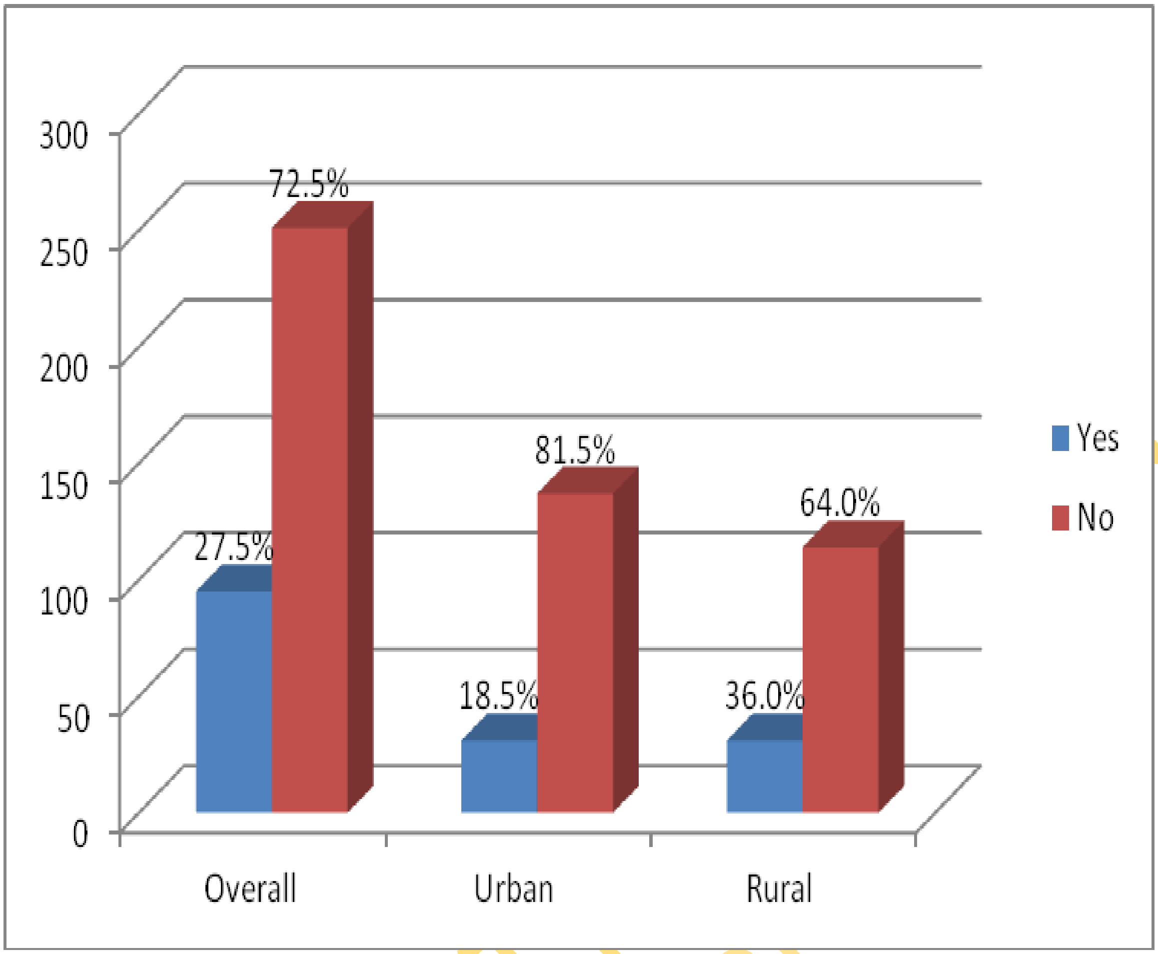



Figure 4.12: Percentage of respondents who skipped meals by locality

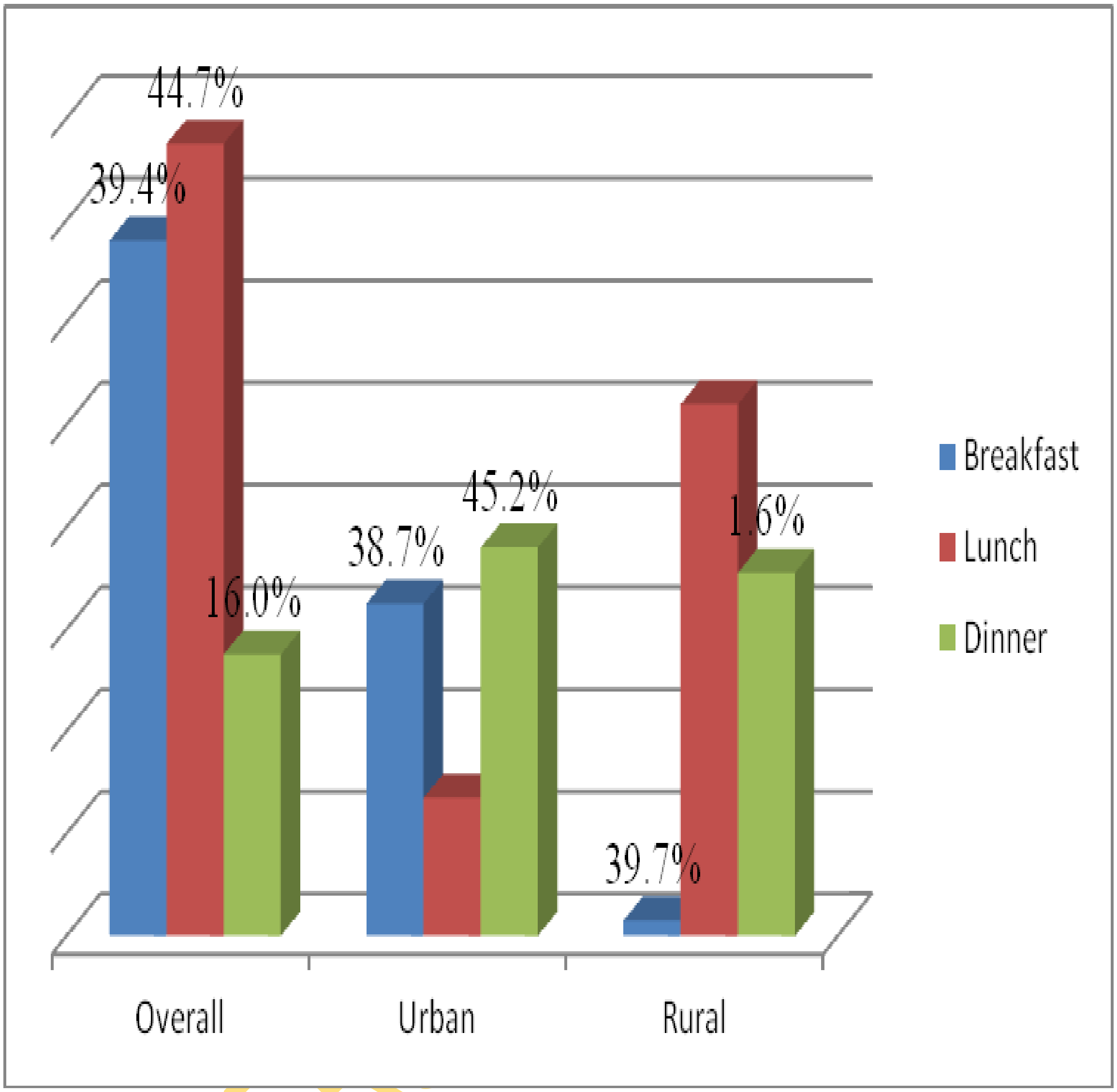



Figure 4.13: Meal often skipped by respondents

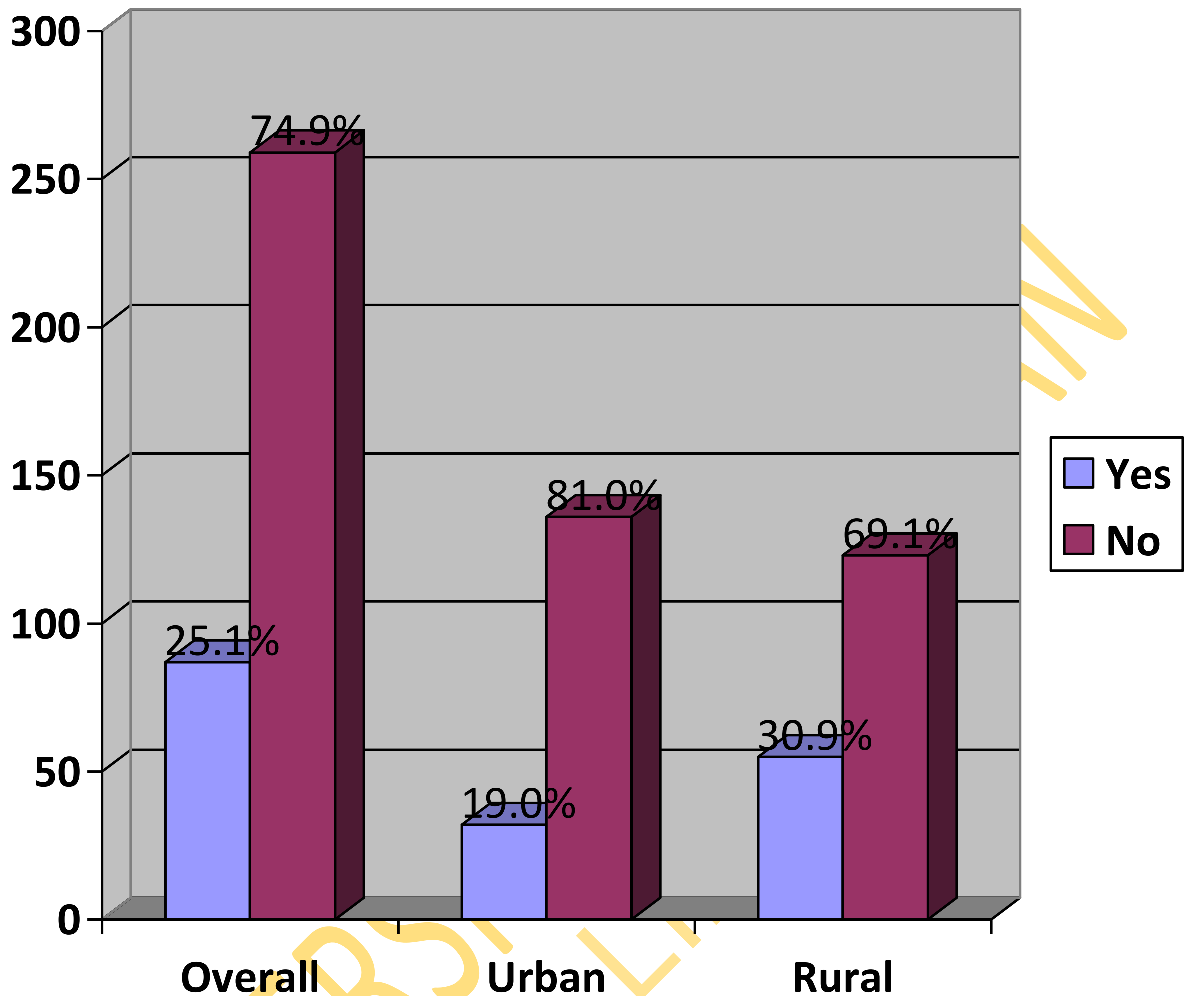



**Figure 4.14: Snacks consumption of respondents**

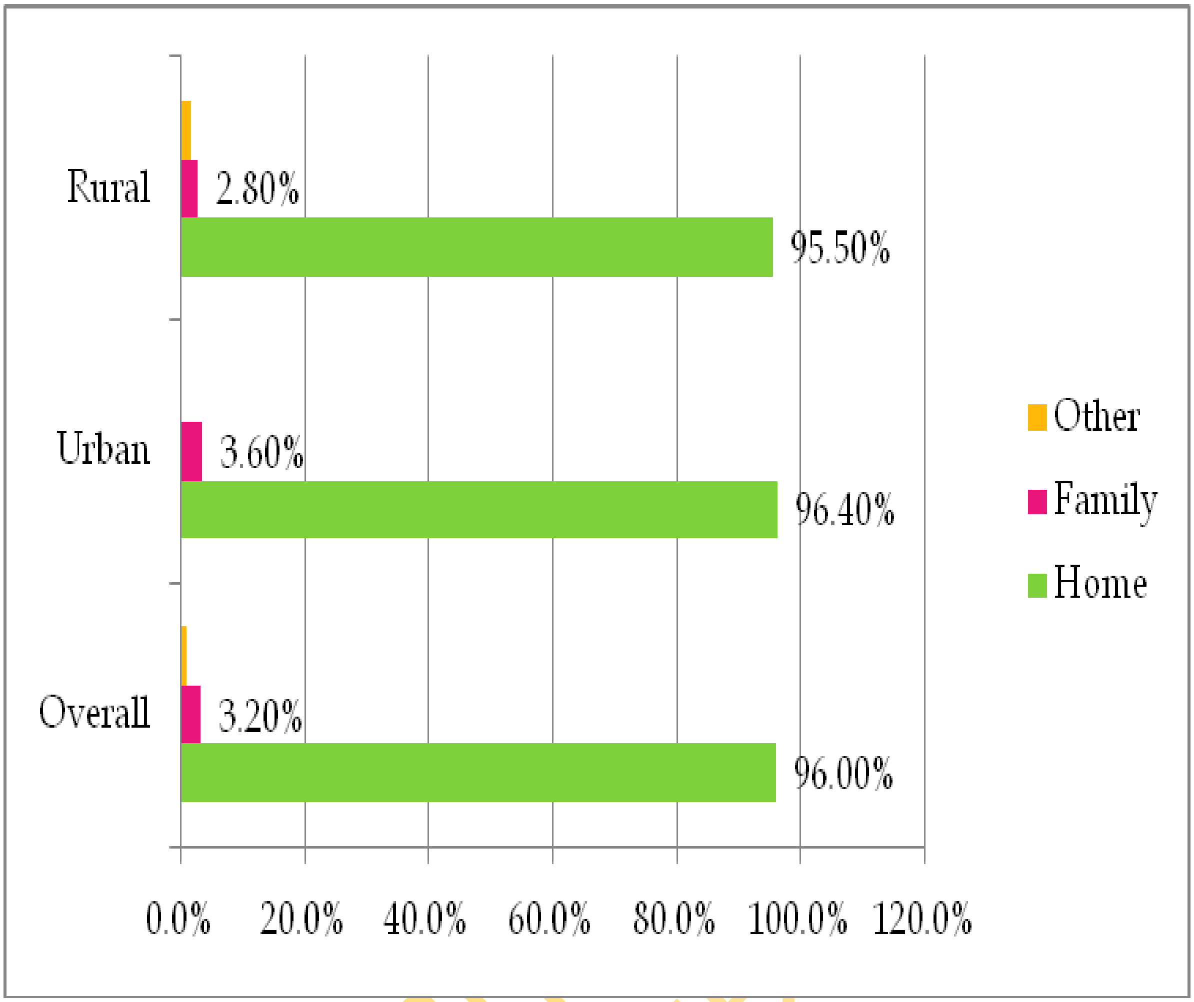



**Figure 4.15: Place of food preparation and consumption by respondents**

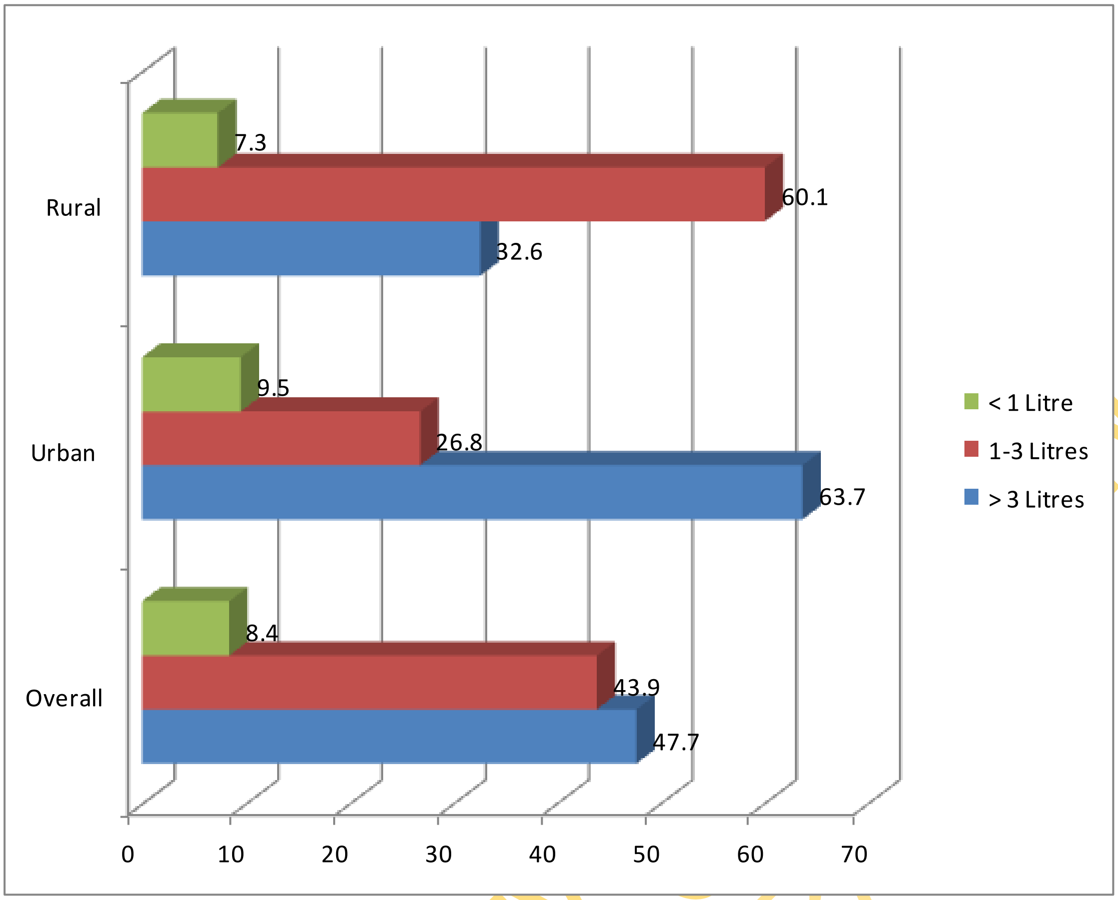



**Figure 4.16: Water intake of respondents**

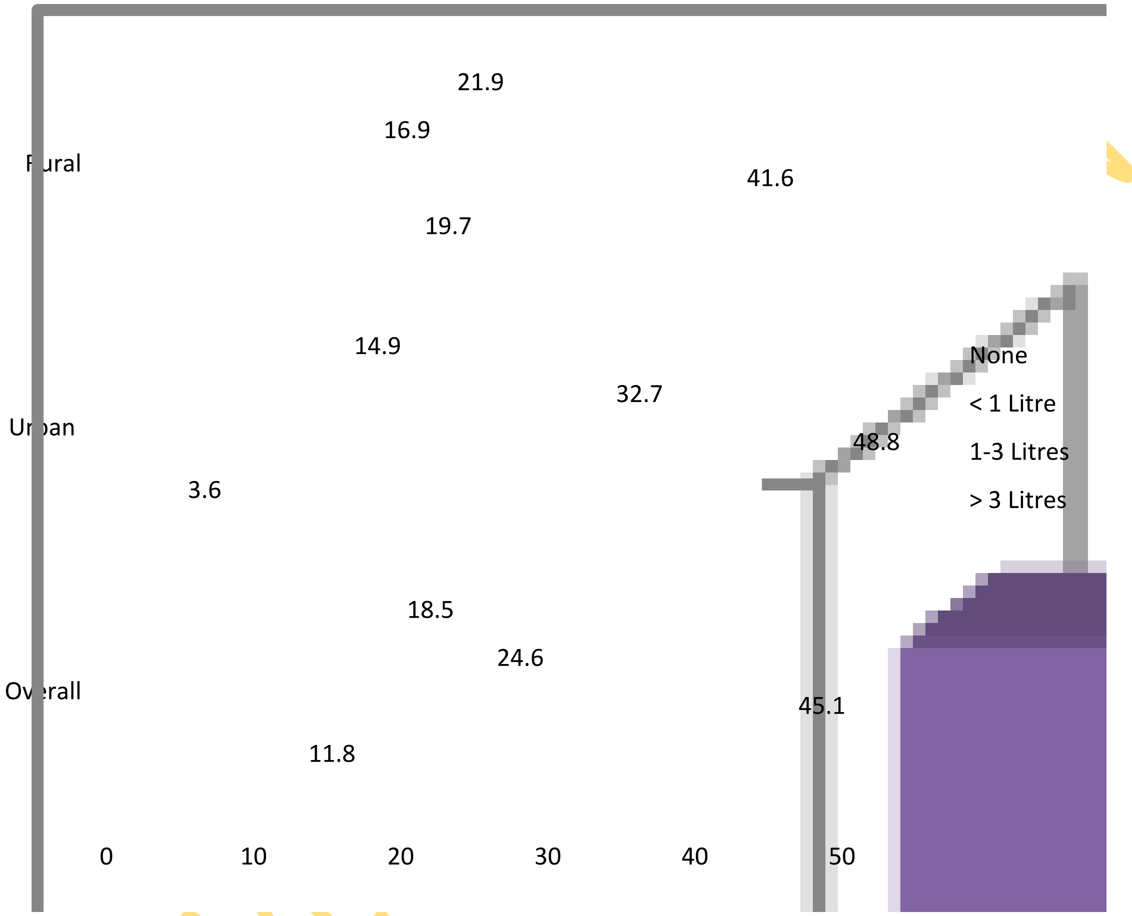



**Figure 4.17: Pattern of weekly sugar-sweetened beverages consumption of respondents**

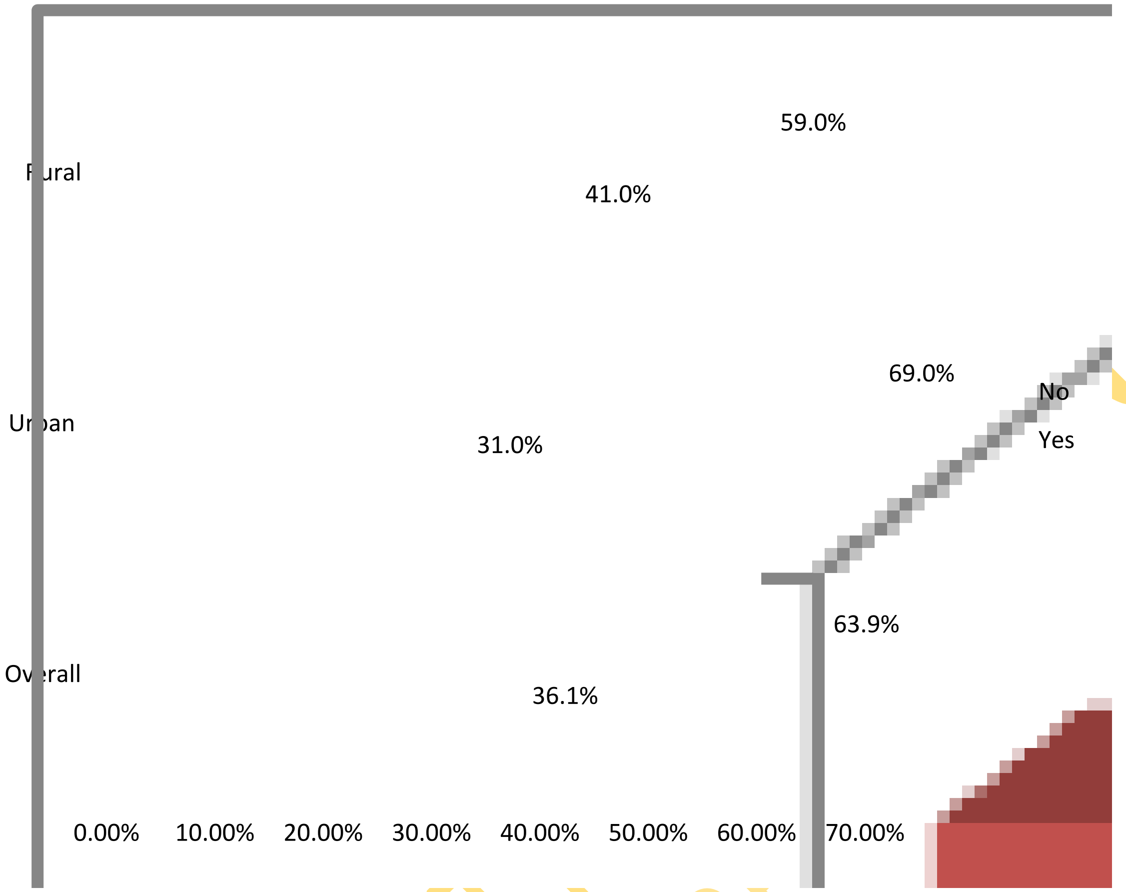



**Figure 4.18: Food restrictions/avoidance of respondents**

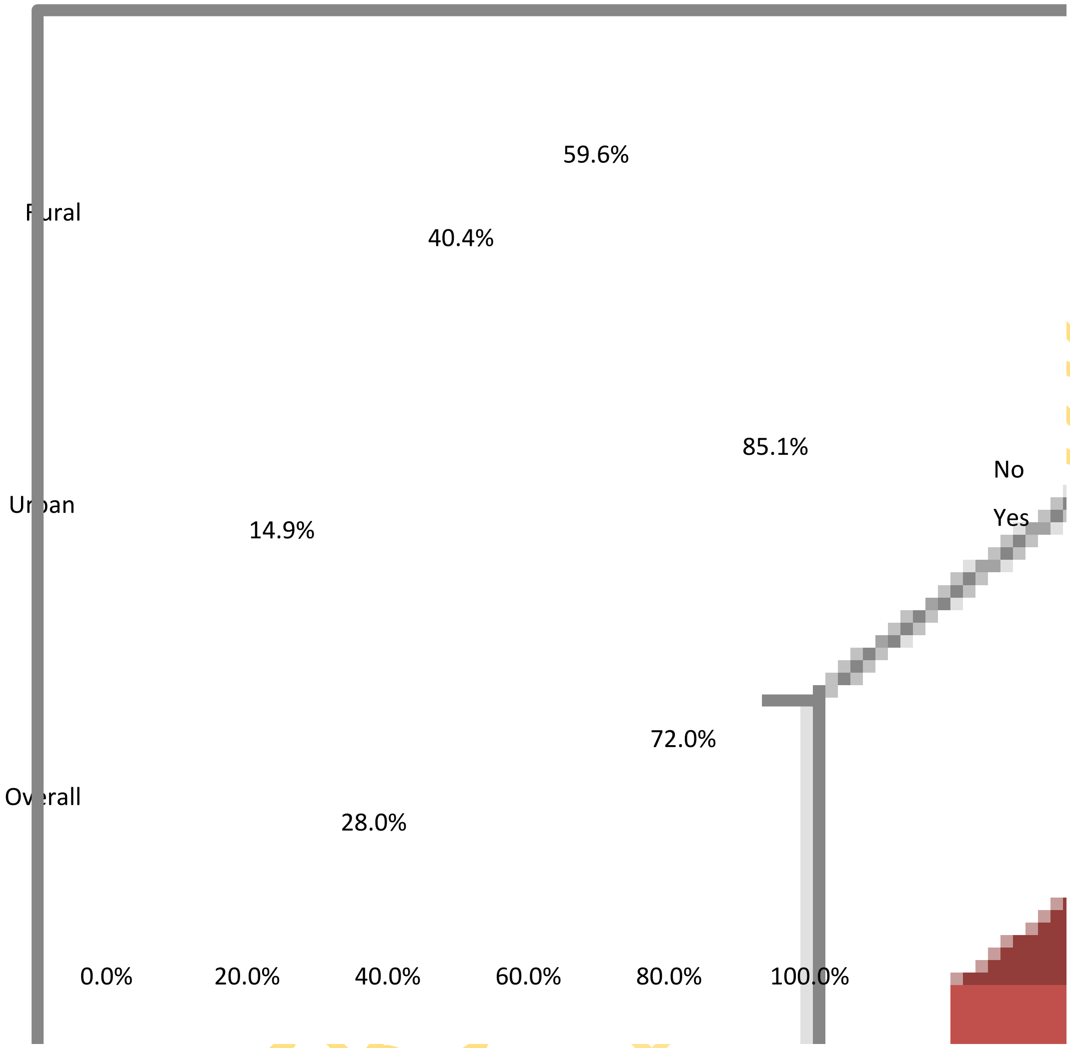



**Figure 4.19: Eating pattern of respondents**

**Null Hypothesis**

Hypothesis 2: There is no significant rural/urban variation in the food habit/consumption pattern of elderly Nigerian.

**4.6.1.9 Food Habits of the Respondents**

The dichotomization of the food habits variables into two major outcomes: poor and good food habits indicate the level of healthiness of the dietary habits of the respondents. The result is as shown in Figure 4.20. About one-third (33.0%) of the overall respondents had good food habits as measured by spreading meals consumed over at least three times per day, non-skipping of meals, regular consumption of snacks, consumption of more than three litres of water daily and sugar-sweetened beverages consumption not exceeding three litres weekly. There were more respondents with good food habits in urban (36.0%) than rural areas (31.0%). The p value for this hypothesis is greater than 0.05, the null hypothesis is hereby accepted. There was no significant rural/urban variation in the food habit of the respondents.


**Figure 4.20: Respondents with good habit (p>0.05)**

### 4.6.2 Rural-Urban comparison of food consumption pattern of the Respondents

Dietary diversification is one of the prominent food based strategies in combating malnutrition. It entails spreading food consumption across all the major food groups such that the intake of the macronutrients will be accompanied by the intakes of essential micronutrients. The food pyramid is a qualitative assessment that shows the recommended serving numbers of different food groups that is compatible with good health. The food consumption pattern of the respondents is presented in Table 4.8. The pattern of food consumption showed that the respondents habitually ate varied diets.

#### 4.6.2.1 Fruits Consumption pattern of respondents

Pattern of fruits consumption per week by area is as shown in Table 4.8. Overall, more than half of the respondents (52.6%) consumed fruits at least four times weekly, some (46.0%) consumed fruits between one to three times weekly while few respondents (1.4%) rarely consumed fruits. Regular fruits consumption of up to four to seven times weekly was higher in urban (55.4%) than rural areas (50.0%) and more respondents in rural (47.2%) than urban areas (44.6%) consumed fruits one to three times weekly. All the respondents in the urban area (100.0%) consumed fruits at least once a week, whereas, few resepondents (2.8%) in the rural area rarely consumed fruits weekly. There was no significant urban-rural difference ($P>0.05$) in the consumption pattern of fruits consumption.

#### 4.6.2.2 Vegetables Consumption pattern of respondents

The pattern of vegetable consumption per week by locality is as described in Table 4.8. Most respondents (83.8%) in the general respondents ate vegetables at least four times weekly, some (15.6%) consumed vegetables at least once but not more than three times weekly while few (0.6%) did not consume vegetables throughout the week. Breakdown by locality showed higher proportion of respondents in urban (91.7%) than rural areas (76.4%) consumed vegetables at least four times weekly while there were almost three times more respondents in the rural (22.5%) than urban areas (8.3%) who consumed vegetables one to three times weekly. All respondents in the urban area ate vegetables at least once weekly whereas few respondents (1.1%) in the rural area did not consume vegetables throughout the week. There was a significant rural/urban difference ($P<0.05$) in vegetable consumption.

#### 4.6.2.3 Animal Foods Consumption pattern of respondents

Consumption of animal foods such as milk, meat, fish and insects by respondents is also shown in Table 4.8. Overall, more than four out of every five respondents (88.4%) consumed animal foods at least four times every week while the remaining one-tenth (11.6%) consumed animal foods between one to three times weekly. Consumption of animal foods at least four times weekly was higher in urban (91.7%) than rural area (85.4%) while more respondents in rural (14.6%) than urban areas (8.3%) consumed animal food between one to three times weekly. All respondent consumed animal foods at least once a week. There was no significant difference ($p>0.05$) in the pattern of animal foods consumption by locality.

#### 4.6.2.4 Legumes Consumption pattern of respondents

The pattern of consumption of leguminous plants is as indicated in Table 4.8. The consumption of legumes in both areas was high. Overall, most respondents (72.0%) consumed legumes at least four times weekly, about than one-quarter (27.7%) consumed legumes one to three times weekly and few respondents (0.3%) rarely consumed legumes. Near daily consumption of legumes was significantly higher ($P<0.05$) in urban (81.0%) than rural areas (63.5%) while respondents that consumed legumes one to three times weekly were almost twice higher in rural (36.0%) than urban areas (19.0%). All respondents in urban area consumed legumes at least once weekly while few respondents (0.6%) in rural area rarely consumed legumes.

#### 4.6.2.5 Roots and Tubers/Cereals Foods Consumption pattern of respondents

There was no difference in the pattern of consumption of both roots and tubers as well as cereals by locality. All respondents in both localities consumed these foods at least four times weekly. Roots and tubers constitute the staple foods in the moist savanah region of Nigeria for a long time, however several findings have shown a shift in the staple foods from roots and tubers to cereals as found in the dry savanah region of Nigeria. Table 4.8 shows the patterns of consumption of cereals as well as roots and tubers respectively.

#### 4.6.2.6 Number of food groups consumed by the respondents

Generally, the diets of the respondents in both localities were spread over the various food groups. All the respondents consumed at least three of the six major food groups weekly. The spread of food groups consumed was however higher in the respondents in urban area than rural area (Figure 4.21). All the respondents in the urban area consumed all the major six food groups weekly while consumption of cereals, vegetables and grains was lower in the rural area.

**Table 4.8: Food Consumption Patterns of respondents**

| Food Consumption Patterns | Overall | | Urban | | Rural | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | (%) | N | (%) | N | (%) | $X^2$ | D | P |
| **Weekly Fruit intake** | | | | | | | 5.18 | 2 | 0.08 |
| Never Consumed (0 time) | 5 | (1.4) | 0 | (0.0) | 5 | (2.8) | | | |
| Moderate consumption (1-3 times) | 159 | (46.0) | 75 | (44.6) | 84 | (47.2) | | | |
| Frequent consumption (4-7 times) | 182 | (52.6) | 93 | (55.4) | 89 | (50.0) | | | |
| **Weekly Vegetable intake** | | | | | | | 15.26 | 2 | 0.01 |
| Never Consumed (0 time) | 2 | (0.6) | 0 | (0.0) | 2 | (1.1) | | | |
| Moderate consumption (1-3 times) | 54 | (15.6) | 14 | (8.3) | 40 | (22.5) | | | |
| Frequent consumption (4-7 times) | 290 | (83.8) | 154 | (91.7) | 136 | (76.4) | | | |
| **Weekly Meat/Fish/Milk intake** | | | | | | | | | |
| Never Consumed (0 time) | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | 3.38 | 1 | 0.07 |
| Moderate consumption (1-3 times) | 40 | (11.6) | 14 | (8.3) | 26 | (14.6) | | | |
| Frequent consumption (4-7 times) | 306 | (88.4) | 154 | (91.7) | 152 | (85.4) | | | |
| **Weekly Legumes intake** | | | | | | | | | |
| Never Consumed (0 time) | 1 | (0.3) | 0 | (0.0) | 1 | (0.6) | 13.5 | 2 | 0.01 |
| Moderate consumption (1-3 times) | 96 | (27.7) | 32 | (19.0) | 64 | (36.0) | | | |
| Frequent consumption (4-7 times) | 249 | (72.0) | 136 | (81.0) | 113 | (63.5) | | | |
| **Weekly Cereal intake** | | | | | | | | | |
| Never Consumed (0 time) | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | |
| Moderate consumption (1-3 times) | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | - | - | - |
| Frequent consumption (4-7 times) | 346 | (100.0 | 168 | (100.0) | 178 | (100.0 | | | |
| **Weekly tuber intake** | | | | | | | | | |
| Never Consumed (0 time) | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | |
| Moderate consumption (1-3 times) | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | - | - | - |
| Frequent consumption (4-7 times) | 346 | (100.0 | 168 | (100.0) | 178 | (100.0 | | | |
| **Total** | **346** | | **168** | | **178** | | | | |

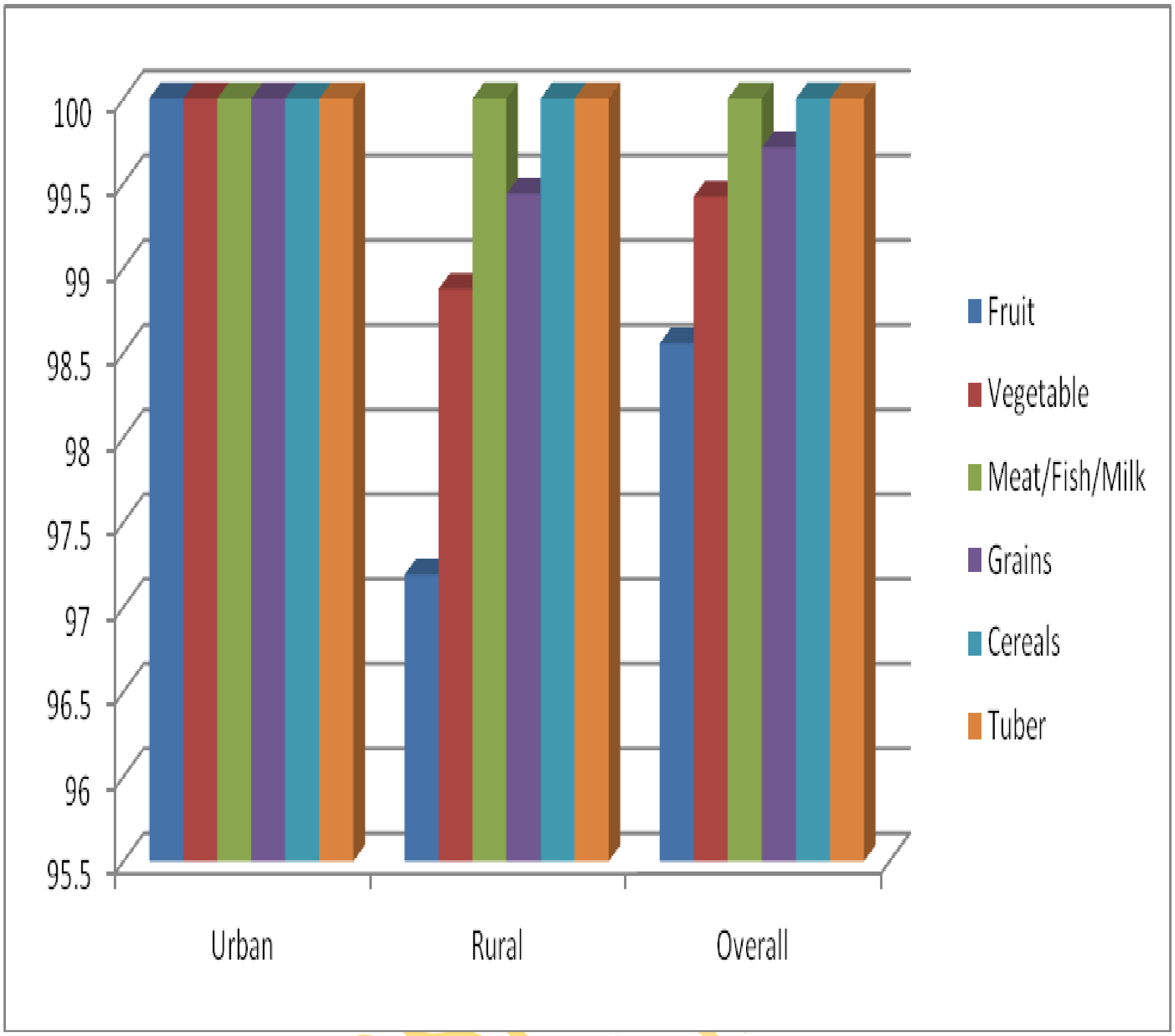



**Figure 4.21: Schematic representation of spread of food groups consumed by the respondents**

## 4.7 Comparison of Food Security and Nutritional Vulnerability of Respondents

The mixtures of factors affecting food security are described by locality in this section. The comparison was stated by the level of food availability, food access and food affordability in the area of food security. Food security level was presented as aggregate of the various variables while nutritional vulnerability was presented as aggregated scores.

### 4.7.1 Comparison of food availability of respondents

The variation in the level of food availability to the respondents by locality is as shown in Table 4.9. Overall, most households (85.8%) had someone who shopped for the household food needs. There was no significant difference ($p>0.05$) in availability of food shopper by locality however, disaggregation shows that there were more household with food shoppers in urban (89.9%) than rural areas (82.1%).

Generally, food was mostly (92.2%) sourced from the market while the home garden/farm (7.8%) served as the other source. There was a significant difference ($p<0.05$) in the source of food by locality. Market constituted the major source of food in both urban (95.2%) and rural areas (82.1%) while respondents who sourced for food from home garden/farm were about twice higher in rural (10.6%) than urban areas (4.8%).

Overall, few respondents (17.1%) reported non availability of foods they typically consumed within the last three months, such non-availability was twice higher in rural (21.9%) than urban areas (11.9%). Similarly, nearly one-tenth (9.8%) of the entire respondents had consumed foods that they typically do not eat within the last three months. Such consumption was five times significantly higher in rural (16.3%) than urban areas (3.0%).

Overall, few respondents (8.7%) had experienced limited choice of familiar foods within the last three months, disaggregation by locality shows that such experience was three times significantly higher in rural (12.9%) than urban areas (4.2%).

Of the total respondents, few (8.4%) had found typically consumed foods unavailable in the last three months and such experience was four times significantly higher in rural (13.5%) than urban areas (3.0%). There was significant rural-urban difference ($P<0.05$) in all the food availability variables except in the availability of food shoppers.

**Table 4.9: Rural-urban differences in food availability to the respondents**

| Food Availability | Overall N(%) | Urban N(%) | Rural N(%) | $X^2$ | P value | Df |
|---|---|---|---|---|---|---|
| Respondent had food shopper available in the household | | | | 13.6 | 0.07 | 2 |
| Yes | 297(85.8) | 151(89.9) | 146 (82.1) | | | |
| No | 49(14.2) | 17(10.1) | 32 (18.0) | | | |
| Source of food | | | | 12.7 | 0.01 | 3 |
| Market | 319(92.2) | 160(95.2) | 159(89.3) | | | |
| Home Garden/farm | 27(7.8) | 8(4.8) | 19(10.6) | | | |
| Typically consumed foods had been unavailable within the past 3 months | | | | 13.4 | 0.01 | 1 |
| Yes | 59(17.1) | 20(11.9) | 39(21.9) | | | |
| No | 287(82.9) | 148(88.1) | 139(78.1) | | | |
| Respondent had to consume foods that were typically not eaten in the past 3 months | | | | 9.4 | 0.00 | 2 |
| Yes | 34(9.8) | 5(3.0) | 29(16.3) | | | |
| No | 312(90.2) | 163(97.0) | 149(83.7) | | | |
| Respondent had experienced limited choice of familiar foods in the past 3 months | | | | 12.4 | 0.01 | 2 |
| Yes | 30(8.7) | 7(4.2) | 23(12.9) | | | |
| No | 316(91.3) | 161(95.8) | 155(87.1) | | | |
| Respondent had found any foods that were typically consumed unavailable in the past 3 months | | | | 15.3 | 0.01 | 2 |
| Yes | 29(8.4) | 5(3.0) | 24(13.5) | | | |
| No | 317(91.6) | 163(97.0) | 154(86.6) | | | |

### 4.7.2 Comparison of access to food by respondents

The urban-rural differences in the level of food access are shown in Table 4.10. Overall, less than half (47.4%) of the respondents had someone who grew foods consumed in the household and there was no significant difference ($p>0.05$) by locality.

Generally, about two-fifth (42.5%) were involved in farming/agriculture, there were more respondents involved in farming/agriculture in the rural (43.8%) than urban areas (41.1%). Nearly one-tenth (9.2%) of the entire respondents had missed meals in the past month due to food insufficiency. Respondents who missed meals as a result of food insufficiency were twice higher in urban (12.5%).than rural areas (6.2%).

More than one-tenth (11.6%) of the overall respondents had slept hungry in the past month. There were more respondents in the rural (12.4%) than urban areas (10.7%) that had slept hungry in the past month.

Generally, more than one-tenth (15.6%) of the respondents had worries about having enough food in the house in the past three months, the occurrence was higher in rural (19.7%) than urban areas (11.3%). There was no significant difference ($P>0.05$) in the access to food by locality.

**Table 4.10: Comparison of access to food among the elderly**

| Food Access | Overall N(%) | Urban N(%) | Rural N(%) | $X^2$ | P value | Df |
|---|---|---|---|---|---|---|
| Some foods eaten at home were produced by household member(s) | | | | 15.2 | 0.27 | 1 |
| Yes | 164(47.4) | 83(49.4) | 81(45.5) | | | |
| No | 182(52.6) | 85(50.6) | 97(54.5) | | | |
| A household member was involved in farming | | | | 11.73 | 0.34 | 1 |
| Yes | 147(42.5) | 69(41.1) | 78(43.8) | | | |
| No | 199(57.5) | 99(58.9) | 100(56.2) | | | |
| Missed meals in the past month due to insufficient food? | | | | 9.57 | 0.34 | 1 |
| Yes | 32(9.2) | 21(12.5) | 11(6.2) | | | |
| No | 314(90.8) | 147(87.5) | 167(93.8) | | | |
| Respondent had slept hungry due to insufficient food in the past month | | | | 11.84 | 0.38 | 1 |
| Yes | 40(11.6) | 18(10.7) | 22(12.4) | | | |
| No | 306(88.4) | 150(89.3) | 156(87.6) | | | |
| Respondent was worried about insufficient food in the house in the past 3 month | | | | 13.23 | 0.06 | 2 |
| Yes | 54(15.6) | 19(11.3) | 35(19.7) | | | |
| No | 292(84.4) | 149(88.7) | 143(80.4) | | | |

### 4.7.3 Comparison of food affordability by respondents

The diversity in the level of food affordability by locality is as shown in Table 4.11. Overall, about one-fifth of the respondents (20.5%) disaggregated 22.6% in urban and 18.6% in rural areas were not in any form of employment. Nearly half (48.3%) disaggregated as 52.8% in the rural and 43.5% in urban areas were fulltime workers. Nearly one-quarter (24.6%) were part-time workers with 28.0% in the urban and 21.3% in the rural while few (6.6%) had irregular work. There were more respondents with irregular jobs in the rural (7.3%) than urban areas (6.0%).

Overall, about one-fifth of the respondents (17.6%) disaggregated as 19.0% in urban and 16.3% in the rural areas had a household member who was not working due to illness. Most respondents (79.2%) disaggregated as 91.7% in the urban locality (91.7%) and 67.4% in the rural areas reported having access to adequate funds to purchase foods regularly. There was a significant rural-urban difference in adequacy of funds to purchase household food need.

Most respondents (78.3%) disaggregated as 77.4% in urban and 79.2% spent no portion of the household income on alcohol. More than one-tenth of the respondents (12.4%) spent less tthan 10% of the household income on alcohol while respondents who spent 10 – 20% and more than 20% of household income on alchol accounted for 5.5% and 3.8% respectively. Respondents that spent less that 10% of income on alcohol were 1.5 times higher in urban (14.9%) than rural areas (10.1%), respondents spending 10-20% of income on alcohol were five times higher in rural (9.0%) than urban areas (1.8%) while respondents that spent more that 20% of household income on alcohol were about 3.5 times higher in urban (6.0%) than rural areas (1.7%). There was a significant rural-urban difference ($p<0.05$) in the proportion of household income spent on alcohol.

Most of the overall respondents (60.4%) and majority of respondents in both urban (69.0%) and rural (52.2%) areas spent 10-30% of the household income on food. Almost one-quarter (23.7%) disaggregated as 17.9% in urban and 29.2% in rural areas spent 30-60% on food. Though few respondents (10.7%) disaggregated as 10.1% in urban and 11.2% in rural areas spent less than 10% of household income on food, respondents that spent >60% of household income on food were more than twice higher in rural (7.3%) than urban areas (3.0%).

Overall, more than half of the respondents (56.4%) spent less than 10% on healthcare with 59.6% and 53.0% in rural and urban areas respectively. Few (1.7%) respondents overall and entirely from the rural locality spent as much as 30-60% of household income on healthcare.

There were no significant differences ($p>0.05$) in the working status, inability to work due to illness and animal keeping by locality. There were significant differences in adequacy of fund for food purchase, as well as in household income spent on alcohol, food and healthcare by locality.

Table 4.11: Comparison of food affordability among the respondents

| Food affordability | Overall N(%) | Urban N(%) | Rural N(%) | $X^2$ | P value | Df |
|---|---|---|---|---|---|---|
| **Respondent working status** | | | | 9.53 | 0.27 | 4 |
| None | 71(20.5) | 38(22.6) | 33 (18.6) | | | |
| Full time | 167(48.3) | 73(43.5) | 94 (52.8) | | | |
| Part time | 85(24.6) | 47(28.0) | 38 (21.3) | | | |
| Irregular | 23(6.6) | 10(6.0) | 13 (7.3) | | | |
| **Household member not working due to illness** | | | | 11.42 | 0.30 | 1 |
| Yes | 61(17.6) | 32(19.0) | 29 (16.3) | | | |
| No | 285(82.4) | 136(81.0) | 149 (83.7) | | | |
| **Adequate funds available to purchase food regularly** | | | | 8.36 | 0.00 | 1 |
| Yes | 274(79.2) | 154(91.7) | 120 (67.4) | | | |
| No | 72(20.8) | 14(8.3) | 58 (32.6) | | | |
| **Household income spent on alcohol?** | | | | 20.12 | 0.03 | 3 |
| <10% | 43(12.4) | 25(14.9) | 18 (10.1) | | | |
| 10-20% | 19(5.5) | 3(1.8) | 16 (9.0) | | | |
| >20% | 13(3.8) | 10(6.0) | 3 (1.7) | | | |
| None | 271(78.3) | 130(77.4) | 141 (79.2) | | | |
| **Household income spent on food** | | | | 14.35 | 0.01 | 3 |
| <10% | 37(10.7) | 17(10.1) | 20 (11.2) | | | |
| 10-30% | 209(60.4) | 116(69.0) | 93 (52.2) | | | |
| 30-60% | 82(23.7) | 30(17.9) | 52 (29.2) | | | |
| >60% | 18(5.2) | 5(3.0) | 13 (7.3) | | | |
| **Household income spent on health care** | | | | 13.75 | 0.02 | 2 |
| <10% | 195(56.4) | 89(53.0) | 106(59.6) | | | |
| 10-30% | 145(41.9) | 79(47.0) | 66(37.1) | | | |
| 30-60% | 6(1.7) | - | 6(3.4) | | | |
| **Respondents or family owned / raised animals** | | | | 19.21 | 0.14 | 1 |
| Yes | 201(58.1) | 103(61.3) | 98(55.1) | | | |
| No | 145(41.9) | 65(38.7) | 80(44.9) | | | |

### 4.7.4 Rural-urban differences in food security among the respondents

The aggregation of various variables gives an indication of the levels of food security of the respondents as shown in Figure 4.22. Overall, majority of the respondents (78.0%) were food secured, respondents that were food secured were higher in urban (91.1%) than rural areas (65.7%). Also, more than one-tenth of the entire respondents (12.4%) were food insecure without hunger and respondents that were food insecure without hunger were about 2.5 times higher in rural (17.4%) than urban areas (7.1%). Almost one-tenth (9.5%) were food insecure with hunger and respondents who were food insecure with hunger were nine times higher in rural (16.9%) than urban locality (1.8%). There was a significant difference ($p<0.05$) in the food security status of the respondents by locality.

### 4.7.5 Rural-Urban comparison of Nutritional vulnerability among the respondents

The aggregation of nutritional vulnerability variables as indicated in Figure 4.23 showed that on the whole, most respondents (71.4%) were non-vulnerable, almost one-fifth (17.6%) were moderately vulnerable and few (11.0%) were highly vulnerable to malnutrition. Disaggregation by locality showed that respondents that were non-vulnerable were about twice higher in urban (94.6%) than rural areas (49.4%). Vulnerability to malnutrition was 8.5 times higher in the rural (50.6%) than urban areas (5.9%). Moderate and high vulnerability accounted for 29.2% and 21.3% respectively in the rural area. There was a significant difference ($P<0.05$) in the level of nutritional vulnerability by locality.

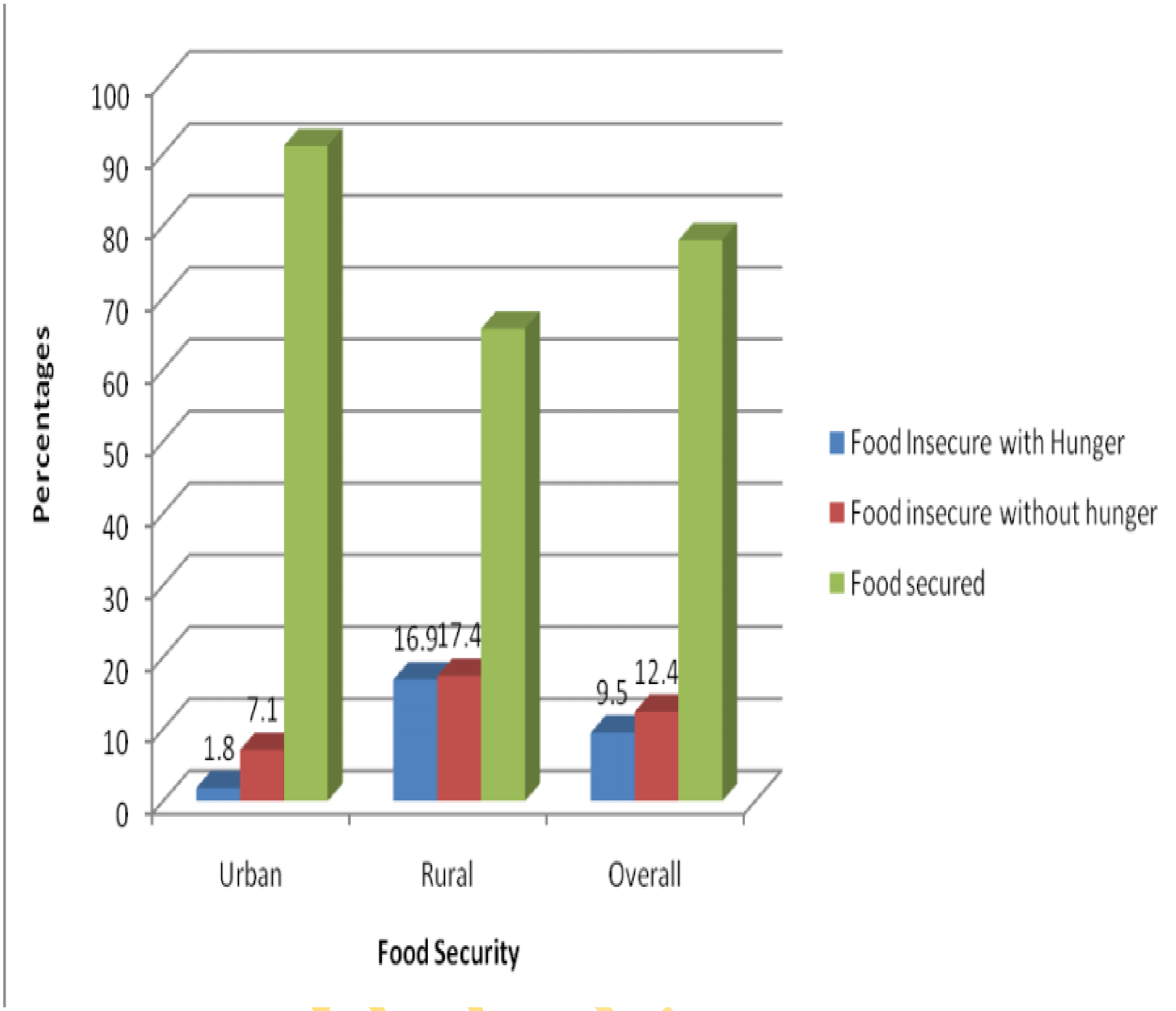



**Figure 4.22: Food security category among the respondents**

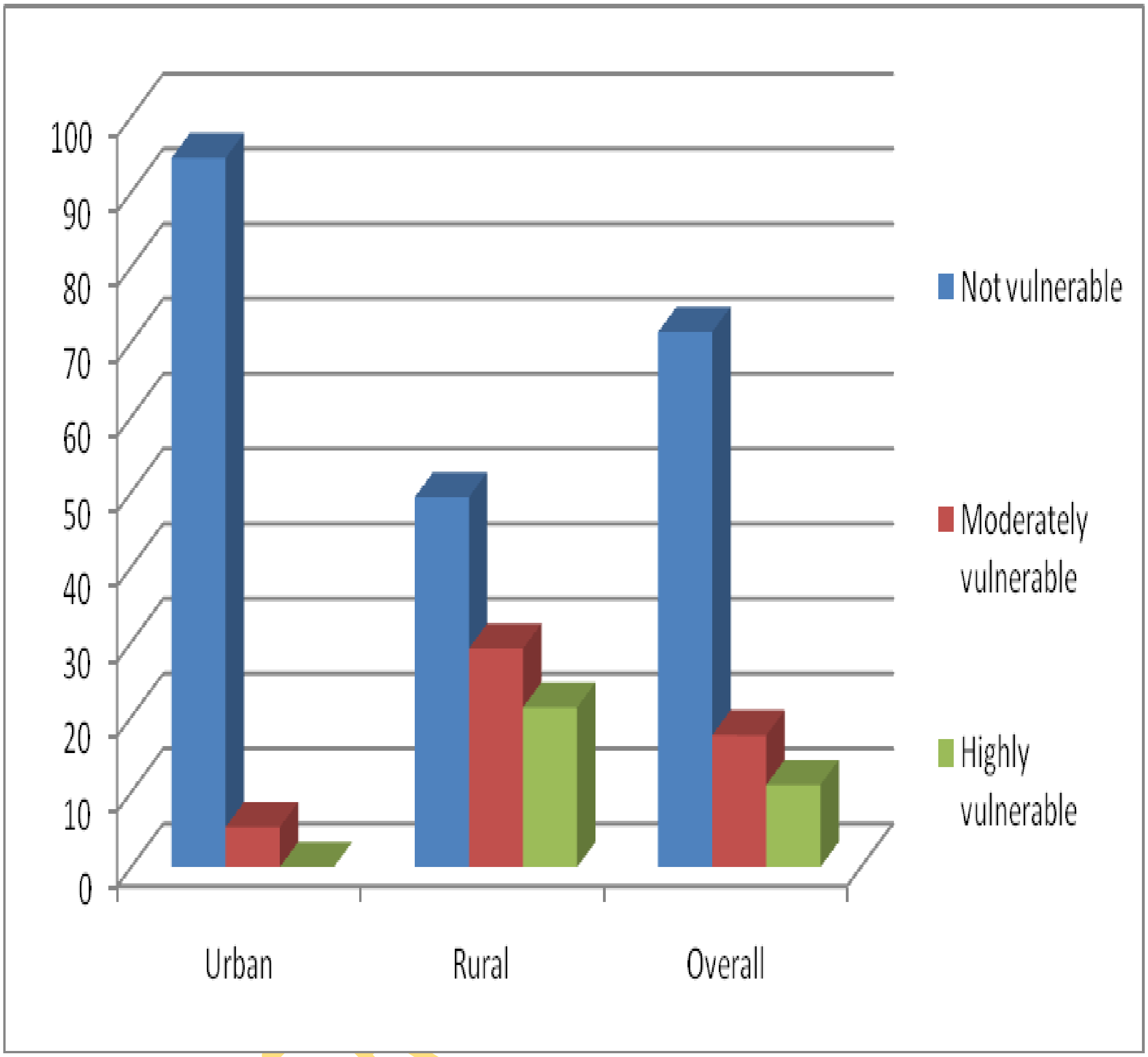



**Figure 4.23: Nutritional vulnerability of the respondents**

### 4.8 Rural-urban differences in Nutritional Status among the respondents

This section presents the result of nutritional assessment of the respondents. Two assessment methods were used in the course of the study, these are dietary and anthropometric assessments.

#### 4.8.1 Rural-urban differential in Dietary Intake of the respondents

One week-day and one week-end direct weighing method was used to assess the dietary intake, the mean nutrient intake and nutrient adequacy were calculated using the Total Dietary Assessment Softtware. The result is as shown in Tables 4.12, 4.13, 4.14 and Figure 4.24.

##### 4.8.1.1 Energy intake of the respondents

As indicated in Tables 4.12 and 4.13, the overall mean daily energy intake was 1638.3±936.1 Kilocalorie and only about one-third of the respondents (33.8%) had energy intake that met their energy requirement. The mean daily energy intake was higher and less varied in rural (1691.2±682.2 Kcal) than urban areas (1582.3±1145.0 Kcal). However, there were more respondents in urban (36.9%) than rural areas (30.9%) who had adequate energy intake while respondents with energy intake above their dietary requirement were about nine times higher in rural (16.9%) than urban areas (1.8%). There was a siginificant (p=0.01) rural-urban difference in energy intake.

##### 4.8.1.2 Protein intake of the respondents

Tables 4.12 and 4.13 show that the mean daily dietary protein intake in the entire respondents was 66.7±26.4 g and nearly half (48.3%) had intake that met their nutritional requirement..Like energy, mean daily protein intake was higher and more varied in rural (69.4±31.2 g) than urban areas (63.9±19.8 g), however there were more respondents with adequate protein intake in urban (51.8%) than rural areas (44.9%) whereas there were more respondents with protein intake higher than their nutritional requirement in rural (35.4%) than urban area (30.4%). There was no significant rural-urban difference in protein intake (p=0.44).

##### 4.8.1.3 Carbohydrate intake of the respondents

As indicated in Tables 4.12 and 4.13, the mean daily carbohydrate intake of the total respondents was 258.1±97.6 g and was expectedly higher in rural (275.7±122.6 g) than urban area (239.5±55.5 g). Overall, less than half of the respondents (45.4%) had adequate intake of carbohydrate. Respondents with adequate carbohydrate intake were significantly higher (p=0.03) in urban (51.2%) than rural (39.9%) areas however respondents with excess carbohydrate intake were about four times higher in rural (21.3%) than urban (4.8%) areas.

#### 4.8.1.4 Fibre intake of the respondents

As shown in Tables 4.12 and 4.13, the mean daily fibre intake in the overall respondents was 20.4±15.6 g, mean daily intake was higher and more varied in rural (21.9±19.6 g) than urban (18.9±9.4) areas. More than one-third of the overall respondents (39.3%) had inadequate intake and there were more respondents with inadequate fibre intake in rural (39.9%) than urban (38.7%) area, however, the difference was not significant (p=0.38).

#### 4.8.1.5 Fat intake of the respondents

The mean daily total fat intake was 32.9±17.9 g in the entire respondents ()Table 4.12. Intake was higher and more varied in urban (31.5±15.8 g) than rural (24.2±11.7 g) areas. Inadequate intake of fat was very high (85.5%) in the overall respondents. There were more respondents with inadequate fat intake in urban (86.9%) than rural (84.3%) areas and respondents with fat intake above nutritional requirement were twice higher in rural (5.1%) than urban areas (2.4%).

The overall mean daily intake of saturated fat was 4.9±4.3 g. The mean daily intake was about twice higher in urban (6.0±3.5 g) than rural area (3.7±3.2 g). Like fat intake, the proportion of overall respondents with adequate intake of saturated fat was very low (1.4%) and was higher in rural (2.2%) than urban areas (0.6%).

#### 4.8.1.6 Vitamin A intake of the respondents

As indicated in Tables 4.12 and 4.14, the intake of micronutrient followed a pattern similar to that of the macronutrient intake. Overall, the mean daily vitamin A intake was 2187.9±1323.7 IU, intake was higher and less varied in urban (2273.2±1170.9 IU) than rural areas (2107.3±1452.0 IU). Respondents with inadequate intake of vitamin A were few (12.1%). Respondents with inadequate vitamin A intake were about four times higher in rural (19.1%) than urban areas (4.8%). There was a siginificant rural-urban difference (p=0.01) in vitamin A intake.

#### 4.8.1.7 Vitamin B1 intake of the respondents

As indicated in Tables 4.12 and 4.14, the mean daily intake of vitamin B1 (Thiamine) was 2.1±1.5 mg in the entire respondents and nearly half (48.0%) had inadequate vitamin B1 intake. Vitamin B1 intake was higher and less varied in rural (2.2±1.8 mg) than urban area (1.9±1.3 mg). There were more respondents with inadequate vitamin B1 intake in urban (51.2%) than rural areas (44.9%), however, the difference was not significant (p=0.07). Also, respondents with dietary intake of vitamin B1 higher than nutritional requirement were about 1.5 times higher in rural (29.8%) than urabn areas (19.0%).

#### 4.8.1.8 Calcium intake of the respondents

As shown in Tables 4.12 and 4.14, the mean daily calcium intake was higher and more varied in rural (255.8±241.4 mg) than urban area (183.5±110.8 mg) and was 220.7±192.7 mg overall. Most of the entire respondents (98.8%) had inadequate intake of calcium and the proportion of respondents with inadequate was high in both localities though significantly higher (p=0.02) in urban (100.0%) than rural areas (97.8%).

#### 4.8.1.9 Zinc intake of the respondents

Overall, the mean daily zinc intake was 10.4±9.8 mg, mean daily zinc intake was higher and more varied in urban (11.1±9.6 mg) than rural area (9.7±5.4 mg). Most of the total respondents (77.2%) had inadeqaute intake of zinc. There were more respondents in urban (82.7%) than rural areas (71.9%) that had inadaequate intake of zinc. There was a significant rural-urban difference (p=0.01) in zinc intake.

#### 4.8.1.10 Iron intake of the respondents

The mean daily iron intake in the overall respondents was 15.7±7.2 mg and fewer that one-quarter of the total respondents (24.3%) had adequate iron intake. The mean daily intake of iron was higher and more varied in rural (17.0±9.0 mg) than urban area (14.2±4.0 mg), however, there were more respondents with adequate iron intake in urban (26.8%) than rural areas (21.9%) while respondents with inadequate iron intake were higher in rural (7.9%) than urban areas (5.4%).

#### 4.8.1.11 Magnesium intake of the respondents

Similarly, the mean daily magnesium intake was higher and more varied in rural area (250.7±179.3 mg) than urban area (210.0±88.6 mg) and was 230.9±143.9 mg overall. Most of the overall respondents (72.5%) had inadequate intake and there were more respondents in urban (73.2%) than rural areas (71.9%) who had inadequate magnesium intake.

**Table 4.12: Rural-urban comparison of nutrient intake of the respondents**

| Nutrients | Overall<br>Mean ± SD | Urban<br>Mean ± SD | Rural<br>Mean ± SD |
|---|---|---|---|
| Energy (Kcal) | 1638.3 ± 936.1 | 1582.3 ± 1145.0 | 1691.2 ± 682.2 |
| Protein (g) | 66.7 ± 26.4 | 63.9 ± 19.8 | 69.4 ± 31.2 |
| Carbohydrate (g) | 258.1 ± 97.6 | 239.5 ± 55.5 | 275.7 ± 122.6 |
| Fibre (g) | 20.4 ± 15.6 | 18.9 ± 9.4 | 21.9 ± 19.6 |
| Fat total (g) | 32.9 ± 17.9 | 31.5 ± 15.8 | 24.2 ± 11.7 |
| Fat saturated | 4.9 ± 4.3 | 6.0 ± 3.5 | 3.7 ± 3.2 |
| Vitamin A (IU) | 2187.9 ± 1323.7 | 2273.2 ± 1170.9 | 2107.3 ± 1452.0 |
| Vitamin B1 | 2.1 ± 1.5 | 1.9 ± 1.3 | 2.2 ± 1.8 |
| Calcium (mg) | 220.7 ± 192.7 | 183.5 ± 110.8 | 255.8 ± 241.4 |
| Zinc | 10.4 ± 9.8 | 11.1 ± 9.6 | 9.7 ± 5.4 |
| Iron (mg) | 15.7 ± 7.2 | 14.2 ± 4.0 | 17.0 ± 9.0 |
| Magnesium | 230.9 ± 143.9 | 210.0 ± 88.6 | 250.7 ± 179.3 |

**Table 4.13 Rural-urban differential in adequacy of macronutrient and related substances intake of the respondents**

| | Overall | | Urban | | Rural | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Nutrient/Level of intake** | **N** | **(%)** | **N** | **%** | **N** | **%** | **$X^2$** | **Df** | **P** |
| **Energy intake** | | | | | | | | | |
| Inadequate | 196 | (56.6) | 103 | (61.3) | 93 | (52.2) | 25.2 | 2 | 0.01 |
| Adequate | 117 | (33.8) | 62 | (36.9) | 55 | (30.9) | | | |
| Excess | 33 | (9.5) | 3 | (1.8) | 30 | (16.9) | | | |
| **Protein intake** | | | | | | | | | |
| Inadequate | 65 | (18.8) | 30 | (17.9) | 35 | (19.7) | 1.7 | 2 | 0.44 |
| Adequate | 167 | (48.3) | 87 | (51.8) | 80 | (44.9) | | | |
| Excess | 114 | (32.9) | 51 | (30.4) | 63 | (35.4) | | | |
| **Carbohydrate intake** | | | | | | | | | |
| Inadequate | 143 | (41.3) | 74 | (44.0) | 69 | (38.8) | 20.9 | 2 | 0.03 |
| Adequate | 157 | (45.4) | 86 | (51.2) | 71 | (39.9) | | | |
| Excess | 46 | (13.3) | 8 | (4.8) | 38 | (21.3) | | | |
| **Fibre intake** | | | | | | | | | |
| Inadequate | 136 | (39.3) | 65 | (38.7) | 71 | (39.9) | 19.9 | 2 | 0.38 |
| Adequate | 102 | (29.5) | 55 | (32.7) | 47 | (26.4) | | | |
| Excess | 108 | (31.2) | 48 | (28.6) | 60 | (33.7) | | | |
| **Fat intake** | | | | | | | | | |
| Inadequate | 296 | (85.5) | 146 | (86.9) | 150 | (84.3) | 1.7 | 2 | 0.46 |
| Adequate | 37 | (10.7) | 18 | (10.7) | 19 | (10.7) | | | |
| Excess | 13 | (3.8) | 4 | (2.4) | 9 | (5.1) | | | |
| **Fat sat. Intake** | | | | | | | | | |
| Inadequate | 341 | (98.6) | 167 | (99.4) | 174 | (97.8) | 1.8 | 1 | 0.18 |
| Adequate | 5 | (1.4) | 1 | (0.6) | 4 | (2.2) | | | |
| Excess | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | |
| **Total** | **346** | **(100.0)** | **168** | **(100.0)** | **178** | **(100.0)** | | | |

**Table 4.14 Rural-urban differential in adequacy of micronutrient intake of the elderly**

| Nutrient/Level of intake | Overall N | Overall % | Urban N | Urban % | Rural N | Rural % | $X^2$ | Df | P |
|---|---|---|---|---|---|---|---|---|---|
| **Vitamin A intake** | | | | | | | | | |
| Inadequate | 42 | (12.1) | 8 | (4.8) | 34 | (19.1) | 18.1 | 2 | 0.01 |
| Adequate | 32 | (9.2) | 20 | (11.9) | 12 | (6.7) | | | |
| Excess | 272 | (78.6) | 140 | (83.3) | 132 | (74.2) | | | |
| **Vitamin B1 intake** | | | | | | | | | |
| Inadequate | 166 | (48.0) | 86 | (51.2) | 80 | (44.9) | 5.4 | 2 | 0.07 |
| Adequate | 95 | (27.5) | 50 | (29.8) | 45 | (25.3) | | | |
| Excess | 85 | (24.6) | 32 | (19.0) | 53 | (29.8) | | | |
| **Calcium intake** | | | | | | | | | |
| Inadequate | 342 | (98.8) | 168 | (100.0 | 174 | (97.8) | | | |
| Adequate | 4 | (1.2) | 0 | (0.0) | 4 | (2.2) | 5.4 | 1 | 0.02 |
| Excess | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | |
| **Zinc intake** | | | | | | | | | |
| Inadequate | 267 | (77.2) | 139 | (82.7) | 128 | (71.9) | 17.9 | 2 | 0.01 |
| Adequate | 52 | (15.0) | 26 | (15.5) | 26 | (14.6) | | | |
| Excess | 27 | (7.8) | 3 | (1.8) | 24 | (13.5) | | | |
| **Iron intake** | | | | | | | | | |
| Inadequate | 23 | (6.6) | 9 | (5.4) | 14 | (7.9) | 1.7 | 2 | 0.42 |
| Adequate | 84 | (24.3) | 45 | (26.8) | 39 | (21.9) | | | |
| Excess | 239 | (69.1) | 114 | (67.9) | 125 | (70.2) | | | |
| **Magnesium intake** | | | | | | | | | |
| Inadequate | 251 | (72.5) | 123 | (73.2) | 128 | (71.9) | 25.3 | 2 | 0.01 |
| Adequate | 76 | (22.0) | 45 | (26.8) | 31 | (17.4) | | | |
| Excess | 19 | (5.5) | 0 | (0.0) | 19 | (10.7) | | | |
| **Total** | **346** | **(100.0)** | **168** | **(100.0)** | **178** | **(100.0)** | | | |

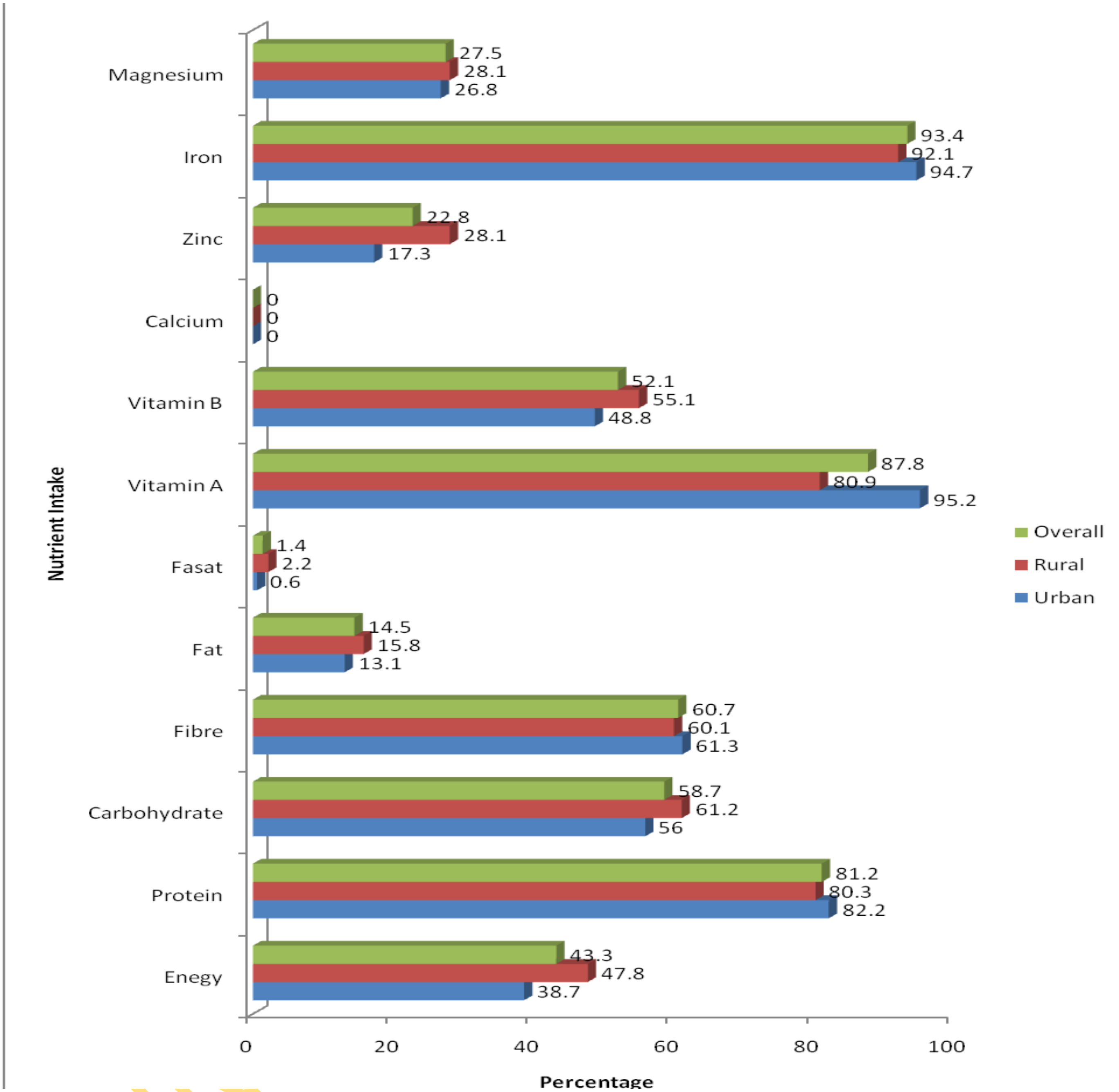



**Figure 4.24: Percentage of Elderly with adequate intake of selected nutrients and energy using Total Diet Assessment Software Version 3.0**

### 4.8.2 Rural-urban differential in Anthropometric characteristics of the Elderly

Three anthropometric indices were used to quantify the nutritional status of the elderly in this study. These are mid upper arm circumference, body mass index based on armspan and body mass index based on height are as indicated in Tables 4.15 and Table 4.16. Mid upper arm circumference was classified as severe malnutrition when the value was 22.1 cm, moderate malnutrition when value was within 22.1 to 23.0 cm, mild malnutrition when within 23.1 to 24.0 cm and normal when the value was greater than 24.0 cm. The ratio of weight to the armspan were categorised as underweight (<16.5 Kg/m$^2$), normal-weight (16.5-22.9 Kg/m$^2$) and overweight (≥23.0 Kg/m$^2$) while the ratio of weight to height was classified as underweight (<18.5 Kg/m$^2$), normal-weight (18.5-24.9 Kg/m$^2$), overweight (25.0-29.9 Kg/m$^2$) and obese (≥ 30.0 Kg/m$^2$).

#### 4.8.2.1 Mid Upper Arm Circumference of the respondents

The mean MUAC of the entire respondents was 26.9±8.5 cm, the mean value was higher in urban (28.4±6.2 cm) than rural areas (25.5±6.9 cm). The distribution of the mid upper arm circumference shows that overall, most of the respondents (82.9%) were well nourished and almost one-fifth (17.1%) were malnourished. Of those who were malnourished, abount one-tenth (11.6%) were mildly manourished and respondents who were moderate and severely malnourished were 3.2% and 2.3% respectively. Respondents that were mildly malnourished were about 1.5 times higher in rural (14.0%) than urban areas (8.9%) and respondents that were severely malnourished were almost twice higher in urban (3.0%) than rural areas (1.7%). There was no significant rural-urban difference in the MUAC (p=0.404) of the respondents.

#### 4.8.2.2 Body Mass Index (Armspan) of the respondents

The mean body mass index based on armspan was 21.3±3.33 Kg/m$^2$. Most respondents (71.7%) had good nutritional status, about one-fifth (20.5%) were underweight and few (7.8%) were underweight. The mean value was higher and less varied in urban (21.5±2.99 Kg/m$^2$) than rural area (21.1±3.16 Kg/m$^2$). There were more respondents with normal body weight in urban (75.0%) than rural area (68.5%) and there were more respondents who were overweight in urban (8.3%) than rural areas (7.3%). Respondents that were underweight were about 1.5 times higher in rural (24.2%) in than urban areas (16.7%). There was a significant (p=0.03) rural-urban difference in the body mass index based on armspan among the respondents.

#### 4.8.2.3 Body Mass Index (Height) of the respondents

Similar to the weight/armspan result, the mean body mass index based on height for the entire respondents was 22.8±3.54 $Kg/m^2$, the mean value was higher and less varied in urban area (23.4±3.01 $Kg/m^2$) than rural area (22.2±3.26 $Kg/m^2$). Most of the total respondents (73.4%) had good nutritional status and the prevalence of malnutrition was 26.6% disaggregated as underweight (16.8%), overweight (8.1%) and obese (1.7%). There were more respondents within the normal BMI range in urban (75.0%) than rural areas (71.9%) while respondents who were underweight were more in rural (18.0%) than urban areas (15.5%). Similarly, overweight respondents were more in urban (8.9%) than rural areas (7.3%), however, obese respondents were about three times higher in rural (2.8%) than urban areas (0.6%). However, there was no significant rural-urban difference in the body mass index based on height (p=0.155) of the respondents.

**Table 4.15: Anthropometric characteristics of the respondents 1**

| Nutrients | Overall<br>Mean ± SD | Urban<br>Mean ± SD | Rural<br>Mean ± SD |
|---|---|---|---|
| MUAC (cm) | 26.9 ± 8.5 | 28.4 ± 6.2 | 25.5 ± 6.9 |
| BMI Armspan | 21.3 ± 3.33 | 21.5 ± 2.99 | 21.1 ± 3.16 |
| BMI Height | 22.8 ± 3.54 | 23.4 ± 3.01 | 22.2 ± 3.26 |

**Table 4.16: Anthropometric characteristics of the respondents 2**

| Nutritional Status | Overall | | Urban | | Rural | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **MUAC (cm)** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** |
| Severe malnutrition (< 22.1) | 8 | (2.3) | 5 | (3.0) | 3 | (1.7) | 2.9 | 3 | 0.40 |
| Moderate malnutrition (22.1–23.0) | 11 | (3.2) | 6 | (3.6) | 5 | (2.8) | | | |
| Mild malnutrition (23.1 – 24.0) | 40 | (11.6) | 15 | (8.9) | 25 | (14.0) | | | |
| Normal range (> 24.0) | 287 | (82.9) | 142 | (84.5) | 145 | (81.5) | | | |
| **BMI armspan (Kg/m$^2$)** | | | | | | | 5.3 | 3 | 0.03 |
| Underweight (< 16.5) | 71 | (20.5) | 28 | (16.7) | 43 | (24.2) | | | |
| Normal (16.5 – 22.9) | 248 | (71.7) | 126 | (75.0) | 122 | (68.5) | | | |
| Overweight (≥ 23.0) | 27 | (7.8) | 14 | (8.3) | 13 | (7.3) | | | |
| **BMI height (Kg/m$^2$)** | | | | | | | | | |
| Underweight (< 18.5) | 58 | (16.8) | 26 | (15.5) | 32 | (18.0) | 3.0 | 3 | 0.16 |
| Normal (18.5 – 24.9) | 254 | (73.4) | 126 | (75.0) | 128 | (71.9) | | | |
| Overweight (25.0 – 29.9) | 28 | (8.1) | 15 | (8.9) | 13 | (7.3) | | | |
| Obese (≥ 30.0) | 6 | (1.7) | 1 | (0.6) | 5 | (2.8) | | | |
| **Total** | **346** | **(100.0)** | **168** | **(100.0)** | **178** | **(100.0)** | | | |

## 4.9 Further analysis of independent and dependent variables

This section presents findings on associations between the following pairs of indepedent and dependent variables; lifestyle and social support versus selected baseline characteristics, food habit and consumption pattern versus selected baseline characteristics, food security versus selected baseline characteristics, nutritional vulnerability versus selected baseline characteristics, and body mass index (armspan) versus selected baseline characteristics. These relationship were considered significant at $p<0.05$.

**NULL HYPOTHESIS**

**Hypothesis 3: There is no significant rural/urban difference in factors predicting nutritional vulnerability of Nigerian elderly**

This section explores the observed association between nutritional vulnerability and selected baseline characteristics of the respondents by sector. These are demographic, socio-economic, environmental characteristics, selected wealth index variables, lifestyle and social support variables.

The rural-urban variation in the association between the socio-demographic characteristics and nutritional vulnerability is as shown in Table 4.17. Nutritional vulnerability is significantly influenced ($p<0.05$) by age in the rural areas while the relation is not significant ($p>0.05$) in the urban area. Individuals aged 65-74 years were largely nutritionally vulnerable in the rural areas unlike their counterparts in urban area. In the rural locality, vulnerability was highest among the young older persons (respondents aged 65-69 years) and least among the respondents above 80 years old. There was no significant relationship between sex, religion and number of children on one hand and nutritional vulnerable on the other in both areas. Marital status had no significant effect ($p>0.05$) on nutritional vulnerability in urban area but did have ($p<0.05$) in the rural locality, widows and widowers were particularly likely to be nutritional vulnerable in the rural areas.

Table 4.18 shows the rural-urban variation in the socio-economic factors that influence nutritional vulnerability. Level of education and income were common significant factors ($p<0.05$) influencing nutritional vulnerability in both localities. However, there is a reverse significance of the components; respondents without formal education were particularly vulnerable in the urban locality while respondents with at least secondary education constituted the likely nutritionally vulnerable group in the rural area. Among the moderately vulnerable respondents in the urban locality, 77.8% had no formal education. In both localities, retirees constituted the largest percentage of vulnerable respondents, the percentage was higher in urban than rural locality. Additionally, occupation was found to significantly influence ($p<0.05$) vulnerability in the rural locality only while sources of cooking fuel did not have significant influence ($p>0.05$) in both localities.

The association of selected lifestyle variables with nutritional vulnerability is as shown in Table 4.19. Nutritional vulnerability was significantly influenced ($p<0.05$) by percentage of income spent on alcohol in the urban locality and percentage of income spent on healthcare in the rural locality. Smoking status, alcohol intake and living alone had no significant relationship ($p>0.05$) with nutritional vulnerability in both localities.

**Table 4.17 Rural-Urban variation in association between socio-demographic characteristics and Nutritional vulnerability**

| | Nutritional Vulnerability | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| | Not Vulnerable | | Moderatey Vulnerable | | Highly Vulnerable | | | | | Not Vulnerable | | Moderatey Vulnerable | | Highly Vulnerable | | | | |
| **Age (in years)** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** |
| 65-69 | 109 | (68.6) | 5 | (55.6) | 0 | (0.0) | | | | 53 | (60.2) | 38 | (73.1) | 19 | (50.0) | 20.49 | 8 | 0.02 |
| 70-74 | 32 | (20.1) | 2 | (22.2) | 0 | (0.0) | | | | 31 | (35.2) | 10 | (19.2) | 9 | (23.7) | | | |
| 75-79 | 10 | (6.3) | 1 | (11.1) | 0 | (0.0) | 3.95 | 4 | 0.35 | 3 | (3.4) | 1 | (1.9) | 6 | (15.8) | | | |
| 80-84 | 4 | (2.5) | 0 | (0.0) | 0 | (0.0) | | | | 0 | (0.0) | 3 | (5.8) | 2 | (5.3) | | | |
| >84 | 4 | (2.5) | 1 | (11.1) | 0 | (0.0) | | | | 1 | (1.1) | 0 | (0.0) | 2 | (5.3) | | | |
| **Sex** | | | | | | | 0.24 | 1 | 0.74 | | | | | | | 2.60 | 2 | 0.27 |
| Male | 93 | (58.5) | 6 | (66.7) | 0 | (0.0) | | | | 49 | (55.7) | 36 | (69.2) | 22 | (57.9) | | | |
| Female | 66 | (41.5) | 3 | (33.3) | 0 | (0.0) | | | | 39 | (44.3) | 16 | (30.8) | 16 | (42.1) | | | |
| **Marital Status** | | | | | | | | | | | | | | | | | | |
| Single | 4 | (2.5) | 0 | (0.0) | 0 | (0.0) | 1.04 | 3 | 0.89 | 3 | (3.4) | 3 | (5.8) | 3 | (7.9) | 48.16 | 6 | 0.01 |
| Married | 126 | (79.2) | 8 | (88.9) | 0 | (0.0) | | | | 77 | (87.5) | 45 | (86.5) | 13 | (34.2) | | | |
| Widow | 27 | (17.0) | 1 | (11.1) | 0 | (0.0) | | | | 7 | (8.0) | 2 | (3.8) | 18 | (47.4) | | | |
| Separated/Divorce | 2 | (1.3) | 0 | (0.0) | 0 | (0.0) | | | | 1 | (1.1) | 2 | (3.8) | 4 | (10.5) | | | |
| **Religion** | | | | | | | | | | | | | | | | | | |
| Christianity | 71 | (44.7) | 4 | (44.4) | 0 | (0.0) | 0.18 | 2 | 0.92 | 52 | (59.1) | 31 | (59.6) | 21 | (55.3) | 9.41 | 4 | 0.11 |
| Islam | 85 | (53.5) | 5 | (55.6) | 0 | (0.0) | | | | 32 | (36.4) | 19 | (36.5) | 10 | (26.3) | | | |
| Traditional | 3 | (1.9) | 0 | (0.0) | 0 | (0.0) | | | | | | | | | | | | |
| **Number of Children** | | | | | | | | | | | | | | | | | | |
| 0 | | (0.0) | 0 | (0.0) | 0 | (0.0) | 6.93 | 6 | 0.32 | 4 | (2.4) | 0 | (0.0) | 0 | (0.0) | 5.25 | 4 | 0.20 |
| 1-3 | 21 | (25.9) | 1 | (26.5) | 13 | (34.2) | | | | 36 | (21.7) | 6 | (50.0) | 0 | (0.0) | | | |
| 4-6 | 32 | (39.5) | 2 | (44.9) | 15 | (39.5) | | | | 93 | (56.0) | 6 | (50.0) | 0 | (0.0) | | | |
| 7-9 | 20 | (24.7) | 1 | (28.6) | 9 | (23.7) | | | | 28 | (16.9) | 0 | (0.0) | 0 | (0.0) | | | |
| 10-20 | 8 | (9.9) | 0 | (0.0) | 1 | (2.6) | | | | 5 | (3.0) | 0 | (0.0) | 0 | (0.0) | | | |

**Table 4.18 Rural-Urban variation in association between socio-economic characteristics and Nutritional vulnerability**

| | Nutritional Vulnerability | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Urban** | | | | | | | | | **Rural** | | | | | | | | |
| | **Not Vulnerable** | | **Moderately Vulnerable** | | **Highly Vulnerable** | | | | | **Not Vulnerable** | | **Moderately Vulnerable** | | **Highly Vulnerable** | | | | |
| **Level of Education** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **%** | **N** | **%** | **N** | **%** | **$X^2$** | **df** | **P** |
| None | 31 | (19.5) | 7 | (77.8) | 0 | (0.0) | 11.4 | 3 | 0.03 | 25 | (28.4) | 9 | (17.3) | 10 | (26.3) | | | |
| Primary | 53 | (33.3) | 1 | (11.1) | 0 | (0.0) | | | | 22 | (25.0) | 6 | (11.5) | 5 | (13.2) | 20.3 | 6 | 0.02 |
| Secondary | 53 | (33.3) | 1 | (11.1) | 0 | (0.0) | | | | 16 | (18.2) | 5 | (9.6) | 12 | (31.6) | | | |
| Tertiary | 22 | (13.8) | 0 | (0.0) | 0 | (0.0) | | | | 25 | (28.4) | 32 | (61.5) | 11 | (28.9) | | | |
| **Occupation** | | | | | | | | | | | | | | | | | | |
| Retiree | 42 | (26.4) | 4 | (44.4) | 0 | (0.0) | | | | 42 | (47.7) | 28 | (53.8) | 12 | (31.6) | | | |
| Artisan | 86 | (54.1) | 3 | (33.3) | 0 | (0.0) | | | | 19 | (21.6) | 2 | (3.8) | 6 | (15.8) | 33.4 | 8 | 0.01 |
| Farmer | 13 | (8.2) | 0 | (0.0) | 0 | (0.0) | 4.1 | 4 | 0.27 | 8 | (9.1) | 6 | (11.5) | 15 | (39.5) | | | |
| Trader | 13 | (8.2) | 2 | (22.2) | 0 | (0.0) | | | | 17 | (19.3) | 10 | (19.2) | 5 | (13.2) | | | |
| Others | 5 | (3.1) | 0 | (0.0) | 0 | (0.0) | | | | 2 | (2.3) | 6 | (11.5) | 0 | (0.0) | | | |
| **Income** | | | | | | | | | | | | | | | | | | |
| <N5000 | 5 | (6.2) | 0 | (0.0) | 0 | (0.0) | | | | 28 | (16.9) | 2 | (16.7) | 0 | (0.0) | | | |
| N5000-N10000 | 10 | (12.3) | 2 | (4.1) | 3 | (7.9) | 13.7 | 5 | 0.01 | 32 | (19.3) | 1 | (8.3) | 0 | (0.0) | 69.4 | 10 | 0.01 |
| N10001-15000 | 12 | (14.8) | 15 | (30.6) | 9 | (23.7) | | | | 33 | (19.9) | 1 | (8.3) | 0 | (0.0) | | | |
| N15001-N20000 | 29 | (35.8) | 21 | (42.9) | 20 | (52.6) | | | | 29 | (17.5) | 6 | (50.0) | 0 | (0.0) | | | |
| N20001-N25000 | 21 | (25.9) | 9 | (18.4) | 4 | (10.5) | | | | 18 | (10.8) | 1 | (8.3) | 0 | (0.0) | | | |
| >N25000 | 4 | (4.9) | 2 | (4.1) | 2 | (5.3) | | | | 26 | (15.7) | 1 | (8.3) | 0 | (0.0) | | | |
| **Sources of Cooking Fuel** | | | | | | | | | | | | | | | | | | |
| Firewood | 7 | (8.6) | 3 | (6.1) | 3 | (7.9) | 2.5 | 4 | 0.77 | 46 | (27.7) | 3 | (25.0) | 0 | (0.0) | 1.6 | 2 | 0.47 |
| Kerosene | 74 | (91.4) | 45 | (91.8) | 35 | (92.1) | | | | 115 | (69.3) | 8 | (66.7) | 0 | (0.0) | | | |
| Electricity | 0 | (0.0) | 1 | (2.0) | 0 | (0.0) | | | | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | |
| Gas | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | | | | 5 | (3.0) | 1 | (8.3) | 0 | (0.0) | | | |

**Table 4.19 Rural-Urban variation in association selected lifestyle factors and Nutritional vulnerability**

| | Nutritional Vulnerability | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| | Not Vulnerable | | Moderately Vulnerable | | Highly Vulnerable | | | | | Not Vulnerable | | Moderately Vulnerable | | Highly Vulnerable | | | | |
| | N | (%) | N | (%) | N | % | $X^2$ | df | P | N | % | N | % | N | % | $X^2$ | df | P |
| **Percentage of Income spent on alcohol** | | | | | | | 17.7 | 6 | 0.002 | | | | | | | 1.71 | 3 | 0.56 |
| <10% | 18 | (22.2) | 3 | (6.1) | 4 | (10.5) | | | | 16 | (9.6) | 2 | (16.7) | 0 | (0.0) | | | |
| 10-20% | 0 | (0.0) | 2 | (4.1) | 1 | (2.6) | | | | 16 | (9.6) | 0 | (0.0) | 0 | (0.0) | | | |
| >20% | 1 | (1.2) | 3 | (6.1) | 6 | (15.8) | | | | 3 | (1.8) | 0 | (0.0) | 0 | (0.0) | | | |
| None | 62 | (76.5) | 41 | (83.7) | 27 | (71.1) | | | | 131 | (78.9) | 10 | (83.3) | 0 | (0.0) | | | |
| **Socio-Economic Level** | | | | | | | | | | | | | | | | | | |
| Low | 2 | (2.5) | 1 | (2.0) | 1 | (2.6) | 3.2 | 4 | 0.51 | 11 | (6.6) | 1 | (8.3) | 0 | (0.0) | 0.12 | 2 | 0.94 |
| Average | 66 | (81.5) | 43 | (87.8) | 35 | (92.1) | | | | 107 | (64.5) | 8 | (66.7) | 0 | (0.0) | | | |
| High | 13 | (16.0) | 5 | (10.2) | 2 | (5.3) | | | | 48 | (28.9) | 3 | (25.0) | 0 | (0.0) | | | |
| **How much household income is spent on health care** | | | | | | | 3.1 | 2 | 0.21 | | | | | | | 5.88 | 2 | 0.04 |
| <10% | 48 | (59.3) | 25 | (51.0) | 16 | (42.1) | | | | 96 | (57.8) | 10 | (83.3) | 0 | (0.0) | | | |
| 10-30% | 33 | (40.7) | 24 | (49.0) | 22 | (57.9) | | | | 65 | (39.2) | 1 | (8.3) | 0 | (0.0) | | | |
| | | | | | | | | | | 5 | (3.0) | 1 | (8.3) | 0 | (0.0) | | | |
| **Respondent smokes** | | | | | | | 2.8 | 2 | 0.25 | | | | | | | 0.33 | 1 | 0.57 |
| Yes | 6 | (7.4) | 2 | (4.1) | 0 | (0.0) | | | | 23 | (13.9) | 1 | (8.3) | 0 | (0.0) | | | |
| No | 75 | (92.6) | 47 | (95.9) | 38 | (100.0) | | | | 143 | (86.1) | 11 | (91.7) | 0 | (0.0) | | | |
| **Alcohol Intake** | | | | | | | 2.5 | 2 | 0.31 | | | | | | | 0.07 | 1 | 0.79 |
| Yes | 70 | (86.4) | 38 | (77.6) | 33 | (86.8) | | | | 138 | (83.1) | 10 | (83.3) | 0 | (0.0) | | | |
| No | 11 | (13.6) | 11 | (22.4) | 5 | (13.2) | | | | 28 | (16.9) | 2 | (16.7) | 0 | (0.0) | | | |
| **Living alone** | | | | | | | 1.2 | 2 | 0.48 | | | | | | | 0.42 | 1 | 0.52 |
| Yes | 1 | (1.2) | 0 | (0.0) | 0 | (0.0) | | | | 3 | (1.8) | 0 | (0.0) | 0 | (0.0) | | | |
| No | 80 | (98.8) | 49 | (100.0) | 38 | (100.0) | | | | 163 | (98.2) | 12 | (100.0) | 0 | (0.0) | | | |

**Hypothesis 4**: **There is no significant relationship in the predictors of nutritional status of the elderly and their locations**

This section explores the observed association between nutritional status and selected baseline characteristics of the respondents by sector. These are demographic, socio-economic, environmental characteristics, selected wealth index variables, lifestyle and social support variables (Tables 4.20-4.22).

MUAC is significantly influenced ($p<0.05$) by occupation, income and food habit in the rural areas while all the selected variables are not significant ($p>0.05$) in the urban area. Respondents without formal education had the highest burden of malnutrition in both localities as defined by MUAC. Using MUAC, respondents who are farmers had the highest burden of malnutrition in rural areas whereas being a farmer and living in urban areas assure good nutritional satus as meausred by MUAC while artisans had the highest burden in urban areas. The category of elderly earning income below N5000 has the highest burden of low MUAC in the rural areas whereas low MUAC was highets among the elderly earning N15001-N20000 in urban areas. Also, inadequate social support contrbutes to low MUAC in rural areas.

Level of education was a significant determinant of BMI (armspan) in both urban and rural areas. However occupation, income, socioeconomic class, food habit, lifestyle and social support were significant in rural areas while they were insignificant in urban areas. The elderly without formal education in rural areas and the elderly with no more than secondary education in urban areas have the highest burden of undernutrition as defined by body mass index using armspan. In rural areas, double burden of malnutrition was highest among the respondents with tertiary education whereas such high double burden of malnutrition occurs among the respondents with secondary education in urban areas. Among the undernourished in urban areas, artisans followed by retirees constitute the majority unlike in the rural areas where retirees and farmers have the highest burden of undernutrition. Like the MUAC, the group of elderly earning less than N5000 monthly had the highest burden of undernutrition in rural areas while the elderly in N15001-N20000 and N20001-N25000 income group have the higesht burden of underweight in urban areas. Overweight was high among the elderly in high socio-economic class in rural areas and the elderly in average soci-economic class in urban areas. Even when food habit was good, double burden of malnutrition was high among respondents in rural areas.

Like the BMI based on armspan, Level of education, occupation, income, socioeconomic class, food habit, lifestyle and social support were significant predictors of nutritional statsus based on BMI-height in rural areas wheras they were insignificant in urban areas.The elderly without formal education in rural areas and the elderly with no more than secondary education in urban areas have the highest burden of undernutrition as defined by body mass index using height. In rural areas, double burden of malnutrition was highest among the respondents with tertiary education whereas such high double burden of malnutrition occurs among the respondents with secondary education in urban areas. Among the undernourished in urban areas, artisans followed by retirees constitute the majority unlike in the rural areas where retirees and farmers have the highest burden of undernutrition. Like the MUAC, the group of elderly earning less than N5000 monthly had the highest burden of undernutrition in rural areas while the elderly in N15001-N20000 and N20001-N25000 income group have the highest burden of underweight in urban areas. Overweight was high among the elderly in high socio-economic class in rural areas and the elderly in average socio-economic class in urban areas. Even when food habit was good, double burden of malnutrition was high among respondents in rural areas.

**Table 4.20a: Rural-Urban variation in association selected variables and Nutritional status (MUAC)**

| | Urban | | | | | | | Rural | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Predicting Factors** | **Inadequate** | | **Adequate** | | | | | **Inadequate** | | **Adequate** | | | | |
| **Level of Education** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **D** | **P** |
| None | 9 | (34.6) | 29 | (20.4) | | | | 13 | (39.4) | 31 | (21.4) | | | |
| Primary | 5 | (19.2) | 49 | (34.5) | | | | 3 | (9.1) | 30 | (20.7) | | | |
| Secondary | 8 | (30.8) | 46 | (32.4) | 3.774 | 3 | 0.281 | 4 | (12.1) | 29 | (20.0) | 5.953 | 3 | 0.107 |
| Tertiary | 4 | (15.4) | 18 | (12.7) | | | | 13 | (39.4) | 55 | (37.9) | | | |
| **Occupation** | | | | | | | | | | | | | | |
| Retiree | 5 | (19.2) | 41 | (28.9) | | | | 11 | (33.3) | 71 | (49.0) | | | |
| Artisan | 16 | (61.5) | 73 | (51.4) | | | | 2 | (6.1) | 25 | (17.2) | | | |
| Farmer | 0 | (0.0) | 13 | (9.2) | 6.019 | 4 | 0.157 | 12 | (36.4) | 17 | (11.7) | 14.066 | 4 | 0.005 |
| Trader | 3 | (11.5) | 12 | (8.5) | | | | 5 | (15.2) | 27 | (18.6) | | | |
| Others | 2 | (7.7) | 3 | (2.1) | | | | 3 | (9.1) | 5 | (3.4) | | | |
| **Income** | | | | | | | | | | | | | | |
| <N5000 | 1 | (3.8) | 4 | (2.8) | | | | 12 | (36.4) | 18 | (12.4) | | | |
| N5000-N10000 | 3 | (11.5) | 12 | (8.5) | | | | 6 | (18.2) | 27 | (18.6) | | | |
| N10001-15000 | 5 | (19.2) | 31 | (21.8) | | | | 5 | (15.2) | 29 | (20.0) | | | |
| N15001-N20000 | 8 | (30.8) | 62 | (43.7) | 3.454 | 5 | 0.609 | 2 | (6.1) | 33 | (22.8) | 15.264 | 5 | 0.007 |
| N20001-N25000 | 7 | (26.9) | 27 | (19.0) | | | | 1 | (3.0) | 18 | (12.4) | | | |
| >N25000 | 2 | (7.7) | 6 | (4.2) | | | | 7 | (21.2) | 20 | (13.8) | | | |
| **Total** | **26** | | **142** | | | | | **33** | | **145** | | | | |

**Table 4.20b: Rural-Urban variation in association selected variables and Nutritional status (MUAC) contd**

| Predicting Factors | Urban Inadequate | | Urban Adequate | | | | | Rural Inadequate | | Rural Adequate | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Socio-economic Status** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **d** | **P** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** |
| Low | 0 | (0.0) | 4 | (2.8) | | | | 4 | (12.1) | 8 | (5.5) | | | |
| Average | 23 | (88.5) | 121 | (85.2) | | | | 22 | (66.7) | 93 | (64.1) | | | |
| High | 3 | (11.5) | 17 | (12.0) | 1.38 | 2 | 0.50 | 7 | (21.2) | 44 | (30.3) | 2.60 | 2 | 0.27 |
| **Food Habit** | | | | | | | | | | | | | | |
| Poor Habit | 0 | (0.0) | 0 | (0.0) | | | | 8 | (24.2) | 14 | (9.7) | | | |
| Good Food Habit | 26 | (100.0) | 142 | (100.0) | | - | - | 25 | (75.8) | 131 | (90.3) | 5.28 | 1 | 0.02 |
| **Lifestyles** | | | | | | | | | | | | | | |
| Poor Lifestyle | 2 | (7.7) | 18 | (12.7) | | | | 8 | (24.2) | 19 | (13.1) | | | |
| Good Lifestyle | 24 | (92.3) | 124 | (87.3) | 0.57 | 1 | 0.54 | 25 | (75.8) | 126 | (86.9) | 2.35 | 1 | 0.18 |
| **Social Support** | | | | | | | | | | | | | | |
| Inadequate Social | 6 | (23.1) | 22 | (15.5) | | | | 17 | (51.5) | 63 | (43.4) | | | |
| Adequate Social Support | 20 | (76.9) | 120 | (84.5) | 0.85 | 1 | 0.39 | 16 | (48.5) | 82 | (56.6) | 0.70 | 1 | 0.44 |
| **Total** | **26** | | **142** | | | | | **33** | | **145** | | | | |

**Table 4.21a: Rural-Urban variation in association selected variables and Body Mass Index (Armspan)**

| | Nutritional Status by BMI (arm span) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| **Predicting Factors** | **Inadequate** | | **Adequate** | | **Excess** | | | | | **Inadequate** | | **Adequate** | | **Excess** | | | | |
| **Level of Education** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **Df** | **P** |
| None | 9 | (32.1) | 25 | (19.8) | 4 | (28.6) | | | | 17 | (39.5) | 27 | (22.1) | 0 | (0.0) | | | |
| Primary | 3 | (10.7) | 46 | (36.5) | 0 | (0.0) | | | | 5 | (11.6) | 25 | (20.5) | 3 | (23.1) | | | |
| Secondary | 13 | (46.4) | 36 | (28.6) | 5 | (35.7) | 11.78 | 6 | 0.05 | 6 | (14.0) | 22 | (18.0) | 5 | (38.5) | 12.25 | 6 | 0.04 |
| Tertiary | 3 | (10.7) | 19 | (15.1) | 5 | (35.7) | | | | 15 | (34.9) | 48 | (39.3) | 5 | (38.5) | | | |
| **Occupation** | | | | | | | | | | | | | | | | | | |
| Retiree | 9 | (32.1) | 33 | (26.2) | 4 | (28.6) | | | | 16 | (37.2) | 60 | (49.2) | 6 | (46.2) | | | |
| Artisan | 15 | (53.6) | 65 | (51.6) | 9 | (64.3) | | | | 3 | (7.0) | 22 | (18.0) | 2 | (15.4) | | | |
| Farmer | 1 | (3.6) | 11 | (8.7) | 1 | (7.1) | | | | 15 | (34.9) | 14 | (11.5) | 0 | (0.0) | | | |
| Trader | 2 | (7.1) | 13 | (10.3) | 0 | (0.0) | 2.76 | 8 | 0.96 | 6 | (14.0) | 22 | (18.0) | 4 | (30.8) | 18.18 | 8 | |
| Others | 1 | (3.6) | 4 | (3.2) | 0 | (0.0) | | | | 3 | (7.0) | 4 | (3.3) | 1 | (7.7) | | | |
| **Income** | | | | | | | | | | | | | | | | | | |
| <N5000 | 0 | (0.0) | 5 | (4.0) | 0 | (0.0) | | | | 18 | (41.9) | 12 | (9.8) | 0 | (0.0) | | | |
| N5000-N10000 | 1 | (3.6) | 13 | (10.3) | 1 | (7.1) | | | | 7 | (16.3) | 23 | (18.9) | 3 | (23.1) | | | |
| N10001-15000 | 6 | (21.4) | 26 | (20.6) | 4 | (28.6) | | | | 6 | (14.0) | 25 | (20.5) | 3 | (23.1) | | | |
| N15001-N20000 | 10 | (35.7) | 52 | (41.3) | 8 | (57.1) | | | | 3 | (7.0) | 29 | (23.8) | 3 | (23.1) | | | |
| N20001-N25000 | 8 | (28.6) | 25 | (19.8) | 1 | (7.1) | 7.39 | 10 | 0.63 | 2 | (4.7) | 16 | (13.1) | 1 | (7.7) | 29.95 | 10 | 0.00 |
| >N25000 | 3 | (10.7) | 5 | (4.0) | 0 | (0.0) | | | | 7 | (16.3) | 17 | (13.9) | 3 | (23.1) | | | |
| **Total** | **28** | | **126** | | **14** | | | | | **43** | | **112** | | **13** | | | | |

**Table 4.21b: Rural-Urban variation in association selected variables and Body Mass Index (Armspan) contd**

| | Nutritional Status by BMI (arm span) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| **Predicting Factors** | **Inadequate** | | **Adequate** | | **Excess** | | | | | **Inadequate** | | **Adequate** | | **Excess** | | | | |
| **Socio-economic class** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** |
| Low | 0 | (0.0) | 3 | (2.4) | 1 | (7.1) | 4.62 | 4 | 0.25 | 4 | (9.3) | 7 | (5.7) | 1 | (7.7) | 9.91 | 4 | 0.03 |
| Average | 22 | (78.6) | 110 | (87.3) | 12 | (85.7) | | | | 33 | (76.7) | 77 | (63.1) | 5 | (38.5) | | | |
| High | 6 | (21.4) | 13 | (10.3) | 1 | (7.1) | | | | 6 | (14.0) | 38 | (31.1) | 7 | (53.8) | | | |
| **Food Habit** | | | | | | | | | | | | | | | | | | |
| Poor Habit | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | - | - | - | 10 | (23.3) | 10 | (8.2) | 2 | (15.4) | 6.60 | 2 | 0.03 |
| Good Food Habit | 28 | (100.0) | 126 | (100.0) | 14 | (100.0) | | | | 33 | (76.7) | 112 | (91.8) | 11 | (84.6) | | | |
| **Lifestyles** | | | | | | | | | | | | | | | | | | |
| Bad Lifestyle | 3 | (10.7) | 15 | (11.9) | 2 | (14.3) | 0.32 | 2 | 0.92 | 7 | (16.3) | 20 | (16.4) | 0 | (0.0) | 2.25 | 2 | 0.34 |
| Good Lifestyle | 25 | (89.3) | 111 | (88.1) | 12 | (85.7) | | | | 36 | (83.7) | 102 | (83.6) | 13 | (100.0) | | | |
| **Social Support** | | | | | | | | | | | | | | | | | | |
| Inadequate Social Support | 7 | (25.0) | 20 | (15.9) | 1 | (7.1) | 2.14 | 2 | 0.37 | 22 | (51.2) | 48 | (39.3) | 10 | (76.9) | 7.47 | 2 | 0.02 |
| Adequate Social Support | 21 | (75.0) | 106 | (84.1) | 13 | (92.9) | | | | 21 | (48.8) | 74 | (60.7) | 3 | (23.1) | | | |
| **Total** | **28** | | **126** | | **14** | | | | | **43** | | **112** | | **13** | | | | |

**Table 4.22a: Rural-Urban variation in association selected variables and Body Mass Index (height)**

| | Nutritional Status by BMI (height) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| **Predicting Factors** | **Inadequate** | | **Adequate** | | **Excess** | | | | | **Inadequate** | | **Adequate** | | **Excess** | | | | |
| **Level of Education** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **Df** | **P** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** |
| None | 8 | (30.8) | 26 | (20.6) | 4 | (25.0) | | | | 13 | (40.6) | 31 | (24.2) | 0 | (0.0) | | | |
| Primary | 3 | (11.5) | 45 | (35.7) | 6 | (37.5) | 8.16 | 6 | 0.21 | 5 | (15.6) | 21 | (16.4) | 7 | (38.9) | 14.12 | 6 | 0.02 |
| Secondary | 12 | (46.2) | 37 | (29.4) | 5 | (31.3) | | | | 4 | (12.5) | 26 | (20.3) | 3 | (16.7) | | | |
| Tertiary | 3 | (11.5) | 18 | (14.3) | 1 | (6.3) | | | | 10 | (31.3) | 50 | (39.1) | 8 | (44.4) | | | |
| **Occupation** | | | | | | | | | | | | | | | | | | |
| Retiree | 9 | (34.6) | 32 | (25.4) | 5 | (31.3) | | | | 13 | (40.6) | 58 | (45.3) | 11 | (61.1) | | | |
| Artisan | 13 | (50.0) | 66 | (52.4) | 1 | (62.5) | | | | 2 | (6.3) | 23 | (18.0) | 2 | (11.1) | | | |
| Farmer | 1 | (3.8) | 11 | (8.7) | 1 | (6.3) | 3.32 | 8 | 0.92 | 12 | (37.5) | 17 | (13.3) | 0 | (0.0) | | | |
| Trader | 2 | (7.7) | 13 | (10.3) | 0 | (0.0) | | | | 4 | (12.5) | 24 | (18.8) | 4 | (22.2 | 15.33 | 8 | 0.03 |
| Others | 1 | (3.8) | 4 | (3.2) | 0 | (0.0) | | | | 1 | (3.1) | 6 | (4.7) | 1 | (5.6) | | | |
| **Income** | | | | | | | | | | | | | | | | | | |
| <N5000 | 0 | (0.0) | 5 | (4.0) | 0 | (0.0) | | | | 15 | (46.9) | 15 | (11.7) | 0 | (0.0) | | | |
| N5000-N10000 | 1 | (3.8) | 13 | (10.3) | 1 | (6.3) | | | | 6 | (18.8) | 21 | (16.4) | 6 | (33.3) | | | |
| N10001-15000 | 5 | (19.2) | 26 | (20.6) | 5 | (31.3) | | | | 2 | (6.3) | 28 | (21.9) | 4 | (22.2) | | | |
| N15001-N20000 | 10 | (38.5) | 51 | (40.5) | 9 | (56.3) | 7.87 | 10 | 0.58 | 3 | (9.4) | 30 | (23.4) | 2 | (11.1) | 38.64 | 10 | 0.00 |
| N20001-N25000 | 7 | (26.9) | 26 | (20.6) | 1 | (6.3) | | | | 0 | (0.0) | 17 | (13.3) | 2 | (11.1) | | | |
| >N25000 | 3 | (11.5) | 5 | (4.0) | 0 | (0.0) | | | | 6 | (18.8) | 17 | (13.3) | 4 | (22.2) | | | |
| **Total** | **26** | | **126** | | **16** | | | | | **32** | | **128** | | **18** | | | | |

**Table 4.22b: Rural-Urban variation in association selected variables and Body Mass Index (height) contd**

| | Nutritional Status by BMI (height) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | | | | | | | Rural | | | | | | | | |
| **Predicting Factors** | **Inadequate** | | **Adequate** | | **Excess** | | | | | **Inadequate** | | **Adequate** | | **Excess** | | | | |
| **Socio-economic class** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **df** | **P** | **N** | **(%)** | **N** | **(%)** | **N** | **(%)** | **$X^2$** | **D** | **P** |
| Low | 0 | (0.0) | 3 | (2.4) | 1 | (6.3) | | | | 4 | (12.5) | 7 | (5.5) | 1 | (5.6) | | | |
| Average | 20 | (76.9) | 110 | (87.3) | 14 | (87.5) | 4.94 | 4 | 0.23 | 24 | (75.0) | 83 | (64.8) | 8 | (44.4) | 9.54 | 4 | 0.04 |
| High | 6 | (23.1) | 13 | (10.3) | 1 | (6.3) | | | | 4 | (12.5) | 38 | (29.7) | 9 | (50.0) | | | |
| **Food Habit** | | | | | | | | | | | | | | | | | | |
| Poor Habit | 0 | (0.0) | 0 | (0.0) | 0 | (0.0) | - | - | - | 9 | (28.1) | 10 | (7.8) | 3 | (16.7) | 9.27 | 2 | 0.01 |
| Good Food Habit | 26 | (100.0) | 126 | (100.0) | 16 | (100.0) | | | | 23 | (71.9) | 118 | (92.2) | 15 | (83.3) | | | |
| **Lifestyles** | | | | | | | | | | | | | | | | | | |
| Poor Lifestyle | 3 | (11.5) | 14 | (11.1) | 3 | (18.8) | 1.11 | 2 | 0.60 | 4 | (12.5) | 21 | (16.4) | 2 | (11.1) | 0.35 | 2 | 0.75 |
| Good Lifestyle | 23 | (88.5) | 112 | (88.9) | 13 | (81.3) | | | | 28 | (87.5) | 107 | (83.6) | 16 | (88.9) | | | |
| **Social Support** | | | | | | | | | | | | | | | | | | |
| Inadequate Social Support | 6 | (23.1) | 21 | (16.7) | 1 | (6.3) | 1.85 | 2 | 0.38 | 18 | (56.3) | 49 | (38.3) | 13 | (72.2) | 9.25 | 2 | 0.01 |
| Adequate Social Support | 20 | (76.9) | 105 | (83.3) | 15 | (93.8) | | | | 14 | (43.8) | 79 | (61.7) | 5 | (27.8) | | | |
| **Total** | **26** | | **126** | | **16** | | | | | **32** | | **128** | | **18** | | | | |

## 4.10. Multiple regression analysis of key study dependent variables

The logistic regression analyses for the study are presented in Tables 4.23 to Table 4.26. The variables were subjected to binary logistic regression using the locality as independent variables and various parameters assessed were used as dependent variables. The result shows a wide difference in the characteristics of the respondents based on the area of locality.

As indicated in Table 4.23, the likelihood of being underweight was about twice higher among elderly in rural than urban areas (OR: 1.58; CI: 0.66-3.79). The elderly in rural areas are twice much likely to be food insecured that their counterparts in urban areas (OR: 0.60, CI: 0.27-0.96) while the odds of being nutritionally vulnerable was almost equal in both areas (OR: 1.04; CI: 0.50-2.16).

Results of the logistic regression in Table 4.24 suggest that food insecure elderly in rural areas were four times more likely to be malnourished (OR: 1.46; CI: 1.15-1.82) than food insecure elderly in urban areas (OR: 0.38; CI: 0.02-0.74). Likewise, nutritionally vulnerable elderly in rural areas (OR: 1.78; CI: 0.69-2.63) had higher likelihood of being malnourished than their counterparts in urban areas (OR: 1.00; CI: 0.33-1.65). Additionally, rural elderly having poor lifestyle (OR: 2.21; CI: 1.49-3.87) were twice likely to be malnourished than urban elderly (OR: 1.33; CI: 1.12-3.01) with poor lifestyle.

As indicated in Table 4.25, respondents with at least primary education in urban area (OR: 0.25; CI: 0.13-0.58) were less likely to be underweight than their counterparts in rural areas (OR: 0.62, CI: 0.27-1.30). Having at least moderate SES reduced the odds of being underweight four times in urban (OR: 4.22; CI: 1.41-7.76) and two times in rural areas (OR: 1.8; CI: 1.21-5.58). Male respondents in urban area (OR: 2.68, CI: 1.4-5.36) were more likely to be underweight than those in rural areas (OR: 2.2, CI: 1.08-4.11). In rural areas, married respondents had a higher likelihood (OR: 0.73, CI: 0.31-1.62) of being underweight that the counterparts in urban areas (OR: 0.54, CI: 0.26-0.94) wheras elderly with steady income in rural areas (OR: 0.5, CI: 0.40-0.96) were twice less likely to be underweight than elderly with steady income in urban areas (OR: 1.21, CI: 0.85-1.83). Surprisingly, elderly in urban areas having household member involved in agriculture (OR: 4.48, CI: 1.34-7.46) are less likely to be malnourished than their counterparts in rural areas (OR: 5.6, CI: 1.72-9.4). Having significant debt makes elderly in urban areas (OR: 3.27, CI: 1.44-5.10) nine times more susceptible to malnutrition than their counterparts in rural areas (OR: 0.34, CI: 0.19-0.53).

As indicated in Table 4.26, elderly with at least primary education in urban areas (OR: 1.5, CI: 1.13-1.87) had higher odds of being nutritional vulnerable than their counterparts in rural areas (OR: 0.92, CI: 0.40-1.24). Also, nutritional vulnerability was four times higher in male than female elderly in rural areas (OR: 4.1, CI: 2.23-5.60) whereas odds was almost equal among the elderly in urban areas (OR: 1.1, CI: 0.71-1.37). The likelihood of being nutritionally vulnerable was four times higher among elderly with steady income in urban areas (OR: 1.21; CI: 0.85-1.45) than their counterparts in rural areas (OR: 0.50, CI: 0.30-0.70). Likewise, elderly who were current smokers were twice likely to be nutritional vulnerable in rural (OR: 5.34, CI: 2.36-8.32) than urban areas (OR: 2.76, CI: 1.76-3.14) while the odds of being nutritionally vulnerable was three times among elderly who consumed alcohol in rural (OR: 3.42; CI: 1.76-5.08) than urban areas (OR: 1.08; CI: 0.89-1.24).

**Table 4.23: Logistic regression analysis of factors associated with BMI (armspan) among respondents in rural and urban areas**

| Variables | OR | 95% C.I | | P-value |
|---|---|---|---|---|
| Being underweight | 1.58 | 0.66 | 3.79 | 0.04 |
| Being food insecure | 0.60 | 0.27 | 0.96 | 0.195 |
| High nutritional vulnerability | 1.04 | 0.50 | 2.16 | 0.925 |

**Table 4.24: Logistic regression analysis of factors associated with BMI (armspan) among respondents in rural and urban areas**

| Variables | Rural | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | OR | 95% C.I | | P-value | OR | 95% C.I | | P-value |
| Food insecure | 1.46 | 1.15 | 1.82 | 0.06 | 0.38 | 0.02 | 0.74 | 0.04 |
| Nutritionally vulnerable | 1.78 | 0.69 | 2.63 | 0.03 | 1.00 | 0.33 | 1.65 | 0.35 |
| Poor lifestyle | 2.21 | 1.49 | 3.87 | 0.03 | 1.33 | 1.12 | 3.01 | 0.48 |

**Table 4.25: Logistic regression analysis of factors associated with Body Mass Index (armspan) among respondents in rural and urban areas**

| Variables | Rural | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | OR | 95% C.I | | P-value | OR | 95% C.I | | |
| Level of Education<br>*At least primary/no education* | 0.62 | 0.27 | 1.2 | 0.06 | 0.25 | 0.13 | 0.58 | 0.13 |
| Socio-Economic status (SES)<br>*At least moderate/Low SES* | 1.8 | 1.21 | 5.58 | 0.04 | 4.22 | 1.41 | 7.76 | 0.03 |
| Sex<br>Male/female | 2.2 | 1.08 | 4.11 | 0.03 | 2.68 | 1.4 | 5.36 | 0.04 |
| Age<br>*≤ 74 years/ ≥ 75 years* | 1.67 | 0.51 | 2.69 | 0.09 | 1.83 | 1.2 | 2.43 | 0.01 |
| Marital Status<br>*Currently Married/Non-Married* | 0.73 | 0.31 | 1.62 | 0.47 | 0.54 | 0.26 | 0.94 | 0.25 |
| Income Level per month<br>*≤N15,000/≥N15,0001* | 1.23 | 0.21 | 2.54 | 0.22 | 1.11 | 0.33 | 1.74 | 0.07 |
| Percentage income spent on food | 1.60 | 0.47 | 2.08 | 0.002 | 2.19 | 1.45 | 3.55 | 0.06 |
| Type of house | 1.93 | 1.14 | 2.21 | 0.03 | 6.70 | 2.91 | 9.34 | 0.06 |
| Number of people sharing house<br>*1-3/ ≥4* | 0.30 | 0.10 | 0.85 | 0.023 | 0.8 | 0.63 | 1.42 | 0.32 |
| Steady income<br>*Yes/ No* | 0.50 | 0.40 | 0.96 | 0.00 | 1.21 | 0.85 | 1.83 | 0.01 |
| Had access to home garden<br>*Yes/No* | 0.96 | 0.47 | 1.96 | 0.91 | 1.41 | 1.03 | 1.81 | 0.37 |
| Family owns house/land<br>*Yes/No* | 1.11 | 1.03 | 1.29 | 0.88 | 3.11 | 1.74 | 4.50 | 0.11 |
| Extended Family within <5km<br>*Yes/No* | 0.51 | 0.37 | 0.71 | 0.212 | 1.18 | 0.83 | 1.35 | 0.92 |
| Respondent smoke<br>*Yes/No* | 5.3 | 1.18 | 8.42 | 0.22 | 4.15 | 1.42 | 0.54 | 2.36 |
| HH member work in agriculture | 5.60 | 1.72 | 9.40 | 0.01 | 4.48 | 1.34 | 7.46 | 0.04 |
| Respondent take alcohol<br>*Yes/No* | 1.98 | 0.42 | 3.42 | 0.62 | 3.48 | 1.54 | 5.20 | 0.47 |
| Had significant debt | 0.34 | 0.19 | 0.53 | 0.29 | 3.27 | 1.44 | 5.10 | 0.04 |
| Looking after small children | 8.77 | 1.94 | 13.7 | 0.01 | 0.65 | 0.34 | 0.93 | 0.98 |

**Table 4.26: Logistic regression analysis of factors associated with nutritional vulnerability among respondents in rural and urban areas**

| Variables | Rural | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | OR | 95% C.I | | P | OR | 95% C.I | | P |
| Level of Education<br>*At least primary/no education* | 0.92 | 0.40 | 1.24 | 0.04 | 1.5 | 1.13 | 1.87 | 0.54 |
| Socio-Economic status (SES)<br>*At least moderate/Low SES* | 1.67 | 1.22 | 2.10 | 0.05 | 1.6 | 1.10 | 2.05 | 0.28 |
| Sex<br>Male/female | 4.1 | 2.23 | 5.60 | 0.95 | 1.1 | 0.71 | 1.37 | 0.02 |
| Age<br>*≤ 74 years/ ≥ 75 years* | 1.7 | 0.52 | 2.80 | 0.49 | 1.2 | 0.82 | 1.53 | 0.28 |
| Marital Status<br>*Currently Married/NonMarried* | 0.9 | 0.71 | 0.98 | 0.16 | 1.3 | 0.71 | 1.69 | 0.14 |
| Income Level per month<br>*≤N15,000/≥N15,0001* | 1.4 | 1.23 | 1.60 | 0.30 | 1.11 | 0.33 | 1.78 | 0.07 |
| % income spent on food | 2.8 | 0.79 | 4.68 | 0.08 | 1.1 | 0.63 | 1.50 | 0.06 |
| Type of house | 1.1 | 0.72 | 1.48 | 0.08 | 2.27 | 1.38 | 3.10 | 0.66 |
| No people sharing house<br>*1-3/ ≥4* | 0.29 | 0.10 | 0.85 | 0.02 | 0.11 | 0.06 | 0.18 | 0.14 |
| Steady income<br>*Yes/ No* | 0.50 | 0.30 | 0.70 | 0.00 | 1.21 | 0.85 | 1.45 | 0.01 |
| Had access to home garden<br>*Yes/No* | 0.96 | 0.47 | 1.96 | 0.91 | 1.51 | 1.07 | 1.57 | 0.24 |
| Family owns house/land<br>*Yes/No* | 1.34 | 0.91 | 1.77 | 0.12 | 2.32 | 1.74 | 2.92 | 0.29 |
| Extended Family within <5km<br>*Yes/No* | 3.09 | 1.67 | 4.43 | 0.34 | 1.53 | 0.77 | 2.12 | 0.31 |
| Respondent smoke<br>*Yes/No* | 5.34 | 2.36 | 8.32 | 0.00 | 2.76 | 1.76 | 3.14 | 0.83 |
| HH member work in agriculture | 3.59 | 1.03 | 6.12 | 0.12 | 0.71 | 0.48 | 0.93 | 0.40 |
| Respondent take alcohol<br>*Yes/No* | 3.42 | 1.76 | 5.08 | 0.00 | 1.08 | 0.89 | 1.24 | 0.15 |
| Had significant debt | 1.64 | 0.63 | 2.46 | 0.43 | 3.05 | 1.26 | 4.83 | 0.06 |
| Looking after small children | 1.29 | 0.94 | 1.46 | 0.41 | 3.92 | 1.98 | 4.67 | 0.05 |

### 4.11. Multiple regression model of key outcomes

#### 4.11.1 Nutritional Vulnerability

$Y=B_0+B_1X_1+B_2X_2+\ldots B_nX_n$

Where Y is nutritional vulnerability

$B_0$ is constant; $B_n$ is the coefficient of each independent variable ($X_n$)

$X_1$ is socio-economic status, $X_2$ is wealth index, $X_3$ is food habit and consumption pattern, $X_4$ is lifestyle and $X_5$ is social support

$Y_{urban}=-0.88+0.03X_1+0.02X_2+1.21X_3+0.33X_4-0.97X_5$

The regression analysis of the predicting factors of nutritional vulnerability shows that among urban dwellers there is positive relationship between each of the factors and nutritional vulnerability of respondents, except social support which has negative relationship with vulnerability. This is shown in the slope (B) of the model.

$Y_{rural}=56.79+0.26X_1-1.19X_2-2.40X_3-2.09X_4-0.64X_5$

On the contrary among rural dwellers, there is negative relationship between each of the identified factors and nutritional vulnerability of respondents, except socio-economic status which has positive relationship with vulnerability.

The coefficient of determination ($R^2$) shows that 2.0% ($R^2$=0.02) of the variations in the level of vulnerability of the respondents can be explained by those factors among urban dwellers whereas, 50% ($R^2$=0.500) of the variation in nutritional vulnerability among rural dwellers can be explained by those factors. This implies that the identified factors determine 50% of nutritional vulnerability level of rural dwellers unlike that of the urban dwellers (2.0%).

None of socio-economic status, lifestyle, food habit and consumption pattern, wealth index and social support has significant effect on nutritional vulnerability of urban dwellers, whereas feeding habit and lifestyle have significant ($p<0.05$) effect on the vulnerability of rural dwellers. Therefore, nutritional vulnerability of urban dwellers is not significantly determined by those factors, compared with that of the rural dwellers which is determined by lifestyle and food habit.

**Table 4.27: Multiple Regression Model of Nutritional Vulnerability**

| | Urban N=168 | | | | | Rural N=178 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean±SD | B | $R^2$ | T | P | Mean±SD | B | $R^2$ | T | P |
| Constant | | -0.88 | | | | | 56.79 | | | |
| Socioeconomic Status | 19.36±2.1 | 0.03 | 0.02 | 0.03 | 0.97 | 19.58±3.51 | 0.26 | 0.50 | 1.67 | 0.09 |
| Wealth Index | 2.77±0.40 | 0.02 | | 0.02 | 0.99 | 2.71±0.50 | -1.19 | | -1.09 | 0.28 |
| Food Habit | 18.28±1.3 | 1.21 | | 0.15 | 0.23 | 16.81±2.49 | -2.40 | | -11.85 | 0.00 |
| Lifestyle | 2.05±0.5 | 0.33 | | 0.85 | 0.40 | 1.87±0.46 | -2.09 | | -1.97 | 0.05 |
| Social Support | 10.72±0.8 | -0.97 | | -0.19 | 0.34 | 10.62±0.85 | -0.64 | | -1.10 | 0.27 |

### 4.11.2 Body Mass Index based on Armspan

$Y=B_0+B_1X_1+B_2X_2+\ldots B_nX_n$

Where Y is nutritional status as indicated by body mass index based on armspan

$B_0$ is constant; $B_n$ is the coefficient of each independent variable ($X_n$)

$X_1$ is socio-economic status, $X_2$ is wealth index, $X_3$ is food habit and consumption pattern, $X_4$ is lifestyle and $X_5$ is social support

$Y_{urban}= 22.52 - 0.13X_1 - 0.49X_2 - 0.10X_3 - 0.80X_4 + 0.59X_5$

The regression analysis of the predicting factors of nutritional status shows that among urban dwellers there is negative relationship between each of the factors and nutritional status of respondents, except social support which has positive relationship with body mass index based on armspan.

$Y_{rural}= 18.38 + 0.15X_1 - 0.73X_2 + 0.31X_3 + 0.68X_4 – 0.43X_5$

On the contrary among rural dwellers, there is positive relationship between each of the identified factors and nutritional status of respondents, except wealth index and social support which has negative relationship with body mass index based on armspan.

The coefficient of determination ($R^2$) shows that 5.0% ($R^2$=0.05) of the variations in the level of nutritional status of the respondents can be explained by those factors among urban dwellers whereas, 11.0% ($R^2$=0.11) of the variation in nutritional status among rural dwellers can be explained by those factors. This implies that the identified factors determine 11 percent of nutritional status of rural dwellers unlike that of the urban dwellers, five percent.

None of socio-economic status, lifestyle, food habit and consumption pattern and wealth index has significant effect on nutritional status of urban dwellers, whereas socio-economic status and food habit have significant ($p<0.05$) effect on the nutritional status of rural dwellers. Also, social support has significant effect on the nutritional status of the respondents in urban areas and has no significant effect on the nutritional status of rural respondents. Therefore, nutritional status of urban dwellers is chiefly determined by social support compared with the rural dwellers which is determined by socio-economic status and food habit.

**Table 4.28: Multiple Regression Model of Nutritional Status by BMI armspan**

| | Urban N=168 | | | | | Rural N=178 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean±SD | B | $R^2$ | T | P | Mean±SD | B | $R^2$ | T | P |
| Constant | | 22.52 | | | | | 18.38 | | | |
| Socioeconomic Status | 19.4±2.1 | -0.13 | 0.05 | -1.15 | 0.25 | 19.6±3.5 | 0.15 | 0.11 | 1.97 | 0.05 |
| Wealth Index | 2.8±0.4 | -0.49 | | -0.75 | 0.45 | 2.71±0.5 | -0.73 | | -1.36 | 0.18 |
| Food Habit | 18.3±1.2 | -0.10 | | -0.57 | 0.57 | 16.8±2.5 | 0.31 | | 3.07 | 0.02 |
| Lifestyle | 2.1±0.5 | -0.80 | | -1.43 | 0.16 | 1.9±0.5 | 0.68 | | 1.29 | 0.19 |
| Social Support | 10.7±0.8 | 0.59 | | 2.09 | 0.04 | 10.6±0.9 | -0.43 | | -1.52 | 0.13 |

## CHAPTER FIVE

## DISCUSSION, CONCLUSION AND RECOMMENDATION

### 5.1 DISCUSSION

#### 5.1.1 Socio-demographic characteristics of the respondents

One of the focuses of this study is the profiles of the rural/urban differences in the lifestyle, socio-economic status and social support of Nigerian elderly. Findings from the study suggest a significant rural/urban difference in the lifestyles, socio-economic variables and social support of Nigerian elderly.

No significant difference was observed in the age distribution, sex, and marital status of elderly in rural and urban areas of Ibadan metropolis. However, the level of education, occupation and income varies with the elderly place of residence. The large difference in the age distribution of the elderly reflects the typical population pyramid of Nigeria population with broad base and narrow top (NPC, 2009), and this observation is consistent with earlier reports from various regions of Nigeria (Nzeagwu and Uwaegbute, 2013; Olayiwola *et al.*, 2004). Young elderly still constitute the bulk of the older population and this structure confirms that the proportion of the elderly would likely increase as indicated by the global reports (UNFPA/HelpAge, 2012). The lower mean age in urban area could be attributed to the predominance of young elderly (65-69 years) found in the area. Urban areas have been shown to offer higher likelihood of involvement of the elderly in economic activities (Yip, Callanan, & Yuen, 2000). Personal characteristics such as age, sex, and religion among others have been shown to influence the nutritional status of an individual (Solomon, 2000). Age is also an essential factor in dietary reference intakes and nutritional status in the elderly. Old age is typically characterized by the need for consumption of nutrient dense foods following several physiological changes which influence the quantity of food consumed and also the biological utilization of food nutrients.

In this study, the predominance of males is not expected following the gender distribution and age structure of the Nigerian population which has more women at its upper tail end (NPC, 2009) and the reports of several studies in which the proportion of older women to older men was higher (Ariyo *et al.*, 2012; Nzeagwu and Uwaegbute, 2013; Olayiwola *et al.*, 2013). The finding is however in line with some other studies (Olayiwola *et al.*, 2004; Olasunbo and Olubode, 2006). The observed disparity can be as a result of age cut-off used: similar studies among elderly Nigerians used a benchmark of 60 years (Olayiwola *et al.*, 2004; Olasunbo and Olubode, 2006; Olayiwola *et al*., 2013). Grieco and Apt (2001) reported that women lived longer than men in most countries and experienced greater financial and cultural constraints which affects their quality of life as older persons. Older women are often involved in many caring practices that necessarily take them away from home or from their spouse, making them unavailable. This situation could be responsible for the observed higher proportion of male to female respondents in the study areas.

In Nigeria, marriage institution is highly valued; the large percentage of married respondents is therefore expected. Olayiwola *et al*. (2004) reported a similar high percentage of married respondents among the elderly in Ogun state. The higher proportion of married respondents in urban than rural areas is however unexpected because the rural areas are known for their conservative stance on societal values like marriage. This observation is however acceptable with the higher percentage of single respondents found in the rural areas. The availability of a living spouse or partner has been suggested as an important source of help and support during late stages of life (Jakobsson *et al.,* 2007). Likewise, United Nations (2011) reported that married people share household and economic activities while single, divorced and widowed people lacked support in household and economic activities unless from children who are old enough to do some household activities. In this study, widows were individuals whose spouse had died and who have not remarried, separated were married respondents who were living alone either legally separated from spouse or otherwise.

The observation that more respondents in rural than urban areas had tertiary education and lived in duplexes and flats are unexpected and inconsistent with earlier report. Garrett and Ruel (1999) indicated that education and income were higher for both men and women in urban than rural areas and these factors contribute to the location disparity in food security and nutritional status. This finding is however consistent with the report among older people in Ilorin, Nigeria (Abdulraheem, 2007).

Education is a good indicator of social position in epidemiological studies and often seen as the easier way of measuring present socio-economic status. Psacharopoulos (1994) reported that illiteracy limits economic, social and physical development in developing nations. Conversely, higher levels of education are usually associated with higher incomes, higher standards of living and above average health (Kabir, Nilsson and Parker, 2004; Asiyanbola, 2009). Therefore, these social demographic characteristics reflect that wide disparity between the rich and poor, the educated and the illiterate in urban areas also occur among elderly Nigerians in rural areas.

Some observations made in this study could be attributed to the high number of retirees in this age group which often relocate to developing settlements mostly rural areas after disengagement from active economic activities. Also, the avoidance of high cost of living, stress and rapid congestion in urban areas is leading to rapid growth of rural areas where a good mix of people of various social strata co-exists. Also, the large difference in education, income and living standard could affect food choice and consumption since often times, nutritious foods cost more than less nutritious foods.

Many studies have established wide disparities in income between rural and urban areas in Nigeria, this study also confirm that household income of older people was significantly higher in urban than rural areas. This finding is consistent with the report of National Bureau of Statistics (2010) which indicates that poverty was higher in rural than urban areas.

Generally, 24 percent of the entire respondents earned N10,000 ($62.5) or below monthly. This information suggests that elderly Nigerians are doing better compared with elderly Kenyans where 57 percent earned incomes below US $25 per month and 64 percent had only completed primary education (Ondigi, 2012). The higher level of income in urban than rural areas is consistent with the report of Garrett and Ruel (1990), and this could be as a result of higher opportunity for employment and sustained involvement in economic activities. The availability of income from employment has been considered a proxy for participation in the labour force.

Lower income predisposes to poor food access, food insecurity and poorer health (Crockett *et al.*, 1992; Glasgow, 1993). The income level in this study confirmed that the elderly constitute one of the subpopulation with poor income (Baiyewu *et al.*, 1996). The higher level of income in urban than rural areas is consistent with results in other population groups (Yang, 1999; Smith *et al.*, 2005; Sicular *et al.*, 2007). Poor income predisposes to nutritional vulnerability and dependency in old age (Tarasuk, 2003; Power, 2005). The observation of lower level of income in rural than urban areas in this study necessarily limits dietary choices and may significantly influence nutritional status.

The higher access to public tap water in rural than urban areas is contrary to reports in many other studies where access to basic social amenities was significantly higher in rural than urban areas (Popkina & Bisgrove, 1988). This finding could be attributed to ongoing environment developmental projects which has disturbed water supply in many urban areas of Ibadan metropolis.

Accumulated wealth such as housing and/or land ownership, having debts, possession of refrigerator, cars, television, phones among others had been shown to be important in assessment of health condition because of the likelihood of underestimation using socio-economic status (Pollack, Chideya, Cubbin, Williams, Dekker, & Braveman, 2007). No significant variation was observed in the wealth index variables of the elderly except in house and/or land possession which was higher in urban than rural areas. This observation is inconsistent with the reports among older Americans where wealth inequality was reported with elderly households in the top $10^{th}$ percentile having 2,500 times as much wealth as those at the lowest $10^{th}$ percent (Smith, 1997).

This present study showed higher occurrence of medium household size in urban and large household size in rural area. This observation is not surprising as earlier studies had reported higher family size in rural areas where children were used as labour for farm work and cohabitation was high (O'Hare *et al.,* 2009; Olayemi, 2012). The predominance of large households in rural areas inspite of lower number of children is an indication of common stronger ties or kinship care that predominates in the rural areas. This practice promotes sharing of resources with close family relations and care for the under-privileged. The large household size in the rural areas may also be as a result of the grandchildren living with the elderly or co-habitation with relations in need. Studies have indicated that large family size has significant relationship with much greater risk of poverty (Maxwell, 1996) and food insecurity (Obamiro *et al.*, 2003).

The larger number of people sharing house in the urban areas is expected because the movement of young people from rural to urban areas creates housing deficit and the new migrants often stayed with existing settlers leading to overcrowding, congestion among other social ills.

A higher access to home gardens in urban areas was observed in this study, however, more respondents in rural (10.6%) than urban areas (4.8%) sourced foods from home garden. This finding could be attributed to easier access to land for agriculture purpose in rural than urban areas. Home gardening has been shown to promote production of yellow and dark-green leafy vegetables, contributes to household food needs and family finance and improved nutritional status (High & Shackleton, 2000; Faber *et al.*, 2002).

In this study, only 1.2% of the respondents lived alone, this is lower than 10.7% reported among elderly Nigerian in Ilorin, Kwara State (Abdulraheem, 2007) and the over 15% in Japan (Sun *et al.*, 2007). The very low level of respondents living alone suggests that the kinship ties and caring attitude of Nigerians remain strong among the Yorubas. At old age, loneliness has been reported to be high among the elderly and is a major susceptibility factor to nutritional risk and dietary inadequacies (Pirlich & Lochs, 2001; Chen *et al.*, 2001; Donini *et al.*, 2003; Callen & Wells, 2005; Ferry *et al.*, 2005). The study found a higher percentage of respondents living alone in rural (1.7%) than urban areas (0.6%), this could be attributed to rural-urban migration of the younger people living their aged and the likely involvement of the aged women in child caring and other household chores in the cities with their children thus living the male elderly to live alone in the rural areas.

In this study, care giving for Nigerian elderly was high (89.0%) and care giving was higher in rural than urban areas. The high level of care giving in the rural areas could be as a result of closer family ties, stronger kinship and the higher possibilities of living among one's kith and kins. Such situations are difficult to meet in the urban areas. In addition to higher level of care giving in the rural areas, the elderly in the rural areas are also more involved in care giving practices of young children. Similar rural-urban variation in care giving for the elderly has been reported among the elderly in United States (Glasgow, 2000).

### 5.1.2 Socio-Economic Characteristics of the elderly

There is a predominance of both high and low socio-economic class in rural areas and this is a reflection of a large disparity among the elderly within the same geographical location. The finding is an indication that place of residence does not primarily suggests the socio-economic class of the elderly even when there is wide variations in the threats and opportunities available with a specific type of location. The large percentage (74.9%) of elderly in middle socioeconomic class shows that some elderly households are coping better than the general population. It may also be a possible reflection of the weakness of the methodology of social class ranking in reflecting the specific socio-economic challenges of the elderly.

Abou one-fifth of the elderly had high socioeconomic class. This is contrary to the general belief and reports of earlier studies which indicated high level of poverty and lack among the elderly (Baiyewu *et al.*, 1996; Asagba, 2005; Lasisi, Abiona & Gureje, 2010; Fadupin, 2013). A surprising finding is that older people in high socio-economic class were greater in rural than urban areas. This may be as a result of rural relocation of many older people who had lived their active life in urban areas. Rural relocation is becoming a common phenomenon in Nigeria because of the cheaper cost of land, rent, higher age-friendliness, reduced competitiveness and stress compared with urban areas. Generally, the cost of living is often lower in rural than urban areas, however, several social amenities are often lacking in these areas and rural residents who had previously lived in urban areas may have to improvise for many basic amenities such as water supply and electricity among others in rural areas. A similar study among the black elderly in United States of America indicated that 21 percent lived below the poverty line and poverty rate was higher in rural than urban areas (Cawthorne, 2008). Globally, poverty constitutes a major threat to the well-being of the older population and this is linked to low income, lack of pension benefits, low literacy, poor health and malnutrition (UNFPA/HelpAge, 2012).

The variations in the classification may be as a result of the methods used in defining the social classification, high level of poverty among the elderly has been largely reported based on income and remmitances (Deaton & Paxson, 1995; Siegenthaler, 1996; Deaton & Paxson, 1997; Gasparini, Alejo, Haimovich, Olivieri & Tornarolli, 2007; Pal & Palacios, 2011).

Depression was significantly associated with low SES among the elderly in Japan and this varies with residential area (Murata, Kondo, Hirai, Ichida & Ojima, 2008). Also, low SES have been associated with higher prevalence of obesity and skipping of breakfast while high SES was associated with higher consumption of vegetable protein, dietary fibre and most micronutrients (Hulshof, Brussaard, Kruizinga, Telman, & Löwik, 2003).
Low SES among older people has been shown to increase mortality rates (Bassuk, Berkman & Amick, 2002), stroke incidence (Avendano *et al*., 2006), and reduce health-related quality of life (Huguet *et al*., 2008). Many studies have established that diet quality is also affected by SES indicators such as occupation, education, and income levels (Galobardes, Morabia & Bernstein, 2001; Darmon and Drewnowski, 2008). Fajemilehin and Odebiyi (2011) reported that the older persons' socio-economic status and traditional lifestyle practices were strong determinant of health behaviours and quality of life. Glasgow (1993) reported that poverty is particularly high among older people in rural areas.
The observed frequency in this study calls to questions the suitability of the general socio-economic ranking method in old age especially indicators such as income (including pension) and education. It is therefore necessary to identify a more robust and age-sensitive approach to depict the socio-economic characteristics of the elderly rather than reliance on the use of socio-economic scores used for the general population.

### 5.1.3 Social support and age-friendliness available to the elderly

Despite the predominance of poor elderly in the rural areas, this study indicated higher availability of social support in urban than rural areas. The low level of social support (55.1%) in rural areas is consistent with inadequate level of social support reported among Nigerian elderly in Ibadan (Fadupin, 2013). Though formal welfare support is non existent nationally, nearly half (48.8%) of the respondents enjoyed welfare support. Such support was higher in urban (60.7%) than rural areas (37.6%). This could be attributed to nearness to relations, religious organizations, non-governmental organizations and other agencies with mandate that covers the welfare of older population. This finding confirms the report that elderly Nigerians received support more in urban areas than rural areas (Peil, Bamisaiye and Ekpenyong, 1989). The possible reason may be closeness to the supposed support, the closer the elderly was to the children/relatives, the more frequent the support. Thus with the increasing level of rural-urban migration, elderly in urban areas were closer and obtained more support.

Until this present study, there is no report of studies of age-friendliness in Nigeria; however, there are indications that the issue of ageing is attracting the attention of government and other stakeholders. The absolute number of elderly in Nigeria and the projection of rapid increase in the proportion of the older population call for the need to promote age-friendly environment and services. In many developing nations, the age-friendly initiative has taken different approaches such as 'age-friendly community' in Canada (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007), 'livable community' in the United States *(*Kochera and Bright, 2006; Oberlink, 2008*)* and 'lifetime neighbourhood' in United Kingdom (Harding, 2007; Kohler, 2007).

The findings from this study shows that environments and services in the study areas are presently not constructed to suit the needs of the older people and variation exists in the level of adaptability of these utilities by the elderly in rural and urban areas. Thus, the elderly largely need to compete with other people for utilities and services. Although many elderly are coping well with the available structures and services shared with the general population, however, the ability to cope may reduce with increasing age.

The higher level of age-friendliness of community and health services in rural areas may be a spill over of informal kinship care which is stronger in rural areas (Jiang, 1995; Glasgow, 2000; Rubin *et al.*, 2008). Also, the age friendliness in communication and information is low and this could be as a result of the rapidly evolving modes of communication with near abandon of the traditional methods of communications which most elderly are familiar with.

Earlier studies have shown that deficits in communication and information to older people are common and may adversely affect health and nutritional well being (Kripalani *et al.*, 2007; Torp *et al.*, 2008). Interventions based on new modes of communication such as computer, electronic bill board and text messages may unintentional leave out the older population as many of them have limited knowledge on these electronic means of communication.

The result of the study also indicated poor level of social inclusion of the older population in both urban and rural areas, social participation was better in urban than rural areas while transportation and outdoor spaces and buildings were better in rural than urban areas. This result is consistent with the report of a medical anthropology study in rural Ghana that indicated caring for the elderly in rural areas is a norm and it is a shame to do contrarily (Van der Geest, 2002). The Ghana study further indicated that the elderly are well respected and enjoy visits and different kinds of services from the young men as this is believed to attract blessings and favour (Van der Geest, 2002).

Social inclusion is essential to protect the elderly from adverse economic conditions. Evidence has indicated that participation of older adults in societal development enhances the well-being both of older adults and of communities as a whole (Haddon, 2000; Hanson, 2006). In some developed countries, conditional cash transfer is operated to promote the welfare of the older population and age-friendly policies are in place (De la Brière & Rawlings, 2006). Also, countries like China and France have Elderly Rights Law that mandates children to care, protect and provide for the aged ones (Chan, 1999; Kanter, 2008); the law includes enforcement mechanisms and potential punishment for defaulters.

Although few states in Nigeria are implementing some form of conditional cash transfer, the impact, scope and coverage of the programme is not known. Moreover, there is no policy backing for these programmes which is an indication that the lifespan of the programme may be limited. Consequently, elderly Nigerians face a great risk of marginalization, effort is therefore required to institute a national policy and a social inclusion programme (Rispel, Palha de Sousa & Molomo, 2009; Aboderin, 2011).

### 5.1.4 Lifestyle of the elderly

In this study, the rural-urban differential in the lifestyle of the elderly is also investigated. The findings indicated that elderly Nigerians have a healthy or good lifestyle following a very low prevalence of smoking and moderate consumption of alcohol; however, physical activity and frequency of consumption of fruits and vegetables were low especially in rural areas. Similar rural-urban differences in lifestyle have been reported among the elderly in United States (Fogelholm *et al.,* 2006) and among Japanese men (Iwasaki *et al.,* 2002). A study also revealed that poor health, smoking, and physical inactivity were higher among rural cancer survivors than their urban counterparts (Weaver *et al*., 2013).

Lifestyle and nutritional status are inextricably linked with health and well being of individuals. Studies have established the significance of lifestyle factors in ageing especially nutrition, tobacco and alcohol consumption (Lloyd-Sherlock, 2010; Steves *et al.*, 2012). Healthy lifestyle reduces mortality risk (Haveman-Nies *et al.,* 2002), recuperation from illness and healthy ageing (Fried *et al*., 2004; Roman *et al.*, 2008; Ahmed & Haboubi, 2010; Danthiir *et al.*, 2011) and prevents age-related deterioration in health (Haveman-Nies, De Groot & van Staveren, 2003; Brownie, 2006).

The main findings on physical activity is that the levels of physical activity is generally low and differ between rural and urban elderly in the study areas, with the latter being more active and the difference was significant. Similar low level of physical activity has been reported among the older people elsewhere. Bassem and Kim (2010) reported that only few older adults in the United States achieve the minimum amount of recommended physical activity, and 28 to 34 percent of adults 65 to 74 years of age are inactive. The Irish longitudinal study on Ageing also reported that 33 percent of elderly Irish had low level of physical activity (Cronin, O'Regan & Kenny, 2011).

The low level of physical activity in rural areas is inconsistent with the reports among other age groups which showed higher level of physical activity in rural than urban areas (Sobngwi *et al.*, 2002; Martin *et al*., 2005; Joens-Matre *et al*., 2008; Salmon *et al.*, 2013). The finding is also contrary to the result of a study among older people in China that reported higher incidence of physical inactivity in urban (15.6%) than rural (7.1%) areas (Chatterji *et al.,* 2008). This difference could be largely attributed to the age of the respondents in this study; young adults in rural areas are more likely to be involved in farming activities which may involve physical exertion whereas their counterparts in urban areas could be sedentary workers. However, the respondents in this study are older people who are unlikely to be involved in strenuous activities such as farming. The observed result could also be due to the predominance of retirees and individuals of high social economic status in the sampled areas. The finding in this study agrees with higher level of sedentariness among rural women than urban women in United States (Wilcox *et al.*, 2000).

The low level of physical activity in rural areas could be attributed to lack of recreational facilities, poor health promotion programmes and lack of physical active role models in rural areas of Nigeria. Studies have shown that rural dwellers were less likely to report sidewalks and other exercises in their neighbourhood and face greater barriers to leisure time physical activity (Wilcox *et al.*, 2000; Buchner, 2009; Padrão *et al.*, 2012). Wilcox *et al.* (2000) noted that encouragement to participate in leisure time physical activity is lacking for older people in rural areas. Furthermore, many of the health promotion and lifestyle interventions in Nigeria are focused on young people and mostly conducted in urban areas where large numbers of people can be reached at once.

Physical inactivity leads to chronic diseases in older adults and when combined with poor dietary habits, there is increased risk of obesity, mortality and morbidity while there is decline in the quality of life of older persons (Drewnowski and Evans, 2001; Stensvold, Nauman, Nilsen, Wisloff, Slordahl and Vatten, 2011). Bassey and Kim (2010) reported that regular physical activity has beneficial effects on a variety of health outcomes and is a proven public health strategy that reduces disease and disability while improving quality of life in older persons. Studies in Nigeria have also identified that moderate physical activity is essential to promote healthy older population (Ojofeitimi *et al.*, 2002; Osho, Abidoye, Owoeye, Akinfeleye & Akinbo, 2011). Physical inactivity in elderly increases the risk of developing cardiovascular diseases, osteoporosis, loss of muscle mass, and the risk of type 2 diabetes mellitus (Hui & Rubenstein, 2006).

The proportion of current smokers (9.2%) and heavy alcohol consumers (16.9%) in this study is low compared to a study by Lasisi *et al.*, (2010) among the elderly in yoruba speaking states of Nigeria which reported that about two-fifth each were consumers of alcohol and cigarette respectively. Elderly Nigerians have a better lifestyle compared to their counterparts in Spain following the result of a study among the elderly in Spain which showed that 22 percent and 23 percent of the elderly were current smokers and consumed alcohol respectively (Martínez Tomé *et al.*, 2011). The proportion of the smoker is also low compared with a study among older Irish which reported that 20.0 percent were current smokers (Cronin *et al.*, 2011). The low incidence of alcohol and cigarette use could be considered a healthy lifestyle among elderly Nigerians.

Unexpectedly, the proportion of respondents involved in smoking and heavy alcohol intake is higher in rural than urban areas, while intake of fruits and vegetables and physical activity are higher in urban than rural areas. The higher level of smoking and alcohol consumption found in rural areas may be related to the migration of older people who had lived in urban areas during their active years or as a result of carry-over of smoking and alcohol intake habits from young age. In Nigeria, penetration of development to the rural areas as measured by availability of social amenities is slow, however, several unhealthy behaviours and health-demoting lifestyle factors seem to penetrate the rural areas rapidly thereby worsening the health and well-being of rural dwellers.

The low level of smoking and alcohol consumption in this study agrees the findings among elderly South Africans (Oldewage-Theron *et al.,* 2008). Smoking is an independent predictor of cardiovascular morbidity, mortality and the development of myocardial infarction (Peters, Poulter, Warner, Beckett, Burch and Bulpitt, 2008). It is also associated with increased susceptibility to oxidative damage caused by free radicals partly because smokers are known to have low intakes of fruits and vegetables that are rich in antioxidants (Palaniappan *et al*., 2001; Cochrane and Afolabi, 2004).

Alcohol has been described as the most common psychoactive drug in Nigeria and is associated with major depressive disorder and a strong risk factor for stroke **(**Gureje, Degenhardt, Olley, Uwakwe, Udofia, Wakil, & Anthony, 2007; Onwuchekwa, Onwuchekwa & Asekomeh, 2009). In older people, alcohol also reduces brain function, impairs co-ordination and memory and can lead to falls and general confusion.

Sedentary lifestyle generally contributes to obesity (Uauy *et al*., 2001; Albala *et al*., 2002) and this is reflected in this study by physical activity level and time spent watching television which could lead to unhealthy weight. Evidence has shown that the amount of time spent watching television influences physical activity and weight status (Dietz and Gortmaker, 1985; Crespo *et al*., 2001).

### 5.1.5 Food habits and consumption pattern of the elderly

Another major objective of this study is to identify how the food habit and consumption pattern of the elderly differ with location. The findings show that more respondents in urban (36.0%) than rural areas (31.0%) had good food habit and only one-third had good food habit overall. The result indicates that the differences in the food habit between rural and urban areas is not statistically significant, thus the null hypothesis is accepted. This finding is consistent with reports among the elderly in Korea (Kim, Lee, Chang, & Choue, 2002; Lorefält, Ganowiak, Wissing, Granérus, & Unosson, 2006). Though it is generally known that food habit among the elderly is influenced by several physiological changes associated with ageing, several other factors that are modifiable also affect dietary habit of the elderly.

In this study, more than one in every four respondents skipped meals in the past month. Though the percentage of those skipping meals was lower compared with 35 percent among the elderly in Ile-Ife, Nigeria (Olasunbo & Ayo, 2013), the high rate remains disturbing considering that the ability to consume large meals at a single sitting is low and dietary quality is poor. The higher incidence of meal skipping in rural than urban areas is contrary to the findings among children which indicated higher levels of meal skipping among urban than rural children (Davis *et al.*, 2008). The observed differences conform to the findng among adolescent in Camerron (Nzefa Dapi *et al.*, 2005). Meal skipping inhibits good nutrition, results in inadequate nutrients intake and promotes reliance on junk foods. The finding that lunch was the most skipped meal in this study contradicts the report that breakfast was the most skipped meals among Nigerians (Afolabi *et al.*, 2013). Like children, meal skipping is particularly unhealthy for the elderly.

Consumption of in-between meals (snacks) was low compared with the 42.5 percent among Nigerian undergraduates (Olumakaiye, Ogbimi, Ogunba, & Soyebo, 2010) but compare favourably with 20.2% reported among dental technology and therapy students (Azodo, Ehizele, Umoh, Ojehanon, Akhionbare *et al.*, 2010). Snacks contribute greatly to nutrient intake among Nigerians supplying 21–34% of the energy, 21–27% of the protein, 23–45% of the calcium, 9–16% of the iron and 23–35% of the phosphorus intake of adolescents (Ene-Obong & Akosa, 1993). The low level of snacks consumption thus indicates that the daily nutrient requirements must be largely met from main meals consumed which frequency is also low. Snacking is also considerably low compared with a similar study in Malaysia which reported that 54 percent of the elderly consumed snacks and snacks contributed 17 percent of the total daily energy intake (Zalilah, Mirnalini, Safiah, Tahir, Siti Haslinda, Mohd Shariff *et al.*, 2008).

Eating alone has been shown to reduce the quantity of meals consumed by the elderly; De Castro (2002) has shown that meals eaten with others tend to be larger by up to 44 percent than when eaten alone. However, eating alone is high among in this study and the situation is worse in rural areas. A study among older Isrealis indicated that elderly that eats alone are at risk of lower dietary intake (Shahar, Shai, Vardi, & Fraser, 2003).

Food choice and consumption among the elderly is influenced by many factors as indicated by Falk framework (Falk *et al.*, 1996). Many studies have demonstrated that type of foods and their quantity of consumption affect body composition. Though the global recommendation based dietary quality on number of servings per day thus consumption frequencies of various food groups should be evaluated on daily basis. However, the typical dietary pattern in Nigeria makes assessment on such basis cumbersome and consumption of a food item more than four times per week has been largely assumed to indicate that the food is consumed almost every day in a week (Maziya-Dixon *et al.*, 2004; Hart, Azubuike, Barimalaa and Achinewhu, 2005).

Fruit and vegetables are good sources of essential micronutrients, dietary fibers and other bio-active substances. The present study indicates that the elderly Nigerians in rural and urban areas have varied food consumption pattern. For example, only half and 83.8% consumed fruits and vegetables for four or more times weekly respectively. The proportion of respondents who consumed fruits and vegetables four or more times weekly in this study was higher than 60.2% and 65.4% adults in Igwuruta and Port Harcourt respectively (Hart *et al.*, 2005). The value is also higher than the national consumption report which indicated that leafy vegetables were consumed more than four times per week by 40% of Nigerian households (Maziya-Dixon, Akinyele, Oguntona, Nokoe, Sanusi and Harris, 2004).

The observation made in this study is inconsistent with earlier report that fruits and vegetables consumption is reduced in old age as a result in difficulty in chewing (Sheiham *et al.*, 1999). The large percentage of respondents who were observed to be consuming fruits and vegetables in this study could be attributed to the wide availability and cheap cost of these foods at the various locations.

It is surprising that despite the high frequencies of fruits and vegetables consumption, fruits and vegetables intake of the respondents were still below the recommendation and this agrees with an earlier study indicatong that vegetable consumption among Nigerians was below the recommended level (Chubike, Okaka & Okoli, 2013). This observation identifies the need to consider the serving size or the quantity fruits and vegetables consumed in addition to the frequency of consumption. WHO recommended a total of 400 g/day vegetable and inadequate intake has been associated with increased global incidence of cardiovascular diseases (Ruel, Minot & Smith, 2005). Other studies have shown the benefits of daily fruit consumption among the elderly to include reduced cardiovascular and total mortality (Gaziano, Manson, Branch, Colditz, Willett & Buring, 1995; Strandhagen, Hansson, Bosaeus, Isaksson & Eriksson, 2000) and greater bone density following greater potassium and magnesium intake (Tucker, Hannan, Chen, Cupples, Wilson & Kiel, 1999).

In South Africa, poor frequency of consumption of calcium-rich food group and the vitamin C- or carotene-rich vegetable group have been reported to contribute to poor micronutrient intake (Charlton, Bourne, Steyn, & Laubscher, 2001). High fruits and vegetables intake are associated with better self-reported health status, higher self-perceived functional ability and improved cognitive function (Clausen, Charlton, Gobotswang, & Holmboe-Ottesen, 2005). High intake of fruits and vebetables also promote higher intake of vitamins and minerals particularly when preparation method prevents substanstial nutrient losses.

The finding also revealed higher frequencies of consumption of both fruits and vegetables in urban than rural areas, this is unexpected since food production is generally higher in rural than urban areas. A similar higher intake of fruits and vegetables in urban than rural areas has been reported among young people in some countries (Kirby, Baranowski, Reynolds, Taylor & Binkley, 1995; Cummins, Smith, Taylor, Dawson, Marshall *et al.*, 2009; Bowen, Ebrahim, De Stavola, Ness, Kinra *et al.*, 2011). Similar difference has been reported in food consumption of elderly Saudi men across various regions (Al-Numair, Lewis & Evans, 2005). The higher intake in urban than rural areas could be as a result of reluctance of rural dwellers to buy fruits and vegetables since these are easily obtainable from the farms (Obayelu, Okoruwa and Oni, 2009). It could also be attributed to the attitude of the farmers who prefer to sell their farm produce to middlemen who generally take such produce to urban areas. One of the resulting consequences of such attitude is the increase in the price of foods often above the selling price in urban areas.

The present study also shows that majority of the respondents consumed foods of animal origin at least four times weekly and consumption was higher in urban than rural though the difference was not significant. Animal foods such as as milk, meat, fish and insects are good sources of high quality protein and other nutrients. The high level of daily consumption of foods of animal origin in this study is contrary to the findings among elderly Nigerians in Cross River which reported that majority did not eat eggs, meat, poultry and milk due to beliefs and superstitions (Nnanyelugo, Kubiangha & Akpanyung, 1979). Obayelu, Okoruwa and Oni (2009) also reported higher consumption of milk, eggs and roots and tubers in urban than rural areas of Nigeria. Kim, Seo, Kwon and Cho (2012) reported a similar higher level of consumption of animal foods and fruits consumption among elderly Koreans in urban than rural areas.

The higher intake of animal foods in urban areas is also consistent with the findings in India (Bowen *et al.*, 2011) and could be as a result of declining use of wild life animals as food since the respondents were too old to go hunting and the cost of purchase may be unaffordable to most of them (Kuhnlein & Receveur, 1996). There is evidence that healthy foods relatively cost more than less healthy foods and this serves as an impediment to eating better among the socioeconomically disadvantaged populations (Rao *et al*., 2013). Thus, the higher proportion of low socio-economic status elderly Nigerians in rural areas could contribute to the lower frequency of consumption of animal foods. This is consistent with the reports of earlier studies (Falk *et al*., 1996; Dean *et al*., 2009).

The finding also shows that 72.0% of elderly Nigerians consumed legumes at least four times weekly and consumption was again significantly higher in urban than rural areas. This level of consumption is below 88.0 percent reported among low income households in Nsukka, Nigeria (King, Nnanyelugo, Ene-Obong & Ngoddy, 1985). The lower percentage in this study could be as a result of using higher benchmark since Nsukka study used weekly consumption of two or more times as cut-off point. Legumes are cheap sources of plant protein and are traditionally consumed in various forms among the Yorubas, it is however surprising that about one-third of the elderly in this study did not consume legumes up to four times weekly. The higher level of consumption in urban than rural areas is also unexpected considering the fact that melon and beans are largely produced in most rural areas. Legumes consumption of 4 times or more per week compared with less than once a week has been associated with a 22% lower risk of coronary heart disease (Bazzano, He, Ogden, Loria, Vupputuri *et al*., 2001).

Generally the level of consumption of many of these food groups may be due to inadequate production in rural areas and/or shifting from food production to cash crops.

In this study, cereals, roots and tubers were consumed near daily, this observation can be linked to the fact that these food groups were cheap and accessible all year round in the study areas. Roots and tubers constitute the staple foods in the moist savanah region of Nigeria for a long time, however there are indications of increased consumption of cereals. The result is consistent with the findings that the commonly consumed foods in Nigeria include rice, fat and oil, bread, soft drink, yam and cassava flour (Stephenson, Amthor, Mallowa, Nungo, Maziya-Dixon *et al*., 2010). High level of root and tubers consumption have been reported to be associated with inadequate protein and micronutrient intake in the general population, and this may partly explain high level of micronutrient deficiencies in Nigeria (Stephenson *et al*., 2010).

Eating a variety of foods is recommended in virtually all national food-based dietary guidelines and in global dietary guidelines. This study has provided a profile of food consumption pattern variation among the elderly Nigerians in Ibadan. The interesting findings are that there is no rural-urban difference in cereals and roots/tubers consumption, however, consumption of fruits, vegetables and foods of animal origin was higher in urban than rural areas. The higher frequencies of consumption of foods of plant origin confirms the earlier report that diets among elderly Nigerians are mainly plant based (Olayiwola *et al*., 2012). A point of particular concern about the elderly in this study was the fact that only 52.6 percent of them consumed fruits 4-7 times weekly and more elderly (23.6%) in rural compared to urban (8.3%) areas had inadequate vegetable intake; while more than one-tenth (11.6%) had very low frequency of consumption of foods of animal origin.

### 5.1.6 Food security and nutritional vulnerability of the elderly

Food security is an important public health issue and a necessary condition for a population to be healthy and well-nourished (Nord, Andrews, & Carlson, 2009). The place of residence has received little attention with regards to food security even though place of residence has been shown to be an important factor affecting nutritional status of children.

It is revealed in this study that one in every five elderly was food insecure and 12.4% being was food insecure without hunger. The observed incidence of food insecurity in this study is lower than the national average of over 40% obtained in the National Food Consumption study (Maziya-Dixon *et al.*, 2004). The rate was also below the prevalence rate of 36% among farming households in Kwara State, Nigeria (Babatunde, Omotesho & Sholotan, 2007), 30 percent among urban households in Gwagwalada, Abuja (Ibrahim, Uba-Eze, Oyewole & Onuk, 2009) and 90 percent reported in two communities in Ibadan, Oyo State (Sanusi, Manyong, Akinyele, Bamire & Oginni, 2005). The incidence of food insecurity among the elderly was however higher than 6 percent among United States elderly (Nord, 2002).

The lower rate of food insecurity among the elderly compared with national average is consistent with the findings in US that elderly households were more food secure than non elderly households (Nord, 2002). The lower rate of food insecurity of elderly households compared with nonelderly households could be as a result of lower rate of unemployment among the elderly than in general population. For example, unemployment in Nigeria is 14 times higher among individuals aged 15-64 years than in the elderly (National Bureau of Statistics, 2011). The lower rate of food insecurity could also be as a result a long standing coping mechanism or traditional approach of promoting food security which may be better than available in the general population.

The findings also show that older people food insecurity was higher in rural (34.3%) than urban areas (8.9%). This result is contrary to the findings that urban households had a higher level of food insecurity than rural households (Tarasuk *et al*., 2013). The result is unexpected because the rural dwellers have being largely viewed as food producers and as such should have a regular access to foods. This observation is however acceptable considering that unemployment was higher in the rural (25.6%) than the urban sector (17.1%) (National Bureau of Statistics, 2011) and income poverty and food insecurity has been shown to be higher in rural areas of Nigeria as a result of low purchasing power (Olarinde and Kuponiyi, 2005).

This study equally reveals higher level of income in urban areas and more elderly in rural areas had low socio-economic status. This finding agrees with Quandt *et al*. (2001) which indicated that rural elderly had lower incomes and hence poor health than their counterparts in urban areas. Studies have shown association between poor economic resources on one hand and hunger and food insecurity on the other (Sahyoun & Basiotis, 2001; Ajani *et al.*, 2006). Quandt *et al*. (2001) also noted that the cost of food in rural areas was much higher and with limited food selection in rural areas, thus low income can restrict not just the quantity but also the nutritional quality of food intake. Thus the higher cost of foods in rural areas and the age group used for the study may contribute to the observed finding. At younger age, the rural dwellers are generally active in food production and are thus more likely to be food secured whereas farming as a profession is devoid of post-retirement benefits and the elderly in rural areas are therefore likely to be dependent on remittances from children, leased land and other investments which may not be forthcoming. Food insecurity is an indication of likely inadequate dietary intake with its attendant consequences. Food security promotes adequate nutrition in old age and therefore contributes to the maintenance of health, physical performance and psychosocial well-being (Drewnowski and Evans, 2001; Bates *et al.*, 2002; Nijs *et al.*, 2009).

The finding agrees with the findings in the United States which reported higher prevalence of household food insecurity in non-metropolitan than metropolitan areas (Coleman-Jensen, Nord, Andrews, & Carlson, 2012). Another study showed that households with children in non-metropolitan areas have a higher prevalence of household food insecurity than those in metropolitan areas (22.0% vs. 20.8%; Nord *et al.,* 2009). These results have provided a mixed picture of the prevalence of household food insecurity in urban and rural areas in the United States.

The interrelationship between household food insecurity and rural/urban residence can be attributed to the varying economic, social and environmental conditions of urban and rural environments. Studies conducted in Canada indicated that the economic and social structures of urban and rural areas differ (Fairbairn & Gustafson, 2006). Although the low socioeconomic status was high in both urban and rural areas of this study, the consequences of low SES may be higher in rural than urban areas, especially in areas that are more remote and isolated. Additionally, increasing rate of rural-urban migration of young people may create increased care burden for the older population with consequences on income and food security (Fairbairn & Gustafson, 2006). The higher level of food insecurity could also be linked to inadequate social support. The finding of low social support in the present study is in contrast with the general belief that availability of social support is high in rural areas (Okumagba, 2011**).** According to Kaseke (2005), public assistance programs are not evenly distributed in rural areas and lack of knowledge of these limit rural elderly from accessing them. Even in cases where these facilities are available, distance to distributing points and lack of public transportation limit the elderly from accessing public assistance.Other studies found out that elderly people with social support systems such as family, and friends tend to be food secure (Quandt *et al.*, 2001). In a study carried out in the USA, Woltil (2012) found that having a spouse helps in preventing or reducing food insecurity.

The higher prevalence of food insecurity could also be linked to poor food access which may play a key role in household food insecurity in urban and rural areas. Rural households are known to be more dispersed than their urban counterparts, which suggest that a longer distance may have to be covered to access foods and other commodities not produced by the household. Quandt *et al.* (2001) noted that hunger and food insecurity among the elderly exacerbates acute chronic diseases and speed up the onset of degenerative diseases.

Like food security, nutritional vulnerability is another concept that explains how and why malnutrition occurs in some older people. Information from nutritional vulnerability assessment is essential to designing programmes that promote healthy ageing and quality of life. Elderly are highly vulnerable to malnutrition as a result of several physiological, psychological, social and economical changes that occur simultaneously. HAI (2000) noted that the elderly may be vulnerable if not empowered economically, socially, physically and psychologically.

Findings from this study showed that 28.7 percent of elderly Nigerians were nutritionally vulnerable with one in ten being highly vulnerable. The level of nutritional vulnerability in this study is lower than reported in earlier studies among the elderly in Nigeria. Nzeagwu and Uwaegbute (2010) reported that 75 percent of the elderly in South East Nigeria were nutritionally vulnerable. Olasunbo and Olubode (2006) and Olayiwola, Olusanya and Ketiku (2004) reported that over 90 percent of elderly Nigerians were nutritionally vulnerable with 46 percent being highly vulnerable. The level of vulnerability is however within the global range of 2-51% (Chen, 2005) and close to 34.5% in Australia (Rist *et al.*, 2012).

A similar study among geriatric patients in Spain reported that 32.5 percent were at nutritional risk (Alert *et al.*, 2012). The wide margin in these proportions could be as a result of the variation in the study location as well as the tools used in the assessment, the former study used Mini Nutritional Assessment (MNA) tool while the latter used London School of Hygiene/Help Age tool combined with WHO procedure. The use of MNA tool in Nigeria may require local adaptation which may not be corrected for in the South East Nigeria study since MNA was originally designed for the frail elderly and for hospital setting (Guigoz, 2006). The combination of two tools to measure nutritional vulnerability may have introduced confounders which resulted in high percentage of nutritional vulnerable elderly in the other study.

The present finding also revealed a significantly higher level of nutritional vulnerability in rural than urban areas which is consistent with the report in United States. Ruel *et al.* (2010) found disproportional levels of vulnerability to food security between the poor urban households and poor rural households. Nutritionally vulnerability is influenced by age in the rural areas, the most vulnerable and the least vulnerable age groups were 65-74 and 80 years and above respectively. This possibly suggests that the elderly gradually develop coping mechanism as they age. In rural areas, marital status also influences nutritionally vulnerability with widows and widowers being the most affected.

This observation is consistent with the finding among the elderly in North Carolina which indicated that widows are more nutritionally vulnerable than married individuals (Quandt *et al.*, 2001). The significant relationship between level of education and income in both areas is consistent with earlier reports (Mukudi, 2003; Tarasuk, 2003; Furness *et al.*, 2004; Power, 2005). These studies indicated that families with little education as well as single-parent families living on low incomes and principally supported by social assistance were more likely to be nutritionally vulnerable. In the present study also, respondents without formal education were particularly vulnerable in the urban locality, contrastingly respondents with at least secondary education constituted the likely nutritionally vulnerable group in the rural area. The finding that retirees constituted the largest percentage of vulnerable respondents could be attributed to irregular payment of pension and possibly lack of any skill to engage in other non strenuous income generating activities.

Six independent risk factors were identified in the present study to predict nutritional vulnerability in the rural areas; these are level of education, socioeconomic status, number of people sharing house, steady income, smoking and alcohol status whereas three predictors namely sex, steady income and looking after small children were found in urban areas.

### 5.1.7 Dietary Intake of the elderly

Direct weighing of food intake in a week day and a weekend day is adjudged to be appropriate as it eliminates errors from inaccurate recall and loss of memory. However, the likelihood of alteration in dietary pattern remains. The dietary intake and nutrient adequacy of elderly Nigerians are described by area of residence. For the judgement of nutrient adequacy, the standards of Total Dietary Assessment software was used where energy and nutrient intakes from 80 – 120 percent were taken as adequate and intakes below and above were take as inadequate or excess respectively.

The findings show inadequate intake of both macro- and micronutrients among elderly Nigerians. More than half of the entire respondents had inadequate energy, fat, calcium, zinc and magnesium intake. The proportion of respondents with inadequate intake of calcium and zinc was particularly high.

Specifically, the mean intake of energy for the entire respondents was 1638.3 Kcal and more than half had inadequate intake. The energy intake level was higher in rural areas and there were more respondents with inadequate intake in urban areas. The high value of standard deviation in urban areas suggests a wide margin of energy intake among elderly Nigerians in these areas. This wide margin may be as a result of varying food habits, wide difference in food consumed and socioeconomic status. Likewise, excess energy intake was more common in rural than urban areas. The mean energy intake in this study is below Nigeria minimum dietary energy requirement of 1,730 Kcal/person/day (FAO, 2004). The mean intake ofthe eldely in this study compares favourably with 1,618 kcal among elderly female Nigerians (Olayiwola *et al.*, 2013), higher than 1,544 kcal among Swiss elderly (Dumartheray, Krieg, Cornuz, Whittamore, Lanham-New & Burckhardt, 2006), lower compared with 2,422 Kcal intake among elderly Italians (Leite, Nicolosi, Cristina, Hauser, Pugliese & Nappi, 2003) and 3,701 kcal among urban women in Abeokuta (Afolabi, Addo & Sonibare, 2004).

The large difference in energy intake among urban women in Abeokuta, Nigeria could be as a result of the age group used in Abeokuta study, moreover, detailed comparisons between studies are difficult because of possible differences in dietary assessment methods and nutrient databases and also because of different composition of study samples with respect to important basic characteristics, such as age, nutritional status or activity, which may influence nutritional requirements.

From the present study, one in five elderly in Ibadan had inadequate protein intake with higher proportion in rural areas despite higher mean intake in rural areas. This is consistent with earlier reports among the elderly (Lim, Cho, Nam, Lee & Park, 2000; Marshall, Stumbo, Warren & Xie, 2001). Overall mean protein intake in this study was 66.7g per day which compares favourably with 65.2 g reported among Swiss elderly (Dumartheray *et al.*, 2006) but higher than 32.13g reported among elderly male Nigerians (Olayiwola *et al.*, 2013). The high value of standard deviation in rural area suggests the co-existence of respondents with very high protein intake and those with very low intake. The mean protein intake in this study is higher than the recommended 56 g protein per day for the elderly (DRI 2002), it is however low compared with 105 g protein per day among elderly Italians (Leite *et al.*, 2003).

The mean protein intake level of the elderly in this study suggests that the risk of protein deficiency is low among these elderly; however with inadequate intake of energy, dietary protein may still be physiologically inadequate. This finding further shows that reliance of mean value of intake in dietary assessment may mask inadequate intake level in some respondents where nutrient intake is particularly high in a segment of the study population. Inadequate energy intake may have contributed to poor level of physical activity while inadequate protein predisposes to infections among the elderly.

With a mean fibre intake of 20.4g, and more than one third having intake less than 30g/day, dietary fibre intake of the elderly in Ibdan may be considered inadequate. The fibre intake falls short of dietary recommendation of 30g per day and is lower than 82.1g of dietary fibre intake reported among Swiss elderly (Dumartheray *et al.*, 2006). The observed intake level could be attributed to the poor frequency of consumption of fruits and vegetables. The higher level of intake of dietary fibre in rural than urban in this study agrees with earlier studies (Borges-Yáñez, Maupomé, Martinez-Gonzalez, Cervantez-Turrubiante, & Gutiérrez-Robledo, 2003).

The findings generally agree with the trends of dietary reports among the elderly. Hewitt *et al.* (2006) reported energy as one of the nutrients which intake may be inadequate among the elderly and this is borne out of the belief that energy needs is reduced in old age. The observed levels of intake in this study could be attributed to high level of meals skipping, low frequency of snacking/in-between meals and quantity of foods consumed by the elderly in this study. These factors have been largely reported by earlier studies (Sharkey, Branch, Zohoori, Giuliani, Busby-Whitehead & Haines, 2002; Shahar, Shai, Vardi & Fraser, 2003; Hickson 2006; Olayiwola, Fadupin, Agbato & Soyewo, 2013). The low energy intake could also be attributed to the elderly poor intake of fats which is below the recommended value.

Also, the low frequency of consumption of foods of animal origin could be responsible for the observed level of protein intake. Though plant foods can also supply protein in human diet, the quality and quantity of protein supplied is often limited except where deliberate attempt to increase intake of protein through foods of plant origin are made.

The picture presented in this study reflects the general nutrition situation in Nigeria where protein intake is grossly inadequate in several age groups resulting in a wide range of protein energy malnutrition. The low level of protein intake could also be attributed to the high cost of proteinous foods (Rao *et al.*, 2013) and the elderly constitute one of the groups that might not be able to afford costly diets. Thus, the poor socioeconomic status of the elderly may have significantly contributed to low protein intake. Similarly the lower intake in rural areas may be as a result of the limitation of foods available.

Like the macronutrients, the intake of micronutrient is below recommended level in many elderly in Ibadan. The lowest intake levels compared to the recommendation were observed for calcium where mean intakes were about one-fifth of the recommended intake level. Although the most striking result of this study is the large proportion of elderly subjects with an insufficient intake of many nutrients in both rural and urban elderly, a considerable proportion also have an excess intake of one or more.

The micronutrient intake in both areas was inadequate with seven out of ten respondents having inadequate intake level of calcium, zinc and magnesium. Except for calcium, iron and magnesium, mean intake levels of the selected micronutrients were higher in urban than rural elderly. Similarly, the mean intake of most nutrients is consistently lower in the rural group; however, the proportion of urban elderly with inadequate intake is greater than their urban counterparts for selected micronutrients except vitamin A and iron.

The mean vitamin A intake (2187.9 IU; 656.4µg per day) in the present study is similar to the levels reported among elderly Irish in Galway and similar rural/urban difference in intake was observed (Fogarty & Nolan, 1992). The higher intake of vitamin A in urban area conforms to observation among women and children in Nigeria (Maziya-Dixon *et al.*, 2004). The low level of vitamin A intake could be a result of poor intake of fat and foods of animal origin.

Mean vitamin B1 intake in this study was higher than the recommended dietary reference intake level yet one of every two elderly subjects had inadequate intake. The observed level of intake could be attributed to the high frequency of consumption of whole cereals among the elderly. The higher level of intake in rural areas is inconsistent with earlier studies and is higher than reported among elderly Isrealis and Zimbabweans (Fogarty & Nolan, 1992; Allain *et al.*, 1997; ; Shahar, Shai, Vardi & Fraser, 2003).

The exceptionally low level of calcium intake in this study is not surprising considering the low frequency of consumption of foods of animal origin and the poor feeding habits of the elderly. The large number of elderly in this study with inadequate intake level is consistent with reports from other studies (Prentice, 1997; Ariyo *et al.*, 2012; Olayiwola *et al.*, 2012).

Other minerals such as zinc, iron and magnesium intake were also grossly inadequate compared with the recommended level. A similar pattern of micronutrient intake has been reported among the elderly in Nigeria and South Africa (Oldewage-Theron & Kruger, 2008; Olayiwola *et al.*, 2012). The low level of intake of calcium, vitamin B1 and zinc is also consistent with the findings among Polish elderly (Szponar & Rychlik, 2002). The levels of these mineral could be attributed to low frequency of foods of animal origin as well as fruits and vegetables in the study population. The observed level of iron intake is anticipated following the observed frequency of vegetable and animal protein consumption which are major sources of iron in Nigerian diets. Though dietary iron of plant origin is low in bioavailability, the intake of animal foods and fruits is believed to enhance its bioavailability among Nigerians. Iron and calcium intake is of particular interest because of the importance of these minerals in blood and bone health.

The general poor level of nutrient intake level among the elderly is not surprising considering the poor feeding habit including meal skipping, low number of respondents taking in-between meals and the high level of consumption of starchy roots and tubers and cereals. It must be noted that cereals could have possibly supply certain quantities of these nutrients but dependence on highly refined cereals and the loss of nutrients following food processing and preparation limits the supply of these nutrients. Many studies have reported limited quantity of food consumed by the elderly such that intake of nutrient dense foods become inevitable. However, the cost of nutrient dense foods is often too high for the affordability of elderly. Besides, many factors have been identified to affect the food intake of the study population, some respondents (33.8%) had poor access to home garden/farms and may therefore necessary depend on food vendors inspite of poor income, non enjoyment of welfare package (51.2%) especially in the rural areas (62.4%). This is consistent with reports from other countries (Falk *et al.*, 1996; Dean *et al.*, 2009). The findings from this study suggest the need to stress the importance of increased food intake and dietary quality among elderly Nigerians.

### 5.1.8 Anthropometric Characteristics of the elderly

Anthropometric measurements refer to the assessment of body physical dimensions which are significant determinants of health and diseases. Underweight is an indication of poor energy reserve and a predisposing factor for infection.

In this study, the mean BMI of the elderly was within the normal range yet the prevalence of underweight was 20.5 percent, 16.8 percent and 17.1 percent using BMI from armspan, BMI from height and MUAC respectively. These percentages were consistent with reports of earlier studies in Nigeria (Ojofeitimi *et al.*, 2002; Olayiwola *et al.*, 2012; Olayiwola *et al.*, 2013). These levels are also consistent with the levels of underweight that has been widely reported among the elderly globally (Chen, 2005; Johansson *et al.*, 2009). However, the observed level of underweight is higher than reported among young adult Nigerians (Bakari *et al.*, 2007; Sola, Steven, Kayode, and Olayinka, 2011). This confirms that malnutrition affects older population more than the general population.

The wide difference in the observed levels using various parameters could be attributed to the varying sensitivity of these approaches. The higher level of underweight obtained using armspan conforms to the report that malnutrition may be underestimated in the use of body mass index from height for the elderly following the gradual loss in height in old age (Ismail and Manadhar, 1999).

Using similar criteria as in underweight, the prevalence of overweight was 7.8 and 9.8 percent in urban and rural areas respectively. The level of overweight in this study is higher than 4.5% among the elderly in Bangladesh (Faruque, Khan, Roy, Malek, Salam, & Khaled,

2006) and is similar to 10 percent among elderly Indians (Mohapatra, Gambir, Singh & Mishra, 2010). The level of overweight in this study is however lower than reported among adult Nigerians in different parts of the country (Siminialayi *et al*., 2008; Amole, OlaOlorun, Odeigah, and Adesina, 2011; Odenigbo, Odenigbo, Oguejiofor, and Adogu, 2011; Adienbo, Hart and Oyeyemi, 2012).

Despite a mean MUAC value higher than the reference limit, 15.5% and 18.5% of the elderly urban and rural elderly respectively had MUAC values suggesting malnutrition which indicates a reduced muscle mass. The mean MUAC in this study compares favourably with the values reported among elderly in Abia State Nigeria (Nzeagwu and Uwaegbute, 2013). Contrary to earlier study, the percentage of respondents that were malnourished using MUAC is lower in this study than when BMI was used (Nzeagwu and Uwaegbute, 2013). MUAC is a known measure of protein and energy reserves in a population and low values is an indication of protein energy malnutrition

This study shows increasing level of malnutrition with increasing age which agrees with the findings among the elderly in Bangladesh (Faruque *et al*., 2006). The proportion of both rural and urban elderly with low anthropometric values could be attributed to inadequate dietary intake and may suggest that low intake resulting in poor fat stores and reduced muscle mass.

The nutritional status in the current study was generally poor as reflected by the average values recorded for BMI and MUAC. The finding may be attributed to poor food habit and lifestyle. The BMI is an important measure because of its established relationship to mortality rates.

Malnutrition, low body mass index (BMI) and low MUAC are risk factors for mortality and have a negative influence on the functional status and psychosocial well-being of the aged population (Dey *et al*., 2001; Crogan & Pasvogel, 2003). The study revealed that malnutrition is a common problem among elderly in both urban and rural areas. In addition, studies have illustrated that elderly people who are underweight are at greater risk of acute illness and death (Van Nes *et al.*, 2001; Villareal *et al.*, 2005). The underweight elderly in addition have a high risk of falls, prolonged hospitalization, post operative complications, infection, complicated wound healing, reduced rates of drug metabolism and death (Chen *et al.*, 2001; Chapman, 2006). The implications of poor mid upper arm circumference include loss of muscle (Hickson, 2006) and increased susceptibility to infections (Prasad, 1995).

Eight independent risk factors were identified in the present study to predict underweight among the elderly in different areas. These are socioeconomic status, sex, income, household member working in agriculture, income spent on food and looking after small children. The logistic regression showing the relationship between residential location and these risks indicates that a larger disadvantage occurs in rural elderly than that of urban elderly.

The observation made in this study shows that elderly's socioeconomic status, sex, steady income and having household member working in agriculture influence nutritional status in both rural and urban areas. In addition, income spent on food and taking care of children in rural areas and having significant debt in urban areas were other significant factors. This is confirmation of the importance of educational level to the quality of life especially nutritional status of the elderly. Education as a determinant factor in nutritional status shows the need for older people to have access to appropriate education and training programme. In Nigeria, education is a gatekeeper of privilege and opportunity, hence reforming education to better serve poverty eradication even among the elderly is a necessary political process.

The observations made in this study suggest that socioeconomic status is an important determinant of nutritional status in elderly. The findings from this study indicates that malnutrition among elderly Nigerians occur in an unequal manner, with the extent and magnitude of problem being more severe in rural areas.

## 5.2 CONCLUSION

The findings in this study showed that despite the similarities in the socio-demographic and household characteristics of urban and rural elderly in Ibadan, the lifestyle, socio-economic status and social support differ. Social support was more in urban even though such support is more needed in rural areas. Age friendliness was generally poor, however, rural elderly appeared to enjoy age-friendliness than urban elderly of Ibadan.

Furthermore, unhealthy lifestyle, undernutrition and nutritional vulnerability were higher in rural than urban areas. Unhealthy lifestyle among elderly in Ibadan is chiefly defined by physical inactivity and low frequency of consumption of fruits and vegetables especially in rural areas. Also, no substantial variation exists in the food habit and consumption of urban and rural elderly in Ibadan except for consumption of foods of animal origin.

Food insecurity in the elderly in Ibadan is lower than the reported national average but more severe among the rural than the urban elderly. Likewise elderly in rural areas were more nutritionally vulnerable and this was influenced by age in the rural areas, marital status, level of education and income.

Many elderly in Ibadan had inadequate intake of both macro and micronutrients and the most affected nutrients were energy, fat, calcium, zinc and magnesium intake. The poor dietary intake could be attributed to the elderly poor lifestyle and dietary habit.

Double burden of malnutrition is present among elderly in Ibadan and cuts across both urban and rural areas. However, undernutrition was more common and more severe in rural areas.

### 5.3 CONTRIBUTION TO KNOWLEDGE

This study has contributed the following to knowledge:

a. The socio-economic status of the elderly in urban and rural areas differs with higher proportion of poor elderly residing in rural than urban areas.
b. Notwithstanding the predominance of poor elderly in the rural areas, social support was mainly available in urban areas and caregiving though generally good, was higher in rural than urban areas.
c. The lifestyle of elderly was good, but physical activity and fruits and vegetable consumption were low in rural areas.
d. Food security was higher in urban than rural areas, consequently nutritional nutritional vulnerability was higher in rural than urban areas.
e. The urban elders were better nourished than rural elders; having better diversity of food intake.
f. The urban elders had higher body mass index despite higher physical activity level
g. The predictive factors for nutritional vulnerability of the elderly were found to be socioeconomic status, gender, income and amount spent on food.

## 5.4 RECOMMENDATION

Following the observations made in this study, the following recommendations are hereby made:

In view of the substantial proportion of the elderly Nigerians without a stealthy income as well as food insecurity, it is hereby recommended that a social assistance scheme which may be food or monetary based be instituted as support for the elderly especially those in rural areas.

The low level of age friendliness in this study indicates the need to consider the older population in community activities and programmes and also create an enabling environment for them to participate in physical activities. It is hereby recommended that development projects at every level of government should be certified age-friendly before approval is granted. Likewise, organizations with mandate that covers the welfare of older population such as African Gerontological Society should ensure that elderly residing in rural areas are adequately considered in programmes, projects and interventions.

Thirdly, following several differences in the lifestyle behaviours of elderly in Ibadan residing in rural and urban areas, it is hereby recommended that policy and programme be made to support healthy lifestyle behaviours within the context of the environments in which older people live. Particularly, the poor level of physical inactivity indicates the need for healthy lifestyle-promoting programmes in our communities. This may involve the use of models to encourage older people to be engaged in age-appropriate physical activities.

Interventions in nutrition and health services should be expanded to include the elderly as one of the vulnerable groups especially the elderly in rural areas.

To overcome the poor dietary intake, nutrition education and home gardening to promote good food habit and consumption pattern among the elderly should be promoted.

Lastly, following the observed substantial proportion of elderly in both urban and rural areas with good nutritional status, lifestyle and food habit; further studies are hereby recommended to determine and define nutritional and lifestyle best practices among these elderly for possible sharing among other elderly.

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## APPENDIX 1

## INFORMED CONSENT FORM (ENGLISH LANGUAGE)

My name is ARIYO, Oluwaseun. I am a student of the Department of Human Nutrition and Dietetics, University of Ibadan, Ibadan. We are interviewing older persons in four Local Government Areas in Ibadan to evaluate the lifestyle, social support, nutritional vulnerability and nutritional status of the respondents. Please note that your answer will be kept confidential. You will be given a number and your name will not be written on the form so that your name will never be used in connection with any information you give. The information you and other people give may be used by the Government to reduce malnutrition in older Nigerians.

During this exercise, dietary and anthropometric assessment will be carried out on you. This will include on site weighing of your food and drinks before consumption, and measuring your weight, height, armspan/halfspan and mid upper arm circumference. You will be given dietary counseling where necessary and the process will not cause you any harm or injury. Your honest answers to the questions will help us to better understand what people think, say or do with respect to their dietary habits and food intake.

You are free to refuse to take part in this programme. You have the right to withdraw at any given time if you choose to. We will greatly appreciate your help in responding to the survey and taking part in the study.

**Consent**: Now that the study has been well explained to me and I fully understand the content of
the study process. I will be willing to take part in the programme.

……………………………………  ……………………………

Signature/Thumbprint of Participant/Date  Interview Date

…………………………………………

Signature/Thumbprint of Witness/Date

## APPENDIX 2

### IWE MO GBA LATI KO PA NINU IWADI YI (YORUBA LANGUAGE)

Oruko mi ni ARIYO, Oluwaseun. Mo je akeko ni Eka Human Nutrition and Dietetics, University of Ibadan, Ibadan. Mo nfi oro wa awon agbagba lokunrin ati lobirin ni Ijoba Ibile merin ni agbegbe Ibadan wo lati se iwadi lori igbe aiye won, awon atilehin ti won ri gba lati odo Ijoba ati lodo awujo, ati awon nkan ti o je mo eto ilera won nipa ti ounje jije ati awon nkan miraan ti o ro mo.

Mo fi da yin loju wipe ohunohun ti e ba so fun wa yio wa ni ipamo lai so fun enikeni. A ko ni fi oruko yin si ori iwe iforowa ni lenu wo yin. Awon koko oro lsti mu igbaye gbadun to mode atagba, ati okunrin ati obirin da ra si ni a le lo lati je ki aito ohunje ati ohun ti o ro mo dinku lawujo wa.

Ni gbs ti a ban se ise iwadi yi, awon ibere lori ohunje yin le jeyo, beeni a le won ohunje ati awon nkan mimu yin ki e to e je won. Bee pelu a yo won giga yin ati odiwon yin pelu. Ni bi ti o ba ti ye, a le gbayin nimoran lori ohun jije aati mimu lona ti ko ni pa yi lara rara.

Nipa bayii, mo ntoro ifowo so wopo yin, ni fi fun wa ni awon esi ti o je otito, ti o si peye si awon ibere wa.

Eni anfaani lati ma ko pa ni nu iwadi yi, bee pelu ni e le yowo pe e ko se mo ni igba kigba to ba wu yin. Awa yio mo loore bi eba le gba lati je okan ninu awon olukopa ninu iwadi yi.

**Mogba**: Nisisinyi ti mo ti gbo alaye lori iwadi ijinle yi ati pelu pe ohun ti won fe se ti ye mi yeke yeke. Mo ti gba beni mo se tan lati ko pa ninu eto iwadi ijinle yi.

……………………………………… ……………………………

Ifowosi iwe/Mo teka pe mo gba/Ojo Ojo ti a se iwadi yi

…………………………………………

Ifowosi iwe/Mo teka pe mo wa ni be, oju mi lo se/Ojo

## APPENDIX 3
## LIFESTYLE, NUTRIENT INTAKE AND NUTRITIONAL RISKS FACTORS AMONG OLDER PERSONS IN RURAL AND URBAN AREAS OF IBADAN

ID/Name: Community: Ward: LGA:
Sector: Rural Urban

Instruction: Please circle or write in space______________

A. SOCIOECONOMIC, LIFESTYLE & ENVIRONMENTAL CHARACTERISTICS

1. Age of respondent (years) ………………..

2. Sex (a) Male (b) Female

3. Marital status (a) Single (b) Married (c) Widow (er) (d) Separated (e) Divorced

4. Do you have children? Yes/No. **If yes**, give the No Male_____ Female____ Total____

5. Religion (a) Christian (b) Muslim (c) Traditional (d) Others specify___________

6. Highest Education (a) None (b) Primary (c) Secondary (d) Tertiary (e) Others ______

7. Occupation (a) Retiree (b) Artisan (c) Farmer (d) Trader (e) Others _________

8. What is your household monthly income (₦)? (a)< N5000 (b) N5000-N10 000 (c) N10 001 – N15 000 (d) N15 001- N20 000 (e) N20 001-N25 000 (f) > N25 000

9. What percentage of the household income is spent on food? (a) 10% (b) 20% (c) 25% (d) 30% (e) 40% (f) 50% (g) >50%

10. How do you obtain food? __________________

11. Who prepares the food? ___________________________

12. Source of cooking fuel? (a) Firewood (b) Kerosene (c) Gas (d) Electricity (e) Others_

13. Type of house? (a) Mud house (b) Brick house (c) Thatched roof house

14. Housing type (a) Duplex (b) Flat (c) One room apartment (d) Rooming type

15. Type of toilet facility (a) Water closet (b) Latrine (c) Communal latrine (d) Stream/Bush

16. Source of cooking & drinking water: (a) Rain (b) Borehole (c) Public Tap (d) Well (e) Stream (f)Bottle (g) Others________

17. How far is clean water access from the home? Inside <10m <30m <100m >100m

18. Who is responsible for fetching the water? ________________________________

19. How is garbage managed: Buried  Dumped  Burned  *Do not know*

20. Is food washed with fresh water before preparation?  Yes  *No*

21. Is fresh water available to bathe: Daily  Weekly  *Less frequent*  *Do not Know*

22. Does the respondent have soap & enough water to wash dishes and utensils? Yes *No*

23. How many people does the respondent share housing with?
 (a) 1-3 (b) 4-6 (c) 7-9 (d) >9

24. Has respondent's housing changed in past twelve months? Yes  *No*

25. Does respondent's family own their house/land? Yes  No

26. Are there extended family households within 5km? Yes  *No*
 If yes, how many?___________________________________

27. Does respondent's household have a steady income? Yes  No

28. Has household income fallen in the past year?  *Yes*  No

29. Is household income adequate to purchase enough food?  Yes  *No*

30. Does the household have significant debts? Yes  No

31. Ready access to gardens/farms or shops for food for your household?  Yes  *No*

32. Does your household have a refrigerator?  Yes  *No*

33. Do you enjoy welfare or support package from any group. If yes, indicate;
 **Relations  Friends  Religious  body  NGO  LGA  State  Federal**

## B. FOOD HABITS & LIFESTYLE VARIABLES

34. Do you smoke Yes  No  **If Yes**, how many sticks a day? _______

35. Numbers of hours spent watching TV a day ________________

36. Numbers of hours spent sleeping a day ________________

37. What is your energy level? (Circle)
 **Worst 1-------2-------3-------4-------5-------6-------7-------8-------9-------10 Best**

38. Do you have physical activity/exercise that is equivalent or higher than 30 minutes walk daily  Yes  No

39. How many times a day do you eat?
Once Twice Thrice > Thrice

40. Is there enough food available for you to eat three meals a day? Yes *No*

41. Have you skipped any meals in the past month? *Yes* No If yes, how many? ______

42. Which meal do you normally skip?
Breakfast 11:00 Clock Lunch 4:00 Clock Dinner Bedtime

43. Why do you skip the meal(s) ________________________________

44. Where is the food prepared? Home Family Neighbor Other

45. What type of food do you normally take during these meals?

a. Breakfast ……………………………………………..
b. 11:00 Clock…………………………………………..
c. Lunch…………………………………………………
d. 4:00 Clock……………………………………………
e. Dinner…………………………………………………
f. Bedtime……………………………………………….

46. How much water does the respondent drink each day? >3 liters 1-3 liters *<1liter*

47. How much soda/carbonated beverage weekly? *>3 liters* 1-3 liters <1liter

48. Is the respondent a *heavy drinker? Yes No *More than five bottles weekly

49. Is there any food restrictions with meat, vegetables, starches, other? *Yes* No

50. Do you eat alone most of the times? Yes No

51. Type of daily activities engaged in apart from work ______________________

**C. FOOD SECURITY**

52. Working status of respondent? No Full time Part time Irregularly

53. How many people in the household are working?
Full time _____ Part time_____ Irregularly_____ Total ________________

54. Does illness prevent anyone in the household from working? *Yes* No

55. How many members of the household are dependent/unemployed? __________

56. No of people in the household/ HH size ______________

57. How many people does your household feed each day? __________

58. Does the household have any non-family members? Yes No (how many?)___

59. Are there adequate funds in the home to purchase food regularly? Yes *No*

60. Is someone in the household able to shop for household food when needed? Yes *No*

61. How much household (HH) income is spent of alcohol? <10% *10-20%* *>20%*

62. How much household income is spent on food? <10% 10-30% *30-60%* *>60%*

63. Where does the food come from? Market Supermarket Home Garden

64. Does anyone in the household grow food consumed at home? Yes *No*

65. How much HH income is spent on health care? <10% 10-30% *30-60%* *>60%*

66. Does the respondent have storage to keep foods cold (refrigerator/freezer)? Yes *No*

67. Does the respondent or HH member(s) work in farming/agriculture? *Yes* No

68. Does the respondent or family own/keep animals? *Yes* No

69. If so how many of which animals? Fowl ___ Cows___ Goats___ Lamb___ Other___

70. How many school age children live in the household? ________

71. Are any school age children in the household not attending school? Yes No

72. If yes, please list their ages and circle reasons why: Working: _________
Too far away: _________ Cost/fees: _________ Need at home: _________

73. In the past month has the respondent missed meals due to not enough food?
Yes No if Yes, how often? ……………………………………………….

74. In the past month has a child in the household missed meals due to not enough food? Yes No if Yes, how often? _________________________

75. In the past month has anyone in the house gone to sleep hungry due to not enough food? Yes No

76. In the past 3 months have you worried about having enough food in the house?
Yes No if Yes, how often? _______________________

77. In the past 3 months, have you found any foods that you typically eat unavailable?
Yes No if Yes, how often? ________________________

78. In the past 3 months, have you had to eat any foods that you typically do not eat?
Yes No if Yes, how often? _______________________

79. In the past 3 months, have you experienced limited choice of familiar foods?
Yes No if Yes, how often? _______________________

80. In the past 3 months, have you found any foods that you typically eat unavailable?
Yes No if Yes, how often? ___________________

81. In the past year has anyone in the house lost weight due to not enough food?

Yes No if Yes, how many? ___________________________

| D. NUTRITIONAL VULNERABILITY RISK FACTOR CHECKLIST OF THE ELDERLY | | | |
|---|---|---|---|
| RISK FACTOR GROUP | RISK FACTOR CHECKLIST | Yes (Y) No (N) | Comments |
| Health | Is there disease or sickness?<br>Is there constipation?<br>Is there problem with digestion?<br>Is there infection, fever?<br>Does he/she take medication?<br>Is he/she a heavy smoker?<br>Is he /she a heavy drinker? | | |
| Food Intake | Is there poor nutrition knowledge?<br>Is there insufficient good quality food?<br>Does he/she eat no/few fruits and vegetables?<br>Are there wastage and/or rejection of the food available?<br>Are there missed meals, snacks, and/or drinks?<br>Do you have poor appetite?<br>Do you prefer foods other than those available in the house?<br>Do you eat alone?<br>Do you have poor teeth/problems chewing food? | | |
| Economics | Is there a low budget for food?<br>Is there insufficient land to grow food?<br>Is there debt?<br>Is the household money outside your control? | | |
| Disability | Is he/she physically disabled?<br>Have you suffered a recent injury?<br>Does he/she have poor eyesight?<br>Does he/she have poor mobility?<br>Does he/she get little exposure to sunlight?<br>Is he/she housebound? | | |
| Functional Ability | Do you need help with self-feeding?<br>Is his/her strength poor?<br>Is his/her manual dexterity poor?<br>Is his/her coordination poor? | | |
| Family Life | Does he/she live alone?<br>Is he/she without a regular caregiver?<br>Is he/she looking after small children?<br>Are adult children far away? | | |
| Psychological or Emotional | Has he/she recently lost a loved one?<br>Has he/she witnessed traumatic events?<br>Is he/she depressed?<br>Is he/she living in an unknown/new community?<br>Is he/she suffering from mental illness?<br>Is he/she suffering memory loss/confusion? | | |

## E. TWO-DAY FOOD WEIGHING RECORD

| Meal | Time | Food/Drink description | Weight of Food and plate (g) | Weight of left over (g) | Weight of Food/Water consumed |
|---|---|---|---|---|---|
| | | | | | |
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| | | | | | |

### F. Anthropometric

Weight ______kg  Halfspan ________________ cm

Height ________cm  Armspan ________________ cm

BMI[1] _______kg/$m^2$  MUAC __________________ cm

[1] Body Mass Index  Is this value less than 23 cm? *Yes** No

## G. FOOD FREQUENCY QUESTIONNAIRE

| FOOD LIST BY GROUP | FREQUENCIES OF CONSUMPTION PER WEEK | | |
|---|---|---|---|
| | Frequently consumed<br><br>(4-7 X weekly) | Moderately consumed<br><br>(1-3X weekly) | Never consumed<br><br>(0 X weekly) |
| **Fruits**<br>Mango, orange, apple, cashew, cantaloupe, grapes, strawberries, bananas, lemons, olives, pawpaw, guava, tangerine, pineapple, cherry, etc. | | | |
| **Vegetables**<br>Amaranth, spinach, lettuce, cabbage, tomatoes, garden egg, carrot, etc. | | | |
| **Animal Protein foods**<br>Fish & other sea foods, Milk & milk products, Meat & meat products, Poultry & Egg, Snail, Edible insects, etc. | | | |
| **Legumes**<br>Beans, Soybeans, Melon, Peas, Locust beans, Peanuts, Groundnuts, etc. | | | |
| **Cereals**<br>Wheat, rice, semovita, bread, tuwo, solid pap (agidi), maize gruel (ogi), kunnu, sorghum, maize, rye, oats, barley etc. | | | |
| **Roots & tubers**<br>Yam, potatoes, cocoyam, cassava, tapioca, lafun, garri, fufu, eba, apu, abacha, etc. | | | |

**Comparative Age-friendliness of Study Areas**

This WHO checklist is a tool for a community's self-assessment and a map for charting progress.

| **. Outdoor spaces and buildings** | Yes | No |
|---|---|---|
| 1. Are public areas clean and pleasant? | | |
| 2. Are there sufficient, well-maintained and safe green spaces and outdoor seating? | | |
| 3. Are the pavements well-maintained, free of obstructions and reserved for pedestrians? | | |
| 4. Are the pavements non-slip and wide enough for wheelchairs? | | |
| 5. Are the pedestrian crossings sufficient in number and safe for people with different levels and types of disability, with non-slip markings and adequate crossing times? | | |
| 6. Do drivers give way to pedestrians at intersections and pedestrian crossings? | | |
| 7. Is outdoor safety promoted by good street lighting, police patrols & community education? | | |
| 8. Are services situated together and accessible? | | |
| 9. Are special customer service arrangements provided (separate queues for older people)? | | |
| 10. Are public toilets outdoors and indoors sufficient, clean, well-maintained and accessible? | | |
| | | |
| **B. Transportation** | | |
| 1. Are public transportation costs consistent and affordable? | | |
| 2. Are public transportation reliable and frequent? | | |
| 3. Are community areas and services accessible by public transport? | | |
| 4. Are vehicles clean, well-maintained, accessible and have priority seating that is respected? | | |
| 5. Do drivers stop at designated stops to facilitate boarding and wait for passengers to be seated before driving off? | | |
| 6. Are transport stops and stations conveniently located, safe, clean, well-lit and well-marked, with adequate seating and shelter? | | |
| 7. Are voluntary transport services available where public transportation is too limited? | | |
| 8. Are Taxis accessible and affordable and drivers are courteous and helpful?. | | |
| 9. Are roads well-maintained, with covered drains and good lighting? | | |
| 10. Is traffic flow well-regulated? | | |
| 11. Are roadways free of obstructions that block drivers' vision? | | |
| 12. Are traffic signs and intersections visible and well-placed? | | |
| 13. Are driver education and refresher courses promoted for all drivers? | | |
| 14. Are parking and drop-off areas safe, sufficient in number and conveniently located? | | |
| 15. Are priority parking & drop-off spots for people with special needs available & respected? | | |
| | | |
| **C. Housing** | | |
| 1. Is sufficient & affordable housing available in areas that are safe and close to services and the rest of the community? | | |
| 2. Are sufficient and affordable home maintenance and support services available? | | |

| | | |
|---|---|---|
| 3. Is housing well-constructed and provides safe and comfortable shelter from the weather? | | |
| 4. Do interior spaces and level surfaces allow freedom of movement? | | |
| 5. Are home modification options and supplies available and affordable? | | |
| 6. Is public and commercial rental housing clean, well-maintained and safe? | | |
| 7. Is sufficient & affordable housing for frail elderly with suitable services provided locally? | | |
| | | |
| **D. Social participation** | | |
| 1. Are venues for events and activities conveniently located, accessible, well-lit and easily reached by public transport? | | |
| 2. Are events held at times convenient for the elderly? | | |
| 3. Can activities and events be attended alone or with a companion? | | |
| 4. Are activities and attractions affordable, with no hidden or additional participation costs? | | |
| 5. Is good information about activities and events provided for older people? | | |
| 6. Is a wide variety of activities offered to appeal to a diverse population of older people? | | |
| 7. Is there consistent outreach to include people at risk of social isolation? | | |
| | | |
| **E. Respect and social inclusion** | | |
| 1. Are the elderly regularly consulted by public and voluntary services on social issues? | | |
| 2. Are services and products provided to suit varying needs and preferences of the elderly? | | |
| 3. Are service staff courteous and helpful? | | |
| 4. Are the elderly visible in the media and depicted positively and without stereotyping? | | |
| 5. Do community-wide settings and activities accommodate age-specific needs & preferences? | | |
| 6. Are the elderly specifically included in community activities for families? | | |
| 7. Do schools provide opportunities to learn about ageing and elderly? | | |
| 8. Are the elderly recognized by the community for their past and present contributions? | | |
| 9. Do the poor elderly have good access to public, voluntary & private services? | | |
| | | |
| **F. Civic participation and employment** | | |
| 1. Are equalities of older employees well-promoted? | | |
| 2. Is a range of flexible & appropriately paid opportunities for elderly to work promoted? | | |
| 3. Is age discrimination forbidden in the hiring, retention, promotion & training of employees? | | |
| 4. Are workplaces adapted to meet the needs of disabled people? | | |
| 5. Are self-employment options for older people promoted and supported? | | |
| 6. Is training in post-retirement options provided for older workers? | | |
| 7. Do Decision-making bodies encourage and facilitate membership of older people? | | |
| | | |

| | | |
|---|---|---|
| **G. Communication and information** | | |
| 1. Does a basic, effective communication system reaches community residents of all ages? | | |
| 2. Is a regular, coordinated and centralized distribution of information provided? | | |
| 3. Are regular information and broadcasts of interest to older people offered? | | |
| 4. Is oral communication accessible to older people promoted? | | |
| 5. Does elderly at risk of social isolation get one-to-one information from trusted individuals? | | |
| | | |
| **H. Community and health services** | | |
| 1. Is an adequate range of health and community support services? | | |
| 2. Do home care services include health and personal care and housekeeping? | | |
| 3. Are health & social services conveniently located & accessible by all means of transport? | | |
| 4. Are residential care facilities and designated older people's housing located close to services and the rest of the community? | | |
| 5. Are health and community service facilities safely constructed and fully accessible? | | |
| 6. Is clear and accessible information provided about health & social services for the elderly? | | |
| 7. Is delivery of services coordinated and administratively simple? | | |
| 8. Are all staff respectful, helpful and trained to serve older people? | | |
| 9. Are economic barriers impeding access to health & community support services minimized? | | |
| 10. Are voluntary services by people of all ages encouraged and supported? | | |
| 11. Are there sufficient and accessible burial sites? | | |
| 12. Does community emergency planning take into account the vulnerabilities and capacities of the elderly? | | |

## APPENDIX 4

**TELEGRAMS……………..** **TELEPHONE……………..**

# MINISTRY OF HEALTH

**DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION**

**PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA**

***Your Ref. No.* …………………………..**

*All communications should be addressed to*
*the Honorable Commissioner quoting*
Our Ref. No. AD 13/ 479/269

18th September, 2012

The Principal Investigator,
Department of Human Nutrition,
College Of Medicine,
University of Ibadan,
Ibadan.

**Attention: Ariyo Oluwaseun**

Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled: "Comparison of Lifestyle, Nutrient Intakes and Nutritional Risks Factors among Older persons in Rural and Urban Areas of Ibadan, Nigeria."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey, to you, the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor, closely, and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. Wishing you all the best,

OYO STATE RESEARCH ETHICAL REVIEW COMMITTEE
Signature & Date
MINISTRY OF HEALTH, IBADAN

Mrs. V. A. Adepoju
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