KNOWLEDGE AND PREVENTIVE PRACTICES OF TYPE 2 DIABETES MELLITUS AMONG IN-SCHOOL ADOLESCENTS IN RURAL AREAS OF EJIGBO LOCAL GOVERNMENT, OSUN STATE

BY

Abimbola Oyeladun FASINA
B.Sc (Ed.) Health Education (Ekiti State University)
Matric. No.: 203905

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ABSTRACT

Type 2 diabetes as one of the groups of diabetes occurs as from the body's inability to respond properly to the action of insulin produced by the pancreas. Type 2 diabetes among adolescent is becoming a major and growing public health concern in Nigeria due to lack of knowledge and increasing rate of adolescents getting invovled in practices that can expose them to risk of the disease. This has not been well investigated among adolescents in the rural community. Therefore, this study examined the knowledge and preventive practices of type 2 diabetes mellitus among in-school adolescents in rural areas of Ejigbo Local Government, Osun State.

This study was a descriptive cross-sectional study using a four-stage sampling techniques in selecting 302 in-school adolescents from five rural communities. A validated semi-structured interviewer-administered questionnaire that contained a 66-points knowledge scale was used for data collection. Knowledge scores of ≤ 22 were rated as poor, >22 - 44 were categorized as fair and >44 as good. A 8-point preventive practice scale, ≤5 point as poor and >5 point as good. Height and weight measurements were taken using a stadiometer and weighing scale respectively. The body mass index (BMI) of the respondents was calculated by dividing the weight measurements by the height measurements. The data collected were analysed using descriptive statistics and inferential statitics at $p<0.05$ level of significance.

Respondents' age was 16.1±1.7 years. Majority (97.0%) of the respondents have heard about diabetes, where 76.8% indicated Radio as the major source of information for diabetes. 65.5% of the respondents had fair knowledge of type 2 diabetes. Majority of the respondents (73.4%) correctly stated frequent urination, 38.6% indicated frequent drinking of water and 30.4% reported that being overweight can be linked to type 2 diabetes**.** More than half (57.3%) of the respondents had good preventive practices of type 2 diabetes. Only (13.6%) of respondents reported to have ever tested for blood sugar, less than 10.0% of the respondents (7.9%) had a family history of diabetes, 4.0% of the respondents reported smoking tobacco products daily and 8.3% of the respondents take alcoholic drinks. More than half (72.5%) of the respondents had normal weight, 22.5% were underweight and a few respondents (5.0%)

were overweight. There was a statistically significant association between knowledge of respondents and preventive practices of type 2 diabetes.

This study showed that respondents had fair knowledge and good preventive practices of type 2 diabetes. In addition, few of them indulged in unhealthy dietary and other lifestyles that could put them at risk of type 2 diabetes. Awareness through the use of Behavioural Change Communication materials and inclusion of non communicable disease education especially diabetes education in the curriculum of secondary school students are hereby recommended.

Key words: Type 2 diabetes, In-school adolescents, Preventive practices
Word count: 452

DEDICATION

This project is dedicated to God Almighty, the omnipotent, for the Ggrace given to me and also to my parents; Dn & Mrs M.A.O. Fasina.

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CERTIFICATION

I certify that this project was carried out, under my supervision by Abimbola Oyeladun FASINA in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

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SUPERVISOR

Dr. Yetunde O. John-Akinola

B.Sc., MPH (Ibadan), Ph.D (Galway)

Department of Health Promotion and Education,

Faculty of Public Health, College of Medicine,

University of Ibadan.

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LIST OF ABBREVIATIONS/ACRONYMS

CDC	Centre for Disease and Control
T2DM	Type 2 diabetes Mellitus
T1DM	Type 1 diabetes Mellitus
DM	Diabetes Mellitus
BMI	Body Mass Index
WHR	Waist-Hips Ratio
TV	Television
WHO	World Health Organisation
ADA	American Diabetes Association
IDF	International Diabetes Federation
BCC	Behavioural Change Communication
SPSS	Statistical Package for Social Sciences

CHAPTER ONE

INTRODUCTION

1.1 Background

Globally, diabetes is classified as one of the most frequent non-communicable diseases. It has become a major and growing public health issue in developing countries, as it has been for a long time in the most developed countries (Hall et al., 2011). Diabetes Mellitus (DM) is categorized as a metabolic disease which is distinguished by hyperglycemia emanating from defects in insulin production, insulin action, or both (Craig et al., 2009). According to the Global Burden of Disease Study (2013), diabetes mellitus was discovered to be the major cause of death. Diabetes mellitus was originated from a Greek word, which indicated "diabetes" as 'passing through' and "mellitus" as 'sweet honey', diabetes mellitus is commonly called diabetes, which people refer to as 'too much sugar' (Bakhru, 2010). It is a severe and chronic illness that occurs as a result of low production of insulin by the pancreas (a hormone which controls blood sugar level) or inability of the body system to utilize the insulin it produced successfully (WHO, 2016). Diabetes mellitus is an important risk factor for blindness, vascular disease, brain diseases renal failure, and limb amputations (WHO, 1999; Motala, et al. 2003). Increase in blood glucose causes serious damage to some of the body systems to like, heart, blood vessels, eyes, kidneys and nerves (WHO, 1999).

Diabetes can be grouped into three; Type 1 (also known as Insulin-dependent or juvenile), type 2 (also called non-insulin dependent diabetes or adult onset diabetes) and gestational diabetes mellitus. Insulin-dependent or juvenile which is popularly called type 1 diabetes is a severe disorder where there is little or no production of insulin by the pancreas (American Diabetes Association, 2000). Currently, type 1 diabetes is not preventable and its cause is not known thereby making people living with type 1 diabetes to be sustained by insulin injections in order to control their sugar level, they cannot survive without daily provision of insulin to control the quantity of glucose in their blood (WHO, 2016). Globally, type 1 diabetes is known to be the most frequent critical disease and its occurrence is escalating in many countries among children, it is approximated to affect 497,100 children globally and more than 79,000 children that are under 15 years develop type 1 diabetes every year. (IDF, 2013).

Type 2 diabetes occurs as a result of inability of the body respond appropriately to the insulin that is produced by the pancreas is increasing rapidly worldwide among children and adolescents, which also tends to endanger their lives ability to obtain a healthy and achievable future (Urrutia-Rojas and Menchaca, 2006; IDF, 2013).

Type 2 diabetes is now frequent and it has the huge population world's diabetes cases, it is reported to have caused 90% of diabetes cases (WHO, 1999). Over the years, it is known to be the disease of the elderly, although the middle-aged and the elderly are at higher risk of having type 2 diabetes but the occurrence is becoming more escalating among adolescents. With the increased rate of type 2 diabetes among adolescents, it is probably going to be the main form of disease in children within the next 10 years in many countries, as it is currently occurring in adolescents in many countries, which include, Japan, the U.S., India, Australia, and the U.K. (Ramachandran et al., 2003; Alberti et al., 2004; WHO 2016). The report of type 2 diabetes in adolescents is increasing worldwide, as it been recorded to have affected some as early at 8years old (Alberti et al., 2004). Unhealthy lifestyles, industrialization and globalization have intensified the rate of type 2 diabetes in adolescents (Alberti et al., 2004; Longo, *et al. 2012*).

Diet and a healthy lifestyle are the functional ways of preventing and controlling type 2 diabetes among children and adolescents at high-risk (IDF, 2017). Excess body fat due to consumption of unhealthy meals and physical inactivity are categorised to be the most powerful and largest risk for type 2 diabetes and causing a huge percentage of the global burden on diabetes (GBD, 2013). The relationship between Waist Circumference and Body Mass Index may be different in various populations, an increase in waist circumference and body mass index (BMI) are connected with the escalated risk of type 2 diabetes (Vazquez *et al*, 2007). Frequent urination, increased thirst, frequent hunger, reducing weight, vision impairment and tiredness are regarded as symptoms of type 2 diabetes, which is similar to type 1 diabetes and makes it difficult to diagnose until there are complications (WHO, 2016). Type 2 diabetes treatment in adolescents is insufficient and is limited to two drugs which are insulin and metformin and also a healthy lifestyle. Comprehensive and informed knowledge of preventive practices of type 2 diabetes among the general public especially the adolescent is urgently needed.

Risk factors for type 2 diabetes can be categorised into modifiable and not modifiable. Those that are not modifiable include genetics, ethnicity and age and the modifiable ones are being overweight or obese, unhealthy meal, lack/insufficient physical activity, smoking and consuming alcohol can be influenced through behavioural and environmental changes (WHO, 2016).

1.2 Statement of the problem

Diabetes prevalence has been on increase for many years. Population growth and ageing cause one-third of type 2 diabetes worldwide, 28% resulted from high age-specific prevalence and 32% are from the interaction of population growth and ageing (Slingerland, 2006). In 2017, it affects 425 million people worldwide, which is envisaged to increase to 629 million by 2045 (International Diabetes Federation, 2017). By 2045 in Africa, the rate of people that will be affected with diabetes is foreseen to have increased by 162.5% by 2045 (IDF, 2017). According to IDF (2017), Nigeria is one of the countries that have high numbers of people living with diabetes, it was reported that 1.7 million peoples to have diabetes (IDF, 2017). The prevalence of diabetes in Nigeria is between 2 - 7% (Wild, *et al*. 2004 and Oyegbade, *et al*, 2007).

The most frequent diabetes is type 2 diabetes, which has a high number of 90% of all cases of diabetes (Davis, et al. 2010 and Shah, et al. 2015; Poretsky, 2017). Type 2 diabetes mellitus contributes tremendously to mortality and disability in Sub-Saharan Africa, especially in Nigeria. Diabetes mellitus led to 3.96 million deaths in 2010, (6.8% of global mortality) (Shivashankara, et al. 2013). This was increased to 5.0 million deaths due to diabetes mellitus and its complications during 2015 in an IDF report, which is equivalent to one death every six seconds. In Nigeria, the current estimated prevalence of diabetes was 8%–10% (Ogbera, 2014). Likewise, the prevalence of diabetes among adolescents in Nigeria has increased from 0.1/1000 in 2009 to 10.1/1000 in 2013 (Ibekwe, *et al.* 2011 and John, *et al.* 2013)

Although it is most common in the elderly it is recently seen in adolescents and due to an increase in the level of physical inactivity, obesity, and poor diet. The number of adolescents who have diabetes increases yearly (IDF, 2017 and WHO, 2018). Type 2 diabetes in adolescents between the ages of 12-19 has increased in frequency around the world over the past 2 decades (Nadeau and Dabelea, 2008). As obesity and physical

inactivity are becoming major issues and increasing among adolescents in many countries, it shows that type 2 diabetes in adolescents has the probability of becoming a global public health problem which will result to serious health outcomes (Saito, et al 2011). Serious complications of type 2 diabetes have been reported to be blindness, renal failure, non-traumatic limb amputations, and cardiovascular illness and death (Aguiree et al, 2013). The complications occur from various factors which include, inadequate knowledge about the health condition, non-adherence to medication and poor blood sugar control level (Gojka and Katz, 2008). The problem of type 2 diabetes among adolescents is on alarming rate which resulted from a lack of knowledge about the risk of it, unhealthy lifestyle and observed weight increase among adolescents in Ejigbo, Osun state. Therefore, there is a need to assess the level of knowledge and practices of adolescents in order to create appropriate and relevant educational programs that will bring about change in behaviour in Ejigbo.

1.3 Justification

A lot of studies have been conducted on type 2 diabetes among adult but there is a dearth of information among the adolescents (WHO, 2016). This study will contribute to the increasing growing literatures on knowledge and preventive practices of type 2 diabetes among the adolescents in rural areas. Also, it will help in preventing the future occurrence of type 2 diabetes among the adolescents.

Moreover, some of the researches that were conducted focused on metropolitan areas such as Lagos (Ubangha, et al. 2016) and Port Harcourt (Okoh, 2014). There is dearth of information on the rural areas. Therefore, it is necessary to carry out this study among adolescents in rural areas in order to identify areas of deficient knowledge and practice so as to organize relevant preventive and educational interventions for the adolescents. Also, different rural communities were used for this study which is different from previous researches.

Finally, this research will help to know the health education strategies needed to promote knowledge and practices of type 2 diabetes as this will help in adopting appropriate lifestyles and preventing the risk factors of having type 2 diabetes among adolescents in rural areas.

1.4 Research Question

1. What is the awareness of type 2 diabetes among adolescents?
2. What is the level of knowledge of type 2 diabetes among adolescents?
3. What are the preventive practices against type 2 diabetes mellitus among adolescents?
4. What categories of anthropometric measurement do the adolescents belong?

1.5 Broad Objective

To investigate the knowledge and preventive practices of type two diabetes mellitus among adolescents in rural areas in Ejigbo Local Government, Osun State.

1.6 Specific Objectives

1. To identify the awareness of type 2 diabetes among the adolescents in rural area in Ejigbo Local Government, Osun State.
2. To assess the level of knowledge of type 2 diabetes among adolescents in rural area in Ejigbo Local Government, Osun State.
3. To determine the preventive practices against the occurrence of type 2 diabetes mellitus among adolescents in rural area in Ejigbo Local Government, Osun State.
4. To determine the categories of anthropometric measurements of adolescents in rural area in Ejigbo Local Government, Osun State.

1.7 Research hypotheses

H_{O1}: There is no significant difference between the level of knowledge of type 2 diabetes and socio-demographic characteristics of respondents.

H_{O2}: There is no significant difference between the preventive practices of type 2 diabetes and socio-demographic characteristics of respondents.

H_{03}There is no significant difference between knowledge and preventive practices of type 2 diabetes of the respondents.

H_{O4}: There is no significant difference between knowledge of type 2 diabetes and anthropometric measurements of the respondents.

H_{O5}: There is no significant difference between gender, age and body mass index classification of the respondents.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Diabetes

Diabetes mellitus has been in existence for a long period of time and categorised as one of the ancient ailment. The first case was announced 3000 years ago in the Egyptian manuscript (Ahmed, 2002). With an increasing incidence of diabetes globally, it remains the most widely spread and crucial non-communicable disease. It can be categorized into three main groups; type 1, type 2, and gestational diabetes (IDF, 2013). According to the International Diabetes Federation and Amelia et al (2018), over 90% of all diabetes cases was constituted by type 2 diabetes. It is expected that the population of people with diabetes will increase from 285 million to 439 million by 2030, globally (Shaw et al., 2010). Formerly, diabetes is not common in Africa but over the years, the rate has increased most of the African countries due to sedentary lifestyle, poor dietary intake, physical inactivity and some other factors. Currently, sub-Saharan Africa is estimated to have 20 million people with diabetes, about 62% are not diagnosed and the number is expected to reach 41.4 million by 2035 or an increase of 109.1%. Using Uganda as an example, diabetic patient was reported to be 98,000 in 2000 and it has escalated to 1.5 million within a period of ten years (Businge, 2010).

In sub-Saharan Africa, Nigeria is rated to have the highest population of diabetic patient which is estimated to about 3.9 million people (or an extrapolated prevalence of 4.99%) (WHO, 2013). With the estimation of Uganda diabetes population that indicated 30million people in 2010 (UBOS, 2010), it shows that more than 5% of the country's population were living with diabetes. This evidence suggests that the number of diabetic patients in African countries is highly likely to maintain an upward trend. Further, in terms of morbidity, diabetes contributes to the development of heart disease, renal disease, pneumonia and tuberculosis (Kornum et al., 2008; Hall et al., 2011). It is known that diabetes patients are 3 times more likely to have other health challenges such as tuberculosis and approximately 15% of TB globally is thought to have background diabetes as a predisposing factor. This situation of the double burden of disease particularly in developing countries put diabetes to compete for resources as well as political commitment (Jeon and Murray, 2008).

Studies conducted in Nigeria indicated that the diabetes rates ranged from low level of 0.8% among adults who are rural dwellers to over 7% among urban dwellers in Lagos with an average of 2.2% nationally (Olatunbosun et al., 1998). As already pointed out, the sixth edition of IDF diabetes Atlas (IDF, 2013), shows that Nigeria is the leading country in Africa in with the highest number of people with diabetes, 3.9 million had diabetes with 105,091 diabetes-related deaths in 2013 which is estimated to increase annually by 125,000 between 2010 and 2030 even though the prevalence of 4.99% is far less than that of Reunion (15.38%), 12.11% in Seychelles, 10.71% in Gabon, 9.73% in Zimbabwe, and 9.27% in South Africa; in addition, there are still about 1.8 million Nigerians with undiagnosed diabetes (IDF, 2013).

2.2 Types of Diabetes Mellitus

Diabetes Mellitus can be grouped into three; it includes Type 1 diabetes mellitus, type 2 diabetes mellitus, and Gestational diabetes.

2.2.1 Type 1 diabetes

Type 1 diabetes is also known as insulin dependent. It is formerly called juvenile-onset diabetes, it is usually developed among children and adolescents (Bakhru, 2010). It is a critical condition in which there is little or no production of insulin that is required by the body. Insulin is a hormone that helps the body to transfer glucose from the bloodstream into the body cells (Mayo Foundation Medical Education and Research, 2018). It develops acutely, as beta cells of the pancreas, which make insulin, are suddenly destroyed (Bakhru, 2010). It may also be regarded as an auto-immune disease, which occurs when the immune which protects the body from invading viruses and bacteria destroys the insulin-producing beta cells (Bakhru, 2010). This can cause serious problems to some organs of the body such as the blood vessels, kidneys, nerves, heart and eyes, thereby causing many health issues such as heart and blood vessel disease, nerve problem, kidney failure, eye problem, foot impairment, skin and mouth conditions and pregnancy complications (Mayo Foundation Medical Education and Research, 2018).

2.2.1.1 Epidemiology of type 1 diabetes (TID)

Type 1 diabetes is considered as one of the frequent endocrine and metabolic issues in children. The total child population of the world (0-14 years) was in 2010 1, 9 billion. Approximately 480 000 children have Type 1 diabetes, which equates to 0.02%. 76 000

new cases are diagnosed every year. This reflects an annual incidence of 3% (Soltesz et al., 2009). A collaborative project of the Diabetes Mondiale study (DIAMOND Project Group, 2006) and the Europe and Diabetes study (EURODIAB) (Patterson et al., 2012) observed the trends in occurrence. The occurrence of Type 1 diabetes has increased all over the world (DIAMOND Project Group, 2006), but it seems that the increase has been strongest in low incidence countries (Patterson et al., 2009). The encouraging observation in some recent studies is that the incidence of childhood Type 1 diabetes in some countries has ceased to increase after a period of accelerated increase (Harjutsalo et al., 2013 and Skrivarhaug, 2014). Even though Type 1 diabetes is diagnosed in all age groups, it seems that the incidence increases with age until puberty (10-14 years) (Springer nature, 2012). The frequency of Type 1 diabetes among children younger than 14 years fluctuates among various ethnic populaces inside nations (DIAMOND Project Group, 2006).

Finland has been recorded to have the most of occurrence in children < 15 years of 64.9 per 100 000 person-years in 2006 (Harjutsalo et al., 2013). China has among the lowest incidences between 0.1 and 4.5 per 100 000 person-years (1990-1996). Norway, Canada, the USA and Australia are high incidence countries, while Argentina is intermediate incidence and India and countries in Sub-Saharan Africa are low incidence countries (DIAMOND Project Group, 2006). The characteristic feature of Type 1 diabetes is the selective eradication of the insulin creating β-cells of the pancreas. This can cause total insulin insufficiency. The etiology is not completely understood, but serological markers are available in 85-90% of people when hyperglycemia is 15 recognized (Craig et al., 2009; Sabbah et al., 2000). These markers include islet cell antibodies, GAD, IA-2, IA-2β and insulin auto-antibodies (Atapattu, et al. 2012). T1D is controlled by numerous genes, human leukocyte antigen (HLA) genes have a powerful known relationship. The ecological triggers (chemical as well as viral) which begin with pancreatic beta cell damage and remain generally unknown, yet the procedure starts a very long time to years before the indication of clinical (Craig et al., 2009).

2.2.2 Type 2 Diabetes

Type 2 diabetes records for about 90-95% of those with diabetes (Mbanya, 2008). Type 2 diabetes is non-insulin dependent diabetes, which is also known as adult-onset diabetes or maturity onset diabetes (Bakhru, 2010). It rarely evolves before the period of 40 years,

however, it might happen at any age. Actually, the occurrence of type 2 diabetes in adolescents is on the high increase (Bakhru, 2010). People with type 2 diabetes are seriously at higher risk for heart ailment, peripheral vascular infection, and stroke, and they are more prominent of having hypertension, dyslipidemia, and obesity (Mbanya, 2008). Type 2 diabetes is a growing disease among children and adolescents. It used to be an infection among the young adult and older generation, but in the latest decade, more young people have been affected. Obese children and adolescents with newly onset Type 1 diabetes can be misdiagnosed having Type 2 diabetes (Rosenbloom et al., 2009). Both genetics and lifestyle are factors that are involved in the pathogenesis of Type 2 diabetes. A positive family history of Type 2 diabetes gives a higher chance to develop Type 2 diabetes, and 15% to 25% of first-degree relations of people with Type 2 diabetes create impaired glucose tolerance (IGT) or diabetes (Pierce et al., 1995). Corpulence and physical inactivity is also a big contribution to the increased incidence of Type 2 diabetes in the world (Stumvoll et al., 2005).

The cause of Type 2 diabetes mellitus is multi-factorial, and it includes behavioural, social and environmental factors, and can be controlled by an exchange of hereditary and metabolic components (WHO, 2016). Adolescent type 2 diabetes is possibly resulted by a comparative scope of faulty pathways as proposed in adult type 2 diabetes, including pancreatic β-cell failure, insulin resilience in the liver, and changes in incretin and pancreatic α-cell function, kidney glucose filtration, and lipolysis (Russell, et al. 2017). There is proof of overemphasized insulin insensitivity and fast weakening in the β-cell role in adolescent type 2 diabetes (Hannon and Arslanian, 2015; Today Study Group, 2013; Russell, et. al 2017). Some of the factors which have been reliably related with Type 2 diabetes mellitus in adolescents include, ethnicity, family ancestry of diabetes, and past history of gestational diabetes merge with seasoned age, overweight and corpulence, hypertension, unhealthy meal, lack of physical activity, and smoking. Age, gender and high capillary glucose level are added to these factors (Licea, *et al*, 2008 and GBD, 2013).

T2D is a condition which results in both hyperglycemia and hyperinsulinemia. This is due to insulin resistance in peripheral tissue, reduced ability to glucose transport over the cell membranes, expanded glucose generation by the liver and deranged insulin secretion by the pancreatic beta cells. Over time, usually a few years, the pancreatic beta cells will be

exhausted and fail to produce insulin (Stumvoll et al., 2005). Treatment for Type 2 diabetes depends on the symptoms, severity of the hyperglycemia and whether ketosis is present or not. To control BG levels it may be sufficient to make a lifestyle change with weight- loss through physical activity and dietary management. Along with normalization of the BG, it is important to control co-morbidities, such as hypertension, dyslipidemia, nephropathy, retinopathy 16 and hepatic steatosis. If control of BG is not achieved by lifestyle change alone, pharmaceutical therapy such as oral tablets to increase insulin sensibility must be added. Failure of treatment after three months with oral tablets indicate the need to start insulin therapy for Type 2 diabetes patients (Rosenbloom et al., 2009).

2.2.3 Gestational diabetes

Gestational diabetes is a short term form of insulin resilience that generally happens halfway through a pregnancy. It results from overproduction of insulin in the body, or the inability of the pancreas to produce extra insulin that is required during pregnancy. Gestational diabetes attack about four per cent of all women during pregnancy, in spite it usually disappears after childbirth. This type of diabetes influence female when pregnant. Few women have inflated levels of glucose in their blood, and their bodies cannot create the amount of insulin needed to transfer all the glucose into their cells, which later result in it to increasing levels of glucose. Diagnosis of gestational diabetes occurs during pregnancy. Most of the gestational diabetes patients can manage their diabetes with physical exercise and a healthy diet. Few of them which are between 10 to 20 per cent need to take medications so as to control the glucose level. Unidentified or unmanaged gestational diabetes can increase the risk of problem during labour. Nevertheless, women who encounter gestational diabetes are at risk of having type 2 diabetes later (Bakhru, 2010).

2.3 Symptoms of type 2 diabetes mellitus

Type 2 diabetes does not have noticeable symptoms which tend to be detected when in routine blood sugar or urine tests (Bakhru, 2010). Polydipsia, polyuria, polyphagia, fatigue, weight loss, blurred vision, slow healing, genital itching, dizziness, nausea are the symptoms that occur in type 2 diabetes.

2.3.1 Weight loss

Rapid and unhealthy reduction in weight occurs when there is a malfunction of protein and fat as another energy source (Hackett, 2009). Despite frequent and large intake of meals to relieve hunger, there is a continual loss of weight. Without the capability to utilize glucose, the body uses another fuel that are reserved in muscle and fat. Calories are lost as overabundance glucose is discharge in the urine (Bakhru, 2010).

2.3.2 Blurred vision

Blurred vision caused by a change in lens refraction can occur (Hackett, 2009). This influences the eyes capacity to focus. It can be treated with adequate treatment. There are serious cases where total blindness or elongated eye problems can occur (Lal, 2016).

2.3.3 Slow healing of wounds and frequent infections

Presence of high sugar level in the alters the ability for quick and fast healing (Lal, 2016). Small and ordinary infection-based or other wounds and injuries heal slowly. The feet are more vulnerable and it is important to take precautions to keep them well protected from injuries and burns (Bakhru, 2010).

2.3.4 Frequent urination

Adolescents with diabetes discharges a large amount of urine different times a day, this happens when glucose does not enter the body cells and therefore stores in the blood and starts discharging in the urine, diabetes patients frequently urinate because the glucose that is present in the urine attracts more water with it than usual (Bakhru, 2010). According to Lal (2016), if there is a high sugar level in the bloodstream you tend to urinate more often. If insulin is inadequate, or there is absence, the kidneys cannot transfer the glucose back into the blood. The kidneys take water from the blood so as to weaken the glucose – which then fills up the bladder.

2.3.5 Increased thirst

Accumulation of surplus sugar in the blood enables fluid to be dragged from the tissues; this may result in been thirsty and since frequent urination occurs, there will need to replace the lost liquid. This then result in drinking more than usual (Lal, 2016).

2.3.6 Increased hunger

As the insulin in the blood is not working adequately or is not present at all, and the body cells are not getting their energy, the body may respond by striving to get more nutritious food, this cause increase in hunger (Lal, 2016).

In a study by Azinge (2013) 58.7% of the respondents regarded excess urination as a symptom of diabetes. A study by Al-Mahrooqi (2013), Ugbangha (2016) and Unadike (2009) reported that 82%, 39.9%, and 29% respectively identified frequent urination as symptoms of diabetes. According to Bakhru (2010), loss of water from frequent urination generates frequent thirst. He further stated that a diabetes patient frequent longing to drink water and thereby drinks a large amount of water within the short period of times.

2.4 Risk Factors of Type 2 Diabetes Mellitus

The particular cause for the evolvement of Type 2 diabetes are not well known, but it is referred to as complex metabolic disorganisation of heterogeneous etiology with behaviour and environmental factors revealing the consequences of genetic susceptibility (Kiess, *et al*, 2003). The known major risk factors for the development of Diabetes include obesity, a family history of the disease, Urbanization and a sedentary lifestyle (Mainous, *et al*, 2007). Youths in Nigeria increasingly adopt western lifestyle including the consumption of junk fatty food and food additives (Aturaka, et al. 2017). The eroding culture of partaking in farm work and working long distances, poor culture of daily exercises among community members all contributes to the new era of sedentary lifestyle (Aturaka, et al. 2017).

2.4.1 Family History of Type 2 Diabetes

Various researches reveal a powerful family history among adolescents that were affected, 45–80% of the affected individual has at least one relative with diabetes and 74–100% has a first or second-degree relation with type 2 diabetes (American Diabetes Association, 2000; Sinha et al., 2002). Adolescents who suffer from diabetes are more predictable to have a family history of any cardiovascular disease (CVD), which is indicated in research that up to 28% have positive family histories of CVD (Glowinska et al., 2002). However, little susceptibility genes have been recognised to be relating with Type 2 diabetes (Grant, *et al.*2006; Ingrid, et al, 2007). The genetic makeup of Type 2 diabetes is exhibited by the strong heritability of the ailment (Hansen, *et al*, 2005; Ingrid, et al, 2007). A powerful family history of Type 2 diabetes is seen in most diabetes

patients irrespective of their ethnic background (ADA, 2000; Ingrid, et al, 2007). It was revealed in a study that, 15% of the respondents reported of being aware of a family member who is diabetic. Family history is identified as one of the most crucial factors of type 2 diabetes (Azinge, 2013), it is revealed that at least 50% of an individual with a family history of diabetes is prone to have diabetes (Johan, Jaana and Jaako, 2012).

2.4.2 Unhealthy and Poor dietary intake

Unhealthy dietary intake has been examined as the main behavioural factor in the enlargement of both overweight and type 2 diabetes, both calorie intake and specific dietary elements such as carbohydrates and fat have been compromised (Rewers, et al. 1995; Terry, 3003). Diet has an active responsibility in the increasing obesity, insulin resilience, and glucose intolerance in adolescents, most especially among people with a high prevalence of risk factors of type 2 diabetes (Trevino, et al. 1999).

Poor eating and drinking habit is one of the risk factors for diabetes (Kuller, *et* al 1995; Springer Nature, 2017). Children and adolescent obesity have a relationship with over-consumption of beverages, fruit drinks, and fruit juices as a result of high calories they constitute to the diet (Dennison, et al. 1997). Substitution of a conventional diet abounding in fruit and vegetables with a diet abounding in high calories supplied by animal fats and low in complex carbohydrates is occurring in the poorest nations. Combination of this diet with tobacco consumption and little or no physical activity prompts population-wide atherosclerosis and the wide circulation of Non-Communicable Disease. This can later cause a high rate of different Non-Communicable Diseases. A diet high in natural products such as fruits, vegetables, and whole-grain products and low in all calories and dietary saturated fat and sodium will defend against both obesity and type 2 diabetes mellitus (Freemark, 2003).

Many studies suggested that the advancement of adequate fruit, vegetable, and whole-grain intake, combined with a reduced intake of sweetened beverages, could lessen the risk for obesity and the upcoming development of diabetes (Huang, et al 2003; Hale, 2004). Tobacco and alcohol intake pose a risk for the development of diabetes mellitus, whereas regular exercise and intake of fruits and vegetables offer protection against the development of the disease (ADA, 2015). In a study that was carried out in Lagos, 72% and 4.80% of the respondents had a positive history of alcohol and tobacco intake,

respectively, whereas 29.60%, 24.80%, and 24.09% of respondents ate fruits, vegetables, and exercised more than five times a week.

2.4.3 Physical inactivity

Physical inactivity is identified as another risk factor for the progression of obesity to type 2 diabetes (Huang, et al. 2003). Inadequate physical activity (i.e, sedentary practices) are related to obesity in adolescents and might be both the cause and outcome of overweight (Huang, et al 2003, Hale, 2004). Physical inactivity is another risk factor which has been overlooked and ignored by many people. It should be noted that all risk factors for obesity serve as risk factors for type 2 diabetes, however, not all risk factors for diabetes are guaranteed risk factors for obesity. For example, an individual may have a good diet, exercise regularly while not being obese. However, despite not being obese, this person may still be at risk of developing type 2 diabetes based on genetic disposition (MOPHS, 2008).

Behaviours that result in low physical activity escalate the risk of getting overweight and minority of adolescent show high-rise levels of inactivity (Gordon-Larsen, *et al.* 1999; Huang, 2003). There are three mechanisms proposed to be connected to sedentary activities and obesity (Robinson, 2001): (i) reduced energy expenditure; (ii) increased dietary energy intake from eating during sedentary activities or from the effects of food advertising; and (ii) decreased metabolic rate during sedentary activities. For instance, TV viewing has been associated with obesity in young and adolescents (Gortmaker, *et al*, 1996) and a decrease in time adolescents spend in such physical inactivity has been shown to reduce obesity (Epstein, *et al.* 1995). The risk of obesity in a child has been related to time spent in watching television in 2 studies (Deheeger, et al. 1997; Hale, 2004). The effect of sedentary practices on obesity risk might indicate the combination of physical inactivity, sedentary behaviours, and specific personality and socioeconomic factors (Hale, 2004).

2.4.4 Overweight and Obesity

Overweight and obesity are becoming the main issue in adolescents throughout the globe (Alberti, et al. 2004). Being overweight or obese is strongly related to diabetes. Notwithstanding, the global voluntary target to halt the rise in obesity by 2025 (WHO, 2013 and WHO, 2015), being overweight or obese has increased in almost all countries

both developed and developing countries (CDC, 2016). The age-standardized prevalence of obesity globally, (defined as a BMI ≥30 kg/m2) increased from 3.2% in 1975 to 10.8% in 2014 in men and from 6.4% to 14.9% in women (NCD Risk Factor Collaboration, 2016; Asselt, 2017). If the trends continue, the global obesity rate is evaluated to reach 18% in men and surpass 21% in women by 2025 (NCD Risk Factor Collaboration, 2016). Excess adiposity, assessed by a high BMI, is the single strongest risk factor for T2DM and is associated with many metabolic abnormalities that result in insulin resistance (Sinha, *et al.* 2002) In Nigeria, the prevalence of obesity ranged from 8.1% - 22.2% (Chukwuonye, *et al. 2013*). In the same vein, the rate of obesity is high and needs to be monitored because it is related to high cardiovascular risk (Omisore, *et al.* 2014).

Obesity in an adolescent is related with high fasting insulin concentrations and exaggerated insulin response to intravenous glucose (Kobayashi, *et al.* 2000). The presence of high levels of fasting insulin is predictive of obesity in adolescence. A study performed by our group on children and adolescents in greater São Paulo found evidence of enhanced resistance to insulin activity in overweight patients with family histories of type 2 diabetes, suggesting that within this age group the effects of insulin can be obstructed by obesity, as has been observed in adults (Cesarini, 2001), which is a condition of risk of diabetes. It the study referred to, criteria for obesity and overweight defined by Cole et al. (2000) were used, in which the indicator of obesity is the ninety-ninth percentile of the corporeal mass index. An excess weight (overweight and obesity) prevalence of 24.5% among girls and 20.0% among boys with family histories of diabetes mellitus was observed.85% of children with Type 2 diabetes are either overweight or obese (defined as at or above the 85th percentile of the sex-specific body mass index [BMI] for age-based growth charts) (Fagot-Campagna, et al. 2000). A study carried out by Nicholas (2013) revealed that 22% of the respondents identified obesity as a risk factor, but in a similar study done in Uyo, 73% agreed that obesity may lead to diabetes mellitus. In an Indian study, 4.6% identified obesity as a risk factor.

2.4.5 Urbanization

Globally, the increase in type 2 diabetes rates resulted from the growth in urbanization and economic development (Zimmet, *et al.* 2001). Maina et al (2010) reported that urbanization with the adoption of western lifestyles has been incriminated in the abandonment of the healthier traditional lifestyles by people in developing countries. In

addition, more and more people in sub-Saharan Africa are migrating to urban areas seeking better life (Maina et al, 2010). It is of concern that 45% of the 973 402 912 population in Sub-Saharan Africa will live in urban areas by 2025; currently, 68% of people with diabetes in sub-Saharan Africa live in urban areas, and the number is expected to increase to 78% by 2030 (Goedecke & Ojuka, 2014). This will have a significant impact on diabetes prevalence as the prevalence tends to be higher among urban compared to rural residents (Chen et al, 2015).

2.5 Prevention of type 2 diabetes

Prevention of type 2 diabetes mellitus means prevention of obesity in childhood (Reinehr, 2013). As prevention should start very early in life, perhaps even before birth, a population and community approach for prevention of obesity in childhood and hence type 2 diabetes mellitus in childhood and adolescence seems to be the most promising and reasonable treatment strategy available at present. However, primary prevention has proven to be difficult or impossible in most societies (Campbell, 2001).

A multidisciplinary team approach is needed to develop and secure preventive strategies. Recent studies have demonstrated the adoption of a healthy lifestyle which is characterized by good nutrition, weight control, and regular physical activities are important in preventing type diabetes (Tuomilehto et al., 2001). However, the use of of metformin was not effective to prevent type 2 diabetes mellitus in obese adolescents with impaired glucose tolerance (Wiegand et al., 2010).

2.5.1 Diet

A healthy diet is a key element in reducing the risk of type 2 diabetes. Eating habits, cohesiveness, and emotional stability have a great impact on all family members, especially the adolescent (Huang, et al. 2003). Parents play a big role in shaping children's eating habits. When parents eat a variety of foods that are low in fat and sugar and high in fibre, children learn to like these foods as well (CDC, 1996 & Heath, *et* al. 1994). Lack of parental supervision or cultural beliefs regarding weight. In addition, many parents are not knowledgeable about good nutrition and obtain most of their information from the media, which often provides misleading nutritional information to increase sales and consumption (CDC, 1996). In a study conducted by Huang, et al (2003) shows that over 50% of the adolescents eat at fast food restaurants 2 to 4 times a week.

2.5.2 Physical Activity

Regular vigorous physical activity helps develop and maintain healthy bones, muscles, and joints in youth. It is also useful in increasing lean muscle mass, reducing body fat, and controlling body weight. Physical activity decreases with increasing age, especially among female adolescents (Hale, 2004). Exercise training can enhance the glycemic status of healthy individuals. In adolescents, the effects of exercise on glycemic status are less well established (McMurray, Bauman, Harrell *et al.* 2000); however, it appears that moderate-intensity exercise for 8 to 15 weeks results in improvement in glycemic status, particularly in obese youth (Hale, 2004).

Smeltzer et al (2009) elaborate that exercise is extremely important in diabetes management because of its effects on lowering blood glucose and reducing cardiovascular risk factors. Exercise lowers blood glucose levels by increasing the uptake of glucose by body muscles and by improving insulin utilization. It also improves circulation and muscle tone. For example, resistance (strength) training, such as weight lifting, can increase lean muscle mass, thereby increasing the resting metabolic rate. These effects are useful in diabetes in relation to losing weight, easing stress, and maintaining a feeling of well-being. However, Smeltzer et al cautions that there are general precautions for exercise in people with diabetes and they should be advised to - use proper footwear and, if appropriate, other protective equipment; avoid exercise in extreme heat or cold; inspect feet daily after exercise; and avoid exercise during periods of poor metabolic control (Smeltzer et al, 2009).

2.5.3. Weight Control

Weight management is important in the prevention of type 2 diabetes. Overweight is the greatest risk factor for type 2 diabetes (Bakhru, 2010). Excess body fat in the body, especially if stored around the abdomen can increase the body's resistance to the hormone insulin, which can lead to type 2 diabetes. For adolescents who are overweight, weight loss can be achieved by consuming a low-calorie diet than normal, monitoring of one's weight and regular check of one's body mass index (BMI) (Bakhru, 2010). According to the American Diabetes Association (2000), once the ideal weight is achieved by cutting down on calories, the body produces sufficient insulin to keep blood sugar within the normal level.

2.5.4 Patient Education

Smeltzer et al, (2009) elaborate that diabetes mellitus is a chronic illness that requires a lifetime of special self-management behaviours. Diabetics must learn daily self-care skills to prevent acute fluctuations in blood glucose, and they must also incorporate into their lifestyle many preventive behaviours for the avoidance of long-term diabetic complications. Patients must become knowledgeable about nutrition, medication effects and side effects, exercise, disease progression, prevention strategies, blood glucose monitoring techniques and medication adjustment. In addition, they must learn the skills associated with monitoring and managing diabetes and must incorporate many new activities into their daily routines. An appreciation for the knowledge and skills that patients with diabetes must acquire can help nurses provide effective patient education and counselling (Smeltzer et al, 2009).

2.6 Knowledge of type 2 diabetes among adolescents

It is important to know about the awareness level of adolescents with regard to diabetes, as knowledge is a critical component of behaviour change (Deane and Parks 2006). Research studies have shown that education in populations about diabetes resulted in a significant increase in knowledge about the disease (Mohan, Raj, Shanthirani, et al. 2005). Recent studies have shown that education of populations about diabetes mellitus resulted in a significant increase in knowledge about the disease (Mohair, et al. 2005 and Wee, Ho and Li, 2002). In a study conducted in Lagos (Ugbangha, et al. 2016), 66% of the respondents had heard about Type 2 Diabetes Mellitus compared to similar studies in Port-Harcourt (Okoh, et al. 2014) and Oman (Al-Mahrooqi, et al. 2013), where 90% of the respondents, respectively, were aware of diabetes. In a study carried out by Nicholas (2013), only 20% of the respondents identified a lack of insulin as the cause. In a similar study done in Uyo, South-South Nigeria and in Pakistan, 40% and 49% of the respondents respectively identified the cause of diabetes (Unadike, et al. 2009 and Nisan, et al. 2008).

In a study conducted by Azinge (2013) and Al Shafaee, et al (2008). Majority of the respondents identified excessive passage of urine as a symptom of diabetes mellitus.DM is a lifelong disease that can only be managed, but not cured (WHO, 2015). 67.3%, 72% and 63% in Lagos, Uyo and Oman respondents respectively, believed the disease can be cured (Ubangha, et al. 2016, Unadike, et al. 2009 and Al-Mahrooqi, et al. 2013).

Knowledge about the management of Diabetes Mellitus in regards to exercise in Lagos was 20%, 60% in Oman, 52.12% respondents knew that eating fruits and vegetables were essential in the management of Diabetes Mellitus and 86% respondents knew that diabetics needed a special diet to manage their condition.

Kiawi et al, (2006) observed that diabetes, obesity, and physical inactivity are common in urban areas in sub-Saharan Africa. Therefore, it was realized that health education about diabetes and its main risk factors was a requirement. Hence, health education should be informed by lay perspectives to make the most of the appropriateness of the messages and their effect on knowledge, attitudes, and behaviour. For example, in rural and remote areas health education should be levelled to what is appropriate to the people, that is, one cannot talk about cakes of which people know little or none at all, but rather use examples of what they have and know. For instance, in some rural areas adolescents believe that being fat or obese is a sign of leading a good life. This also indicates why it is crucial to investigate attitudes and behaviours relating to diabetes and its main risk factors among adolescents.

2.7 Sources of information

The sources of information on diabetes for the participants were school teacher (33%), doctor (37%), radio or television (25%), newspaper (2%), friends (1.5%), and uncertain (1.5%) (Okoh et al, 2014) while the study carried out by Ugbangha, et al (2016) were, mass media 31.0%, friends/family 16.6%, school 15.3%, social media 13.5%, print media 12.7%, and religious bodies 10.9%.

The main source of information indicated by the respondents was mass media, 43.0% in Ubangha, et al. (2016) study, 48% in Al-Mahrooqi, et al. (2013) and 25% in (Okoh, et al. 2013). However, there is no doubt that the mass media also plays a very important role in the dissemination of information on diabetes, including young people, who account for a large proportion of the populace. This wide and relatively easy form of knowledge dissemination should be taken advantage of by health workers to give the correct information on diabetes (Okoho, et al. 2014).

2.8 Theoretical Framework

The theoretical framework that was adopted for this study was the PRECEED MODEL as postulated by Lawrence Green (1974). It has served as a conceptual framework in health education planning aimed at diagnosing the health problems of a community, understanding the factors that influence the people's behaviour and developing an intervention to promote healthy behaviour (Green & Kreuter, 1999). The acronym represents Predisposing, Reinforcing and Enabling Constructs for Educational Diagnosis and Evaluation (Green & Kreuter, 2005).

Predisposing Factors

These are behavioural antecedent factors which motivate or provide a reason for the behaviour. They are the factors that are present before a decision can occur about a particular behaviour and has the potential of exposing the respondents at risk of having type 2 diabetes. Lack of awareness and knowledge on type 2 diabetes, inadequate knowledge of the risk factors can make an adolescent to adopt unhealthy lifestyles, thereby rejecting the preventive practices of type 2 diabetes. The predisposing factors for this study include knowledge, religion, level of education, ethnic group and significant others.

Enabling Factors

These are factors that make any health-related behaviour more or less likely to occur. These are factors present before the behavioural decision takes place (antecedent). They are referred to as environmental-bound factors that enable adolescents to practice a healthy lifestyle. These could be programs or services, and available/accessible resources (Green & Kreuter, 2005). These factors include information, time, skills to enable exercise, availability/accessibility of fruits and vegetables and health services, that is, availability of anthropometric measurement kits and diabetes testing kits within the school environment with skilled and competent personnel and also provision of confidentiality. Some variables related to enabling factors in the study were the use of alcohol and other substances, exercise, availability of fruits and vegetables.

Reinforcing Factors

These are factors that are related to the influence of significant others such as friends, parents, mass media, religious organization, and family members. For instance, friends, relatives and relatives may encourage unhealthy lifestyles and also discourage the adolescent from testing for diabetes. Influence of media will be considered in the design of the study instruments.

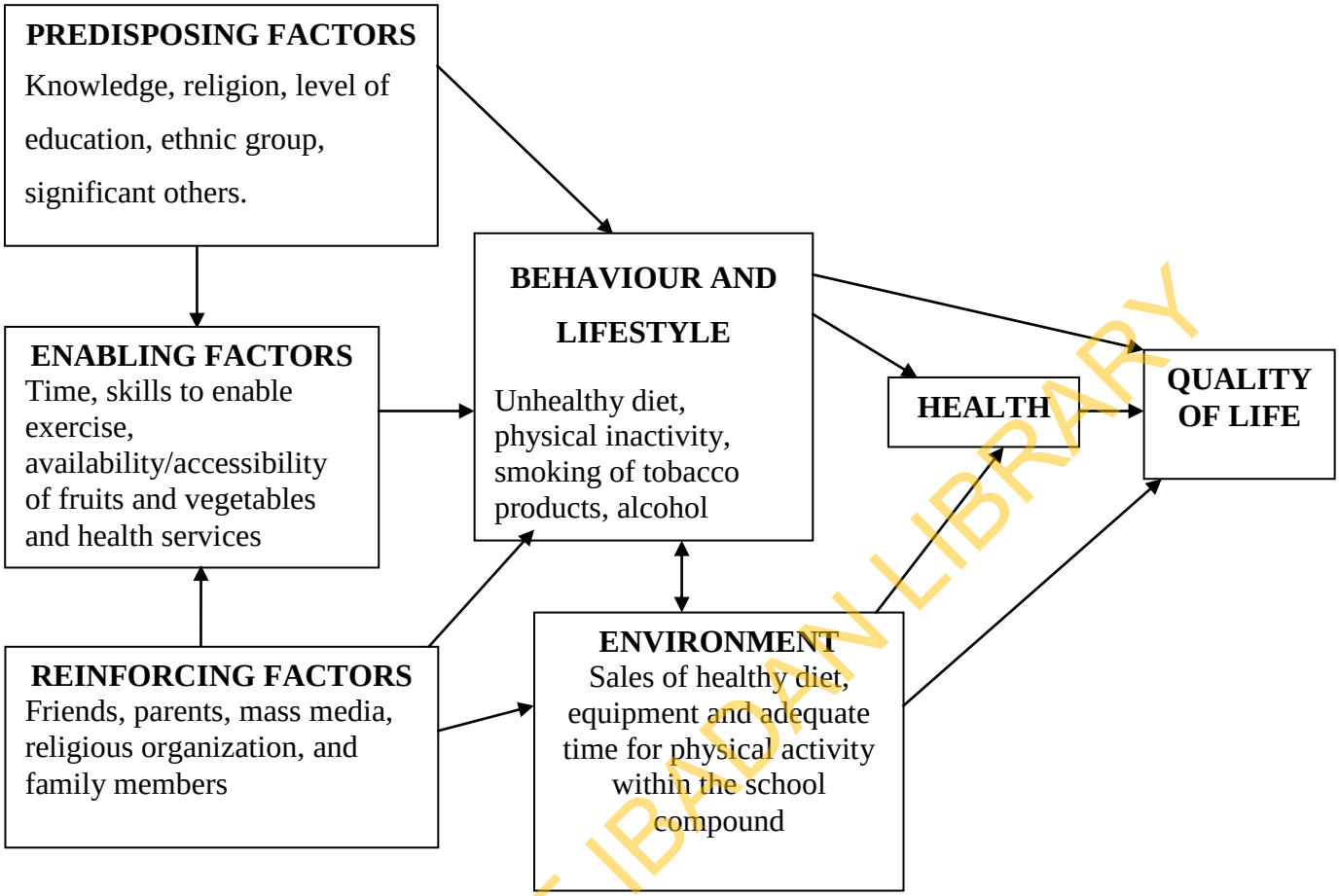


Figure 2.1 Schematic Application of the PRECED Model for this study

2.8.1 APPLICATION OF PRECEDE MODEL TO TYPE 2 DIABETES AMONG ADOLESCENTS

Predisposing Factors: This contains the socio-demographic variables such as, gender, age, class, religion, name of school, and ethnic group. (Questions 1-6, see appendix II)

Enabling Factors: It includes availability of fruits, availability of vegetables, time of exercise, sport activities within the school (Questions 34, 35, 37, 40, 41, see Appendix II)

Reinforcing Factors: It includes radio, Television, School (Questions 8.1 – 8.7, see Appendix II)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Design

The descriptive cross-sectional study design was used to investigate the knowledge and preventive practices of type 2 diabetes among adolescents in selected public secondary schools in rural areas of Ejigbo Local Government, Osun State, using a semi-structured questionnaire.

3.2 Description of study site

The study was carried out in five rural areas of Ejigbo Local Government. Ejigbo is the headquarter of Ejigbo Local Government, which is surrounded by major towns in Oyo State and Osun State. Ejigbo has Ogbomoso in the north, Ede in the south-east and Osogbo. Ejigbo LGA is surrounded by Surulere and Ogo-Oluwa Local Government Areas in Oyo State and Ola-Oluwa, Orolu, and Egbedore LGA in Osun State. Ejigbo LGA has 11 wards that comprise of various town and villages. The population of Ejigbo Local Government Area according to 2006 FGN Population census was 132,641. Ejigbo Local Government is constituted with 29 villages with 17 Public Secondary Schools. Out of 29 villages, 9 villages have public secondary school each. The villages include Ola, Ika, Oguro, Agurodo, Masifa, Ilawo, Idigba/Songbe, Isundunrin, and Ife-Odan. The rural areas selected for this study included Ola, Masifa, Agurodo, Oguro and Isundunrin.

3.3 Study Population

The study population was both male and female adolescents attending public Senior Secondary Schools in selected rural areas of Ejigbo, Osun State.

3.4 Inclusion criteria

The respondents included both male and female who are in senior classes that are, S.S1, S.S.2 and S.S. 3. Respondents were between the ages of 12 to 19. Must be attending public secondary school in any of the selected rural areas for this study. Only those who gave consent/assent were recruited for the study.

3.5 Exclusion criteria

Any adolescent who does not attend public secondary school in any of the selected rural areas was not recruited for the study. Adolescent below 12 and above 19 was not be recruited for the study. Adolescents in junior classes were not recruited for the study.

3.6 Sample Size Determination

The sample size (n) was determined using Leslie Kish sample size formula

$$n = \frac{Z^2 p (1-p)}{d^2}$$

where n = sample size

Z = standard normal deviation (1.96) at 95% confidence interval

P = 20% = 0.2 prevalence of diabetes mellitus knowledge among adolescents in Uyo (Unadike, et al. 2009)

Q = 1 –p (1 – 0.2) = 0.8; D = margin of error tolerated (usually 0.05)

Therefore,

$$N = \frac{1.96^2 \times 0.2 \times 0.8}{0.5^2} = 246 \text{ approximately}$$

A non-response rate of 10% of the sample size n/(1-10%)

246/(1-0.1) = 246/0.9 = 273

Therefore, the sample size was 273. 10% of the sample size (27 adolescents) was used for the pre-test. In order to ensure adequate representation, the sample size was increased to 302.

3.7 Sampling Procedure

A multistage sampling technique was used to select respondents for the study. The sampling method was carried out in four stages.

Stage 1: Five rural communities were randomly selected out of nine communities having a public secondary school in Ejigbo Local Government.

Stage 2: The schools in the communities were used for the study, since there is one public secondary in each community, therefore making a total number of five schools were used for the study. Proportionate sampling was used to determine the number of respondents that was selected from each school because the schools do not have an equal number of students.

Stage 3: Simple random sampling was used to determine the numbers from each arms of the class (i.e. S.S.2 A, S.S.2B, and S.S.2C) to constitute the sampling frame.

Stage 4: Simple random sampling was also used to select the number of respondents' in the class.

Table 3.1: Distribution of respondents across the schools

S/N	Name of Schools	Number of students in each school	Number of students per class	The proportion of students to be selected in each school $\frac{A + B}{C}$
1.	Agurodo Community High School, Agurodo	260	S.S. 1 = 69 S.S.2 = 110 S.S.3 = 81	$\frac{260 \times 302}{1009}$ = 78
2	Baptist High School, Ola	175	S.S. 1 = 62 S.S.2 = 42 S.S.3 = 71	$\frac{175 \times 302}{1009}$ = 52
3.	Masifa Community High School, Masifa	189	S.S. 1 = 58 S.S.2 = 75 S.S.3 = 56	$\frac{189 \times 302}{1009}$ = 57
4.	Isundunrin Community High School, Isundunrin	185	S.S. 1 = 73 S.S.2 = 62 S.S.3 = 50	$\frac{185 \times 302}{1009}$ = 55
5.	Oguro Community High School, Oguro	200	S.S. 1 = 66 S.S. 2 = 58 S.S. 3 = 76	$\frac{200 \times 302}{1009}$ = 60
	Total	**1009**		**302**

* Data obtained from each of the schools prior to the conduct of the survey.

- A = number of students in each school
- B = Sample size
- C = total number of students in all schools

3.8 Instrument for Data collection

A quantitative method was adopted for data collection which was facilitated by the use of interviewer-administered questionnaires. The questionnaire was developed with the use of information from the literature. The instrument was divided into four (4) sections;

Section A: designed to collect information on socio-demographics of the respondent.

Section B: identifies respondents' level of awareness on type 2 diabetes among adolescents

Section C: assessed the knowledge of type 2 diabetes among the respondents

Section D: determined the practice of preventive measure against type 2 diabetes

Section E: determined the categories of anthropometric measurements of the adolescents.

Bathroom weighing scale (to determine the weight), Stadiometer (to measure the height), bouncing rabbit tape rule (to determine the waist and hip circumference), were the additional instruments used for the collection of data.

3.9 Validity of the instrument

Content validity of the instruments was ensured through a comprehensive review of the literature. Construct validity was ensured by making sure variables in the theoretical framework are represented in the instrument. The draft instrument was reviewed by my supervisor and other relevant professionals in the faculty of Public Health, University of Ibadan. The questionnaire was written in simple English Language to facilitate comprehension among respondents.

3.10 Reliability of the instrument

The instrument was pre-tested among 27 adolescents (10% of the total sample size) in Oko, Surulere Local Government Area, Oyo State. Cronbach's Alpha was used to calculate the reliability coefficient. The reliability obtained was 0.69, in which the instrument was considered reliable.

3.11 Data Collection Process

The study was carried out using a semi-structured questionnaire which was administered to secondary school students in their schools. This was done with the help of four research assistants who are literate, mature and have experience in data collection. They were trained in the research procedures and handling of the instrument for data collection before the commencement of the study. Permission was obtained from the principals of

the schools and informed consents from the respondents. The questionnaire was administered only to respondents who were willing to participate in the spot. Respondents who were not willing to participate were exempted from the study and were replaced with other willing to participate.

After the respondents filled the questionnaire, their anthropometric measurements were taken. Height and weight measurements were taken using a stadiometer and weighing scale respectively. The body weight was measured to the nearest 0.1kg, where the respondents were weighed wearing their school uniforms and underwears, without anything in their pockets. Their height was measured while standing erect, without shoes, looking straight and with their heels and back against the stadiometer. The body mass index (BMI) of the respondents was calculated by dividing the weight measurement by the height measurements. Waist circumference was measured halfway between the lowest rib and the top of the hipbone. Hip circumference was measured over light clothing over the buttocks when viewed from. Waist to hip ratio of the respondents was derived by dividing the waist circumference by hip circumference.

3.12 Data Management and Analysis

The data were checked for accuracy and completeness. A serial number was written on each copy of the questionnaire for easy identification and data entry. The data were analyzed using IBM's SPSS software, version 21. Frequency distribution, fisher's exact test, descriptive statistics, multinomial regression and binary regression were used for the analysis and data were presented in charts.

The total number of knowledge score was 66-points which were analyzed by assigning 1point to the correct answer and 0point for incorrect and don't know answer. The lowest score was 0point while the highest was 53-points. Respondents with ≤ 22 points were graded as having poor knowledge, >22 - 44 points as fair while >44 points as having good knowledge of type 2 diabetes. Data on practices were also analysed. An 8-point preventive practice scale was used. Practice score of ≤5 point, >5 point was regarded as poor, and good respectively. Respondents who were ≥95th percentile were regarded as obese and 85th to <95th percentiles were regarded as overweight, 5th to <85th percentile as normal weight and <5th percentile as underweight (BMI-for-age was used). The BMI was

calculated using the Centers for Disease Control (CDC) and Prevention BMI calculator (CDC, 2018). Height measurement of the respondents was in centimetre and weight in kilogram. The waist to hip ratio of the respondents was calculated by dividing the waist measurement by the hip measurement. Girls between the ranges of 0.80 or lower were classified as having low risk, 0.81-0.85 as moderate risk and 0.86 or higher as high risk while Boys between the ranges of 0.95 or lower were classified as having low risk, 0.96 – 1.0 as moderate risk and 1.0 or higher as high risk (Daniel, 2017).

3.13 Ethical Consideration

Ethical approval for the study was obtained from Osun State Ministry of Health Ethical Review Board. Permission to carry out the study was obtained from Ejigbo Local Government Education Board. The respondent verbal and written consent was obtained after providing adequate and relevant information regarding the study.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of the respondents

The socio-demographic characteristics of the respondents are presented in table 4.1. A total of 302 respondents participated in the study. The age distribution of respondents ranged from 12years to 19years with a mean of 16.1±1.7 years. Most of the respondents (61.6%) were within the age range of 16-19years. Majority of the respondents (55.3%) were male while 44.7% were females. A large proportion of the respondents 62.9% were Christians, 22.2% followed by Muslims while 14.9% were traditional believers. S.S.2 constituted the highest number of respondents 35.8%. Majority of the respondents 98.0% were Yoruba.

Table 4.1: Socio-demographic characteristics of respondents **N=302**

Socio-demographic characteristics	No.	%
Age (as at last birthday)		
12 – 15	116	38.4
16-19	186	61.6
Sex		
Male	167	55.3
Female	135	44.7
Religion		
Christianity	190	62.9
Islam	67	22.2
Traditional	45	14.9
Class		
S.S. 1	98	32.5
S.S 2	108	35.8
S.S. 3	96	31.8
Ethnic Group		
Yoruba	296	98.0
Hausa	5	1.7
Igbo	1	0.3

*Mean age 16.1±1.7

4.2: Awareness of type 2 diabetes

Table 4.2 examined the awareness of respondents on type 2 diabetes. Majority of the respondents (97.0%) indicated to have heard about diabetes before. Radio (76.8%) was the main source of information, 45.4% reported to have heard on Television, 41.3% from family members, 34.5% from faith-based organization, 33.4% from school, 31.7% from newspaper and 28.0% from friends.

Table 4:2 Awareness of Type 2 diabetes

Awareness Variable	Yes (%)	No (%)	I don't know (%)
Ever heard about type 2 diabetes mellitus (n = 302)	293 (97.0)	9 (3.0)	0(0)
Sources of information (n=293)			
Radio	225(76.8)	65(22.2)	3(1.0)
Television	133(45.4)	153(52.2)	7(2.4)
School	98(33.4)	191(65.2)	4(1.4)
Friends	82(28.0)	203(69.3)	8(2.7)
Family members	121(41.3)	160(54.6)	12(4.1)
Newspaper	93(31.7)	189(64.5)	11(3.8)
Faith-Based Organisation	101(34.5)	178(60.8)	14(4.8)

4.3: Knowledge of type 2 diabetes

Table 4.3 examined the knowledge of adolescents on type 2 diabetes. Majority of the respondents (64.5%) understands the meaning of diabetes as abnormal increase in blood glucose level while 13.3% knew it to be an abnormal reduction in blood glucose level and 17.1% knew diabetes to be normal blood glucose level. Majority of the respondents (64.5%) didn't know the types of diabetes, 22.2% indicated two types of diabetes, less than 10% respondents reported three types (4.4%) and one type (8.5%). Over half of the respondents correctly reported (73.4%) excessive sugar in the body and 30.7% correctly stated inability to convert sugar properly as causes of diabetes. Majority of the respondents (73.4%) correctly stated frequent urination, 65.9% reported weight loss, 52.2% indicated slow healing of cuts and wounds, 42.3% reported poor (blurred) vision and repeated infection, 38.6% indicated frequent drinking of water and 33.8% reported frequent eating as symptoms for type 2 diabetes. Most of the respondents (81.6%) agreed that diabetes can be detected through blood sugar test, 74.4% also supported urine test can be used, 75.4% believed it can be detected with the presence of ants on urine. More than half of the respondents (63.5%) indicated that type 2 diabetes can affect anybody, less than half reported people who take alcohol (45.4%), people who smoke (32.1%), those who live sedentary life (32.1%) and those who are obese/overweight (29.4%).

Less than half of the respondents reported hypertension (47.4%), kidney problem (47.1%), heart attack (39.9%), brain damage (25.3%), blindness (21.8%) and cutting off the affected part (20.5%). Majority of the respondents indicated insulin injection (74.4%), frequent medical check-up and care (67.9%), not taking alcohol (48.8%), eating of fruits and vegetables (46.4%), regular exercise (44.0%), not smoking (40.6%) and reducing weight (32.4%). More than of the respondents (67.9%) reported eating too many sugary foods can cause type 2 diabetes and half of them (51.5%) indicated drinking too much alcohol can lead to type 2 diabetes. Less than half of the respondents reported that smoking increase the chance of having diabetes (41.3%), Eating food rich in vegetables reduces the chance of having type 2 diabetes (36.5%), Having an immediate family member (father, mother, sister or brother) with diabetes increase the risk of developing type 2 diabetes mellitus (34.1%), Being obese or being overweight can be linked to type 2 diabetes (30.4%), Mental stress can lead to type 2 diabetes (23.9%), Lack of regular exercise can cause type2 diabetes (23.2%) and Increase in age can expose one to type 2 diabetes (18.1). As shown in figure 4.1, the overall level of knowledge was 26.6%, 65.5% and 7.8% had poor, fair and good knowledge of type 2 diabetes respectively.

4.3a: Knowledge on type 2 diabetes **N =293**

Meaning of diabetes	**Yes (%)**	**No (%)**	**Don't know (%)**
Abnormal increase in blood glucose level*	189 (64.5)	42 (14.3)	62(21.2)
Abnormal reduction in blood glucose level	39(13.3)	164(56.0)	90(30.7)
Normal blood glucose level	50(17.1)	147(50.2)	96(32.8)

Types of diabetes	**No.**	**%**
I don't know	189	64.5
1 type	25	8.5
2 types	65	22.2
3 types*	13	4.4
4 types	1	0.3

Causes of diabetes	**True (%)**	**False (%)**	**I don't know (%)**
Excessive fat in the blood	73(24.9)	117(39.7)	103(35.2)
Inability to convert sugar (glucose) properly*	90(30.7)	94(32.1)	109(37.2)
Excessive protein in the body	70(23.9)	134(45.7)	89(30.4)
Excessive sugar in the body*	215(73.4)	44(15.0)	34(11.6)
Excessive vitamin in the blood	67(22.9)	125(42.7)	101(34.5)
Lack of insulin	96(32.8)	80(27.3)	117(39.9)
Spiritual attack	62(21.2)	125(42.7)	106(36.2)

Symptoms	**True (%)**	**False (%)**	**I don't know (%)**
Frequent eating *	99(33.8)	99(33.8)	95(32.4)
Frequent drinking of water *	113(38.6)	97(33.1)	83(28.3)
Frequent urination*	215(73.4)	35(11.9)	43(14.7)
Poor (Blurred) Vision*	124(42.3)	97(33.1)	72(24.6)
Slow healing of cuts and wounds*	153(52.2)	61(20.8)	79(27.0)
Weight loss*	193(65.9)	46(15.7)	54(18.4)
Sugary Urine	179(61.1)	64(21.8)	50(17.1)

4.3b: Knowledge on type 2 diabetes (continued)

Symptoms	Yes (%)	No (%)	Don't know (%)
Fainting while walking	73(24.9)	116(39.6)	104(35.5)
Tiredness	160(54.6)	58(19.8)	75(25.6)
Inability to eat	79(27.0)	122(41.6)	92(31.4)
Frequent Stooling/Going to the toilet	83(28.3)	114(38.9)	96(32.8)
Repeated Infection*	124(42.3)	82(28.0)	87(29.7)
Adding weight	62(21.2)	156(53.2)	75(25.6)
Detection of type 2 diabetes	**True (%)**	**False (%)**	**I don't know (%)**
Testing blood sugar with a device*	239(81.6)	22(7.5)	32(10.9)
Testing the urine sugar with a device*	218(74.4)	36(12.3)	39(13.3)
Tasting the urine to know if sugar is in it	100(34.1)	106(36.2)	87(29.7)
Presence of ant/flies on urine	221(75.4)	33(11.3)	39(13.3)
Nose test	37(12.6)	128(43.7)	128(43.7)
People that can be affected type 2 diabetes	**False (%)**	**True (%)**	**I don't know (%)**
People who smoke*	119(40.6)	94(32.1)	80(27.3)
People who take alcohol*	84(28.7)	133(45.4)	76(25.9)
Those who are obese/overweight*	110(37.5)	86(29.4)	97(33.1)
Those who live sedentary life*	120(41.0)	94(32.1)	79(27.0)
Children and adolescent only	171(58.4)	61(20.8)	61(20.8)
It only affects the rich	167(57.0)	69(23.5)	57(19.5)
It can affect anybody*	78(26.6)	186(63.5)	29(9.9)
It only affects the poor	176(60.1)	41(14.0)	76(25.9)
Complication	**True (%)**	**False (%)**	**I don't know (%)**
Blindness*	64(21.8)	126(43.0)	103(35.2)
Kidney problem*	138(47.1)	75(25.6)	80(27.3)
Cholera	113(38.6)	86(29.4)	94(32.1)
Brain damage*	74(25.3)	114(38.9)	105(35.8)

4.3c: Knowledge on type 2 diabetes (continued)

Complications	Yes (%)	No (%)	Don't know (%)
Cutting of affected part of the body*	60(20.5)	139(47.4)	94(32.1)
Typhoid Fever	101(34.5)	110(37.5)	82(28.0)
Heart attack*	117(39.9)	82(28.0)	94(32.1)
Hypertension*	139(47.4)	75(25.6)	79(27.0)
Poor academic performance	69(23.5)	126(43.0)	98(33.4)
Management	**True (%)**	**False (%)**	**I don't know (%)**
Insulin injection*	218(74.4)	37(12.6)	38(13.0)
Regular exercise*	129(44.0)	96(32.8)	68(23.2)
Eating of fruits and vegetables*	136(46.4)	76(25.9)	81(27.6)
Taking too much of sugar	74(25.3)	159(54.3)	60(20.5)
Not smoking*	119(40.6)	90(30.7)	84(28.7)
Not taking alcohol*	143(48.8)	81(27.6)	69(23.5)
Frequent medical check up and care*	199(67.9)	48(16.4)	46(15.7)
Praying always	113(38.6)	99(33.8)	81(27.6)
Reducing weight*	95(32.4)	105(35.8)	93(31.7)
Use of well prepared traditional medicine	164(56.0)	64(21.8)	65(22.2)
Risk factors of diabetes	**True (%)**	**False (%)**	**I don't know (%)**
Drinking too much alcohol can lead to type 2 diabetes*	151(51.5)	66(22.5)	76(25.9)
Having an immediate family member (father, mother, sister or brother) with diabetes increases the risk of developing type 2 diabetes mellitus*	100(34.1)	120(41.0)	73(24.9)
Being obese or being overweight can be linked to type 2 diabetes*	89(30.4)	126(43.0)	78(26.6)

4.3d: Knowledge on type 2 diabetes (continued)

Lack of regular exercise can cause type2 diabetes*	68(23.2)	138(47.1)	87(29.7)
People who read too much can have type 2 diabetes	26(8.9)	199(67.9)	68(23.2)
Smoking increase the chance of having type 2 diabetes*	121(41.3)	93(31.7)	79(27.0)
Eating too many sugary foods can cause type 2 diabetes*	205(70.0)	52(17.7)	36(12.3)
Eating food rich in vegetables reduces the chance of having type 2 diabetes*	107(36.5)	103(35.2)	83(28.3)
Eating too many fruits can lead to type 2 diabetes	71(24.2)	153(52.2)	69(23.5)
Increase in age can expose one to type 2 diabetes*	53(18.1)	160(54.6)	80(27.3)
Mental stress can lead to type 2 diabetes*	70(23.9)	143(48.8)	80(27.3)
Taking too much of water can cause type 2 diabetes	23(7.8)	190(64.8)	80(27.3)

*Correct responses

N = 293

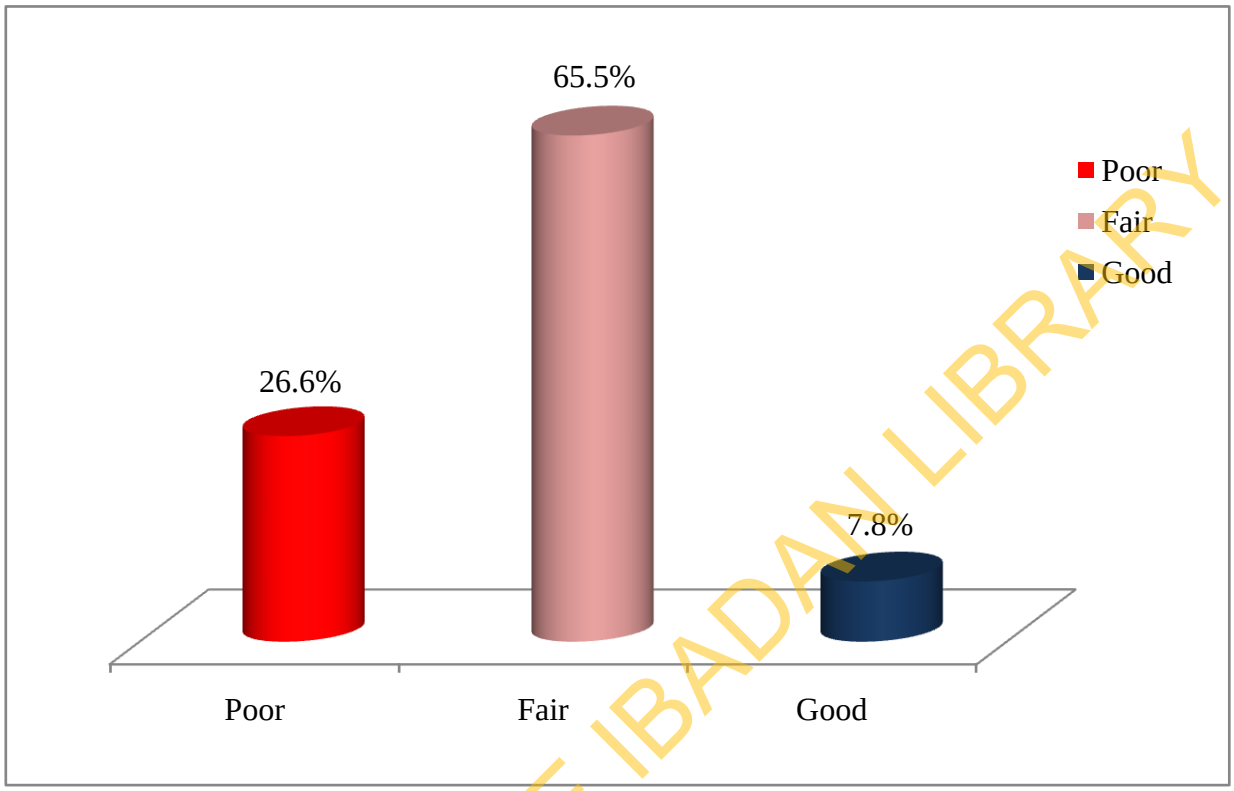


Figure 4.1: Respondents' categories of knowledge scores on type 2 diabetes

4.4. Preventive Practices of type 2 diabetes

The preventive practices of the adolescents were presented in Table 4.4. 13.6% of respondents reported to have ever tested for blood sugar. Less than 10% of the respondents (7.9%) had a family history of diabetes, the relationship with the family member was indicated as Father (33.3%), Mother (33.3%), Sister (25.0%) and Brother (8.3%). 4.0% of the respondents reported smoking tobacco products daily while 4.0% smoke too but not daily. 8.3% of the respondents take alcoholic drinks. Less than half of the respondents (42.1%) stated to exercise more than two times in a week, 23.5% exercise twice a week while 20.5% exercise once a week. 41.7% reported to exercise between 30min-1hr, 34.1% indicated to exercise between 10min-20min while 24.8% stated to exercise for less than 10min. Majority of the respondents (76.8%) walked to school for 5days, (2.6%) for 4days, (3.0%) for 3days, (2.0%) for 2days and (12.3%) for 1 day.

Majority of the respondents (82.5%) reported participating in sports activities in schools. The respondents reported to have participated in football (34.5%), Running (28.1%), Jumping (25.7%), Throwing javelin (4.0%), shot put (1.6%), Volleyball (0.4%) and Swimming (0.4%). Over half of the respondents (60.2%) watched TV between 1 hour to 3hours, 12.6% watched between 4hours to 6hours, 6.0% reported between 20 to 30minutes and 1.3% watched more than 9hours. It was reported that less than half of the respondents consumed vegetables in the previous week between 1-2days (30.8%), between 3days-4days (37.1%) and more than 5days (22.5%). Also in the previous week, it was reported that 43.4% consumed fruits for more than 5 days, 24.5% between 3-4days and 22.5% consumed fruits between 1-2days.

Popular foods/snacks consumed by respondents during break hours are presented in Table 4.5. Less than half of the respondents (32.5%) consumed rice twice, same as doughnut (29.8%), fish pie (26.2%), biscuit (22.5%), Spaghetti (26.8%), Fish pie (24.8%). Almost half of the respondents (46.0%) take beans every day while 27.8% takes it twice a week. Table 4.6 shows the common soft/non-alcoholic drinks consumed by adolescents. Less than half of the respondents (40.4%) take viju milk while (11.3 %) takes sprite twice a week. 28.1% takes zobo every day. Less than 10% of the respondents (7.3%) takes Pepsi, (9.3%) Coke and (9.3%) fanta. Figure 4.2 indicated the overall preventive practice of the adolescent which showed that 57.3% had good preventive practice and 42.7% had poor preventive practice.

Table 4.4a Preventive Practices of type 2 diabetes **N =302**

Preventive Practices	No.	%
Have you ever test for blood sugar		
Yes	41	13.6
No	261	86.4
Family history of diabetes		
Yes	24	7.9
No	278	92.1
Relationship with the family member (Victim) *(n=24)*		
Father	8	33.3
Mother	8	33.3
Sister	6	25.0
Brother	2	8.3
Currently smoking		
Yes, daily	12	4.0
Yes, but not daily	12	4.0
No	278	92.1
Take alcohol		
Yes	25	8.3
No	277	91.7
Times of exercise		
Once	62	20.5
Twice	71	23.5
More than two times	127	42.1
None	42	13.9
Minutes of exercise *(n = 258)*		
Less than 10min	64	24.8
10min-20min	88	34.1
30min-1hr	108	41.7
Days of walk between 10-30minutes		
I don't walk	37	12.3
1 day	10	3.3
2 days	6	2.0
3 days	9	3.0
4 days	8	2.6
5 days	232	76.8

Table 4.4b Preventive Practices of type 2 diabetes **N= 302**

Preventive Practices	**No.**	**%**
Participate in any sport activities		
Yes	249	82.5
No	53	17.5
Type of sports activity participated in *(n=249)*		
Jumping	64	25.7
Running	70	28.1
Football	86	34.5
Throwing Javelin	10	4.0
Shot put	4	1.6
Volleyball	1	0.4
Swimming	1	0.4
Hours of watching TV		
I don't watch TV	60	19.9
20minutes - 30minutes	18	6.0
1 hour - 3hours	182	60.2
4 hours - 6 hours	38	12.6
>9 hours	4	1.3
Days consumed vegetables		
I didn't eat vegetables	29	9.6
1 day – 2days	93	30.8
3 days – 4days	112	37.1
> 5 days	68	22.5
Days consumed fruits		
I didn't eat fruit	29	9.6
1 day – 2days	68	22.5
3 days – 4days	74	24.5
> 5 days	131	43.4

4.5 Food/Snacks items **N = 302**

Food/snacks items	Frequency of consumption				
	Everyday (%)	2 times (%)	3-4times (%)	> 4 times (%)	I don't take it (%)
Rice	120(39.7)	98(32.5)	47(15.6)	19(6.3)	18(6.0)
Doughnut	79(26.2)	90(29.8)	50(16.6)	17(5.6)	66(21.9)
Fish pie	112(37.1)	79(26.2)	42(13.9)	15(5.0)	54(17.9)
Biscuit	139(46.0)	68(22.5)	36(11.9)	15(5.0)	44(14.6)
Spaghetti	112(37.1)	81(26.8)	35(11.6)	25(8.3)	49(16.2)
Fish Roll	107(35.4)	75(24.8)	37(12.3)	14(4.6)	69(22.8)
Sweets	110(36.4)	77(25.5)	32(10.6)	17(5.6)	66(21.9)
Beans	139(46.0)	84(27.8)	22(7.3)	16(5.3)	41(13.6)

*multiple responses

4.6 Common soft/non-alcoholic drinks consumed during the last week **N = 302**

Food items	Frequency of consumption				
	Everyday (%)	2 times (%)	3-4times (%)	> 4times (%)	I don't take it (%)
Viju Milk	89(29.5)	122(40.4)	34(11.3)	11(3.6)	46(15.2)
Sprite	62(20.5)	106(35.1)	34(11.3)	8(2.6)	92(30.5)
Zobo	85(28.1)	73(24.2)	33(10.9)	9(3.0)	102(33.8)
Pepsi	83(27.5)	93(30.8)	22(7.3)	18(6.0)	86(28.5)
Coke	102(33.8)	106(35.1)	28(9.3)	6(2.0)	60(19.9)
Fanta	90(29.8)	97(32.1)	28(9.3)	11(3.6)	76(25.2)

*multiple responses

N=302

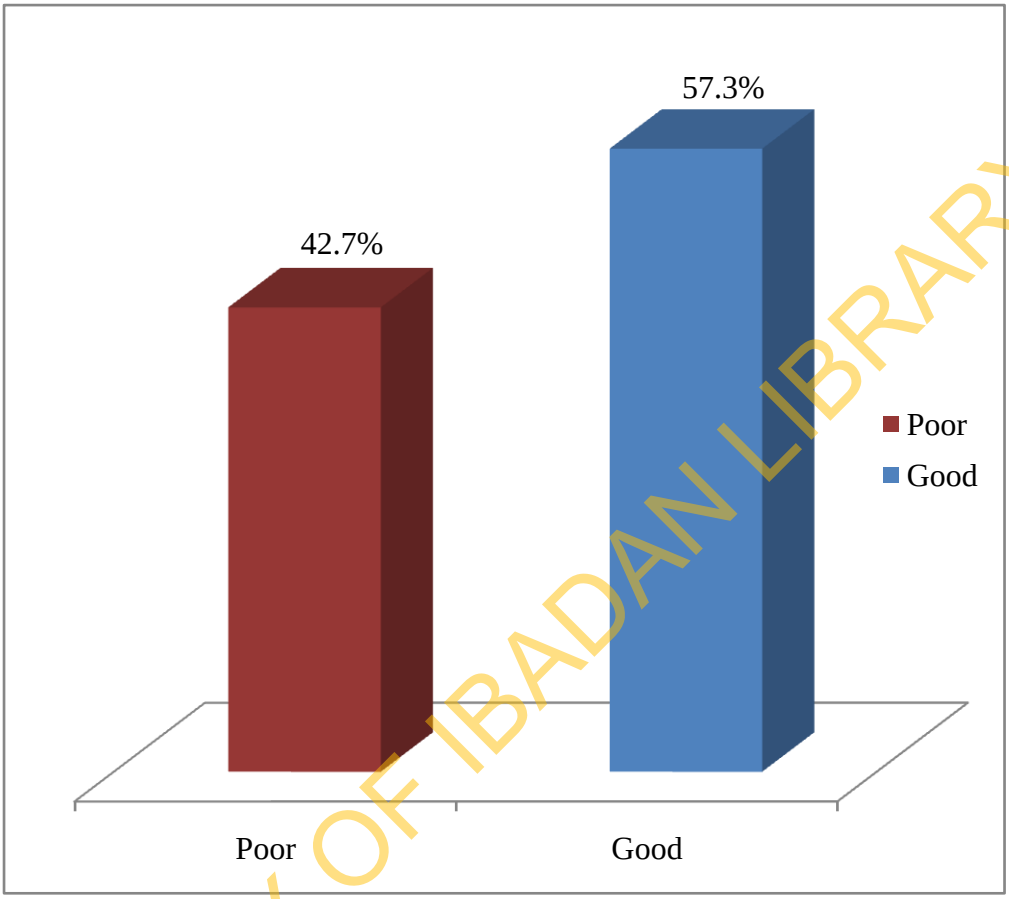


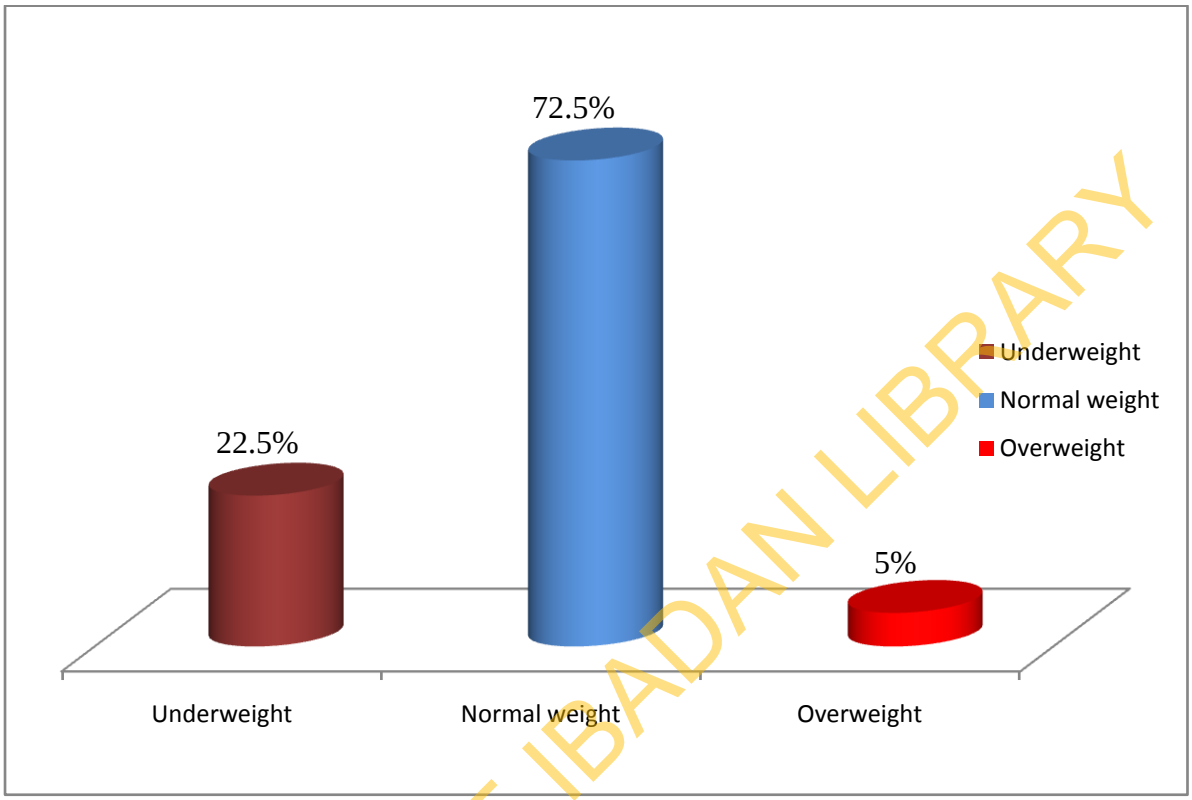
Figure 4.2: Respondents categories on preventive practices of type 2 diabetes

4.5 Respondents' Body Mass Index (BMI) and Waist-Hips Ratio (WHR)

Figure 4.3 presented the respondents BMI. It showed that more than half (72.5%) of the respondents had normal weight, 22.5% were underweight and a few respondents (5.0) were overweight.

Figure 4.5 represented the waist to hip ratio of the respondents. Majority of the respondents (74.5%) were at low risk to diabetes, 16.9% were at moderate risk and 8.6% were at high risk of diabetes.

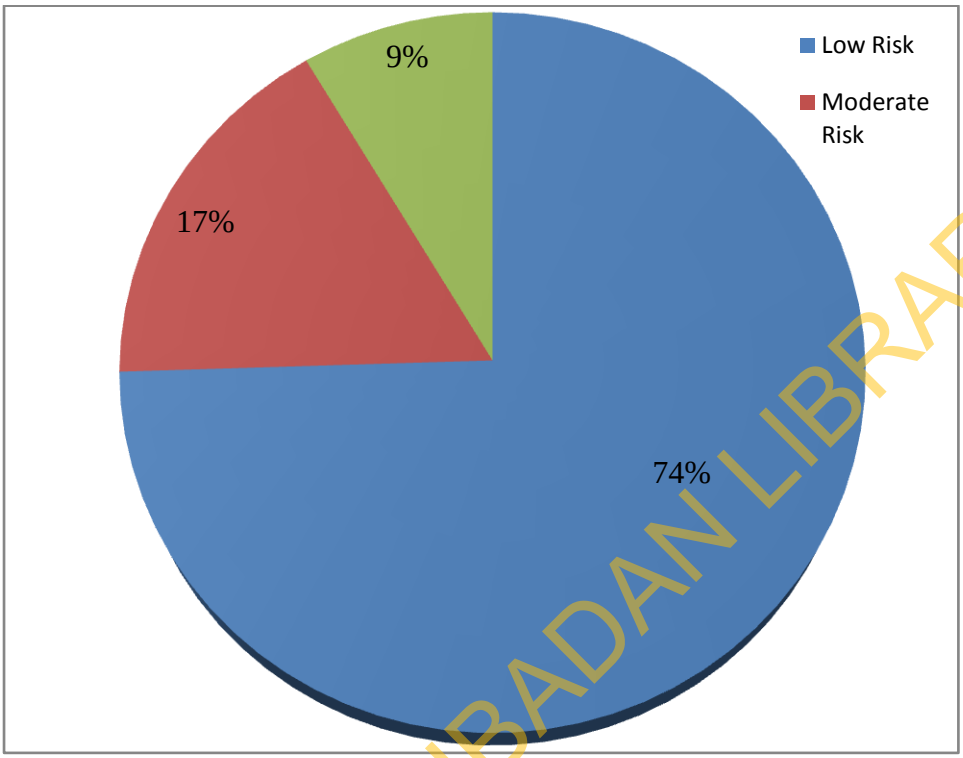
N = 302



***** *Underweight – Less than 5th percentile, Normal weight – 5th percentile to less than the 85th percentile, Overweight – 85th to less than the 95th percentile*

Figure 4.3: Respondents' Body Mass Index

N = 302



Girls

Low Risk: 0.08 or lower

Moderate Risk: 0.81-0.85

High Risk: 0.86 or higher

Boys

Low Risk: 0.95 or lower

Moderate Risk: 0.96-1.0

High Risk: 1.0 or higher

Figure 4.4: Respondents' Waist to Hips Ratio

TEST OF HYPOTHESES

Hypotheses I: There is no significant difference between socio-demographic variables and level of knowledge of type 2 diabetes.

The first variable used to test the hypothesis was age and it is shown that a p-value of 0.010 was obtained which is less than 0.05. Therefore there was a statistically significant association between the age of the respondents and their knowledge of type 2 diabetes. Hence, we reject the null hypothesis.

The second variable was class, a p-value of 0.152 was obtained which is >0.05. This indicated that there was no statistically significant association between the class of the respondents and knowledge of type 2 diabetes. Hence we fail to reject the null hypothesis. Fisher's exact test was used.

The third variable used was gender, a p-value 0.019 was obtained which is <0.05, this showed that there was a statistically significant association between gender and knowledge of type 2 diabetes. Hence we reject the null hypothesis.

The fourth variable used to test the hypothesis was religion, where the p-value was 0.076 which is <0.05, there was no statistically significant association between the religion of respondents and knowledge of type 2 diabetes. Hence, we fail to reject the null hypothesis. Fisher's exact test was used.

The last variable was an ethnic group, where a p-value of 0.486 was obtained which is >0.05. Therefore, there was no statistically significant association between the ethnic group of the respondents and knowledge of type 2 diabetes. Hence we fail to reject the null hypothesis. Fisher's exact test was used.

4.7 Association between socio-demographic variables and knowledge of type 2 diabetes

Socio-demographic Variables	Knowledge			Df	X^2	P-Value
	Poor (%)	Fair (%)	Good (%)			
Age						
12-15	39(34.5)	62(54.9)	12(10.6)	2	9.292	0.010*
16-19	39(21.7)	130(72.2)	11(6.1)			
Class						
S.S. 1	33(34.7)	53(55.8)	9(9.5)	4	6.719	0.152
S.S. 2	24(22.9)	72(68.6)	9(8.6)			
S.S. 3	21(22.6)	67(72.0)	5(5.4)			
Gender						
Male	33(20.2)	115(70.6)	15(9.2)	2	7.881	0.019*
Female	45(34.6)	77(59.2)	8(6.2)			
Religion						
Christianity	41(21.9)	127(67.9)	19(10.2)	4	8.457	0.076
Islam	23(35.4)	39(60.0)	3(4.6)			
Traditional	14(34.1)	26(63.4)	1(2.4)			
Ethnic group						
Yoruba	75(26.1)	189(65.9)	23(8.0)	4	3.595	0.486
Hausa	2(40.0)	3(60.0)	0 (0.0)			
Igbo	1(100)	0 (0.0)	0 (0.0)			

Multinomial regression for significant association between respondents' socio-demographic variables and knowledge of type 2 diabetes

Table 4.8 shows the logistic regression analysis that there was a significant association between the age of respondents and knowledge of type 2 diabetes. It shows that the odds of a respondent within the age bracket of 16-19 are 0.477 times less likely to have a fair knowledge of type 2 diabetes rather than respondents that are aged 12-15. It shows a significant association. (OR=0.477, 95% CI: 0.279-0.816). It also shows that respondents who are female are 2.037 more likely to have a fair knowledge of type 2 diabetes than male respondents (OR= 2.037, 95% CI: 1.194-3.474). It shows that there is a significant association.

The analysis also shows that respondents who are in the age bracket of 16-19 are 1.091 more likely to have good knowledge of type 2 diabetes than those within the age of 12-15 (OR=1.091, 95% CI: 0.430-2.767). It shows that respondents that are female are 2.557 more likely to have good knowledge of type 2 diabetes rather than male respondents (OR=2.557, 95% CI: 0.971-6.735).

Table 4.8 Multinomial regression analysis between respondents' Socio-demographic variables and knowledge of type 2 diabetes

Socio-demographic variables	OR	95%CI OR	p-value
Age			
12-15**			
16-19	0.477	0.279-0.816	0.007*
Sex			
Male**			
Female	2.037	1.194-3.474	0.009*
Age			
12-15**			
16-19	0.430	0.430-2.767	0.855
Sex			
Male**			
Female	2.557	0.971-6.735	0.057

****** Reference category

* Significant ($p<0.05$)

Hypotheses II: There is no significant difference between socio-demographic variables and preventive practices of type 2 diabetes.

The first variable used was age, a p-value of 0.192 was obtained which is >0.05. This indicated that there was no statistically significant association between the age of the respondents and preventive practices of type 2 diabetes. Hence we fail to reject the null hypothesis.

The second variable showed that there was a statistically significant association between class and preventive practice of type 2 diabetes. The p-value obtained was 0.000 which is <0.05. Hence, we reject the null hypothesis.

The third variable used was gender, the p-value obtained was 0.000 which is <0.05. It showed that there was a statistically significant association between gender and preventive practice type 2 diabetes. Hence, we reject the null hypothesis.

The last variable showed that there was no statistically significant association between religion and preventive practice of type 2 diabetes. The p-value obtained was 0.647 which is >0.05. Hence, we fail to reject the null hypothesis.

4.9 Association between socio-demographic variables and preventive practices of type 2 diabetes

Socio-demographic Variables	Preventive Practices		Df	X^2	P-Value
	Poor (%)	Good (%)			
Age					
12-15	55(47.4)	61(52.6)	1	1.699	0.192
16-19	74(39.8)	112(60.2)			
Class					
S.S. 1	56(57.1)	42(42.9)	2	19.376	0.000*
S.S. 2	48(44.4)	60(55.6)			
S.S. 3	25(26.0)	71(74.0)			
Gender					
Male	55(32.9)	112(67.1)	1	14.606	0.000*
Female	74(54.8)	61(45.2)			
Religion					
Christianity	85(44.7)	105(55.3)	2	0.871	0.647
Islam	26(38.8)	41(61.2)			
Traditional	18(40.0)	27(60.0)			

*Significant (<0.05)

Binary regression for significant association between respondents' socio-demographic variables and preventive practices of type 2 diabetes

Table 4.10 shows the logistic regression analysis that there was a significant association between the gender of respondents and preventive practices of type 2 diabetes. It shows that the odds of a respondent who are male 2.11times more likely to have a good practices of type 2 diabetes rather than respondents who are female (OR=2.11, 95% CI:1.30-3.42). It also shows that respondents who are in S.S. 2 are 1.59times more likely to have a good practice of type 2 diabetes than those in S.S.1 (OR=1.59, 95% CI:0.904-2.78). It also indicated that respondent who are in S.S. 3 are 3.24times more likely to have good practices of type 2 diabetes than other respondents. (OR= 3.24, 95% CI: 1.74-6.02)

Table 4.10 Binary regression analysis between respondents' Socio-demographic characteristics and preventive practices of type 2 diabetes

Socio-demographic characteristics	OR	95%CI OR	p-value
Sex			
Female**			
Male	2.11	1.30-3.42	0.002*
Class			
S.S. 1**			
S.S. 2	1.59	0.904 – 2.78	0.108
S.S. 3	3.24	1.74 – 6.02	0.000*

****** Reference category

* Significant ($p<0.05$)

Hypotheses III: There is no significant difference between knowledge and preventive practices of type 2 diabetes of the respondents

The table showed that the p-value was 0.016 which is <0.05, this means that there is a statistically significant association between knowledge of respondents and preventive practices of type 2 diabetes. Hence, we reject the null hypothesis.

Table 4.11 Association between knowledge and preventive practices of the respondents

Knowledge	Practices		Df	X^2	p-value
	Poor (%)	Good (%)			
Poor	44 (56.4)	34 (43.6)	2	8.302	0.016*
Fair	73 (38.0)	119 (62.0)			
Good	8 (34.8)	15 (65.2)			

***significant (<0.05)**

Hypotheses IV: There is no significant difference between knowledge of type2 diabetes and anthropometric measurements of the respondents

Table 4.12 indicated the result of the test hypothesis between knowledge of type 2 diabetes and BMI of the respondents. Majority of the respondents (72.9%) who were normal weight had fair knowledge compared with those who are underweight (22.9%) and overweight (4.2%). The p-value was 0.912 which is >0.05, therefore, there is no statistically significant association between knowledge and BMI of the respondents.

Table 4.13 shows the respondents' waist-hip ratio. Respondents with 67.9% who have poor knowledge were at low risk of diabetes, 75.5% who had fair knowledge and 91.3% who had good knowledge were also at low risk of having diabetes. There was no statically significant association between knowledge and WHR of the respondents.

4.12 Association between Knowledge and BMI of the respondents

Knowledge	BMI			Df	X^2	P-Value
	Underweight (%)	Normal weight (%)	Overweight (%)			
Poor	17 (21.8)	56 (71.8)	5(6.4)	4	0.987	0.912
Fair	44 (22.9)	140(72.9)	8(4.2)			
Good	4(17.4)	18(78.3)	1(4.3)			

4.13 Association between Knowledge and Waist-Hips ratio (WHR) of the respondents

Knowledge	WHR			Df	X^2	P-Value
	Low Risk (%)	Moderate Risk (%)	High Risk (%)			
Poor	53(67.9)	18(23.1)	7(9.0)	4	7.136	0.129
Fair	145(75.5)	31(16.1)	16(8.3)			
Good	21(91.3)	0(0.0)	2(8.7)			

Hypotheses V: There is no significant difference between gender, age and body mass index classification of the respondents

Table 4.14 showed the association between gender and BMI of the adolescents. The p-value was 0.001 which is less than <0.05. Therefore, there is statistically significant association between gender of the respondents and their BMI.

Table 4.15 was showing the association between respondents' age and BMI. The p-value was 0.957 which is greater than >0.05. Hence, there is no statistically significant association between age of the respondents and their BMI.

4.14 Association between Gender and BMI

Gender	BMI			Df	X^2	P-Value
	Underweight (%)	Normal weight (%)	Overweight (%)			
Male	49 (29.3)	114 (68.3)	4 (2.4)	2	13.634	0.001*
Female	19 (14.1)	105 (77.8)	11 (8.1)			

***significant (<0.05)**

4.15 Association between Age and BMI

Gender	BMI			Df	X^2	P-Value
	Underweight (%)	Normal weight (%)	Overweight (%)			
12-15years	27 (23.3)	83 (71.6)	6 (5.2)	2	0.88	0.957
16-19years	41 (22.0)	136 (73.1)	9 (4.8)			

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

5.1.1 Socio-Demographic Profile

Respondents' mean age was 16.1±1.7 years with the majority between the ages of 16 and 19years. The finding is similar to research carried out by Omisore, et al. (2014), it revealed that the mean age was 15.1 ± 1.1 years. Most of the respondents were male, which is similar to a finding conducted by Ugbangha et al (2016) whereby 57.6% were male. A large proportion of the respondents were Christians compared to other religions. Christianity being predominant religion among the adolescents is attributed to the location of the study area, as it is the most common religion practised in the south-western part of Nigeria compared to the Northern part of the country where Islam is predominant religion. The major religions practised in Nigeria are Christianity and Islam which can be observed in the religion percentage seems among the adolescents that are mostly Christians and Muslims. The majority of the respondents in this study were Yoruba which could be attributed to the location of the study area where Yoruba tribe constitute the majority.

5.1.2 Awareness of type 2 diabetes

The awareness of the respondents is similar to a study conducted in Oman (Al-Mahrooqi, 2013), although higher than a study carried out among adolescents in Oyo State with a level of awareness of 88.5% (Omisore et al, 2014) and also to a study carried out among adolescents in Lagos with a level of awareness of 66% (Ugbangha et al, 2016). This could be ascribed to their access and listening to the radio which serves as the highest source of information on diabetes in the rural area.

Findings from this study shows that, majority of the respondents identified radio as their main source of information and followed by television which is contrary to a study conducted in Lagos by Ugbangha, et al (2016), where 25% of the respondents indicated radio or television as their sources of information and also in contrary to studies conducted by Al-Mahrooqi, et al. (2013) and (Okoh, et al. 2013) where 48% and 25% of respondents main sources of information were from mass media. This is due to the fact

that the majority of adolescents in rural areas listen to radio more than the urban dwellers. Other sources of information also discovered from this study include, family members, faith-based organization, school, newspaper and friends, this is contrary to a study conducted in Ethiopia where 48.2% indicated their information was from relatives and 3.8% from religious leader (Asmamaw et al, 2015).

5.1.3 Knowledge of type 2 diabetes

The overall result of this study unveiled that most of the respondents had a fair knowledge of diabetes. The result was similar to a study conducted by Dinesh, et al (2016). In contrary to the findings of this study, Ubangha (2016) reported that less than half (46%) of the respondents had good knowledge of the study, this is due to the fact that the study area is a rural area compared to an urban area where the respondents have greater exposure to information materials. It is observed that the awareness and level of knowledge of diabetes are not the same, the awareness is high compared to good knowledge that is fair. This difference could be attributed to the fact that the respondents may have heard about diabetes but may not have in-depth knowledge of symptoms, management and risk factors.

Majority of the respondents in this study correctly defined diabetes as an abnormal increase in blood glucose which is similar to a study conducted in Lagos (Ugbangha, 2016), compared to a previous study in Port-Harcourt (33%) (Okoh, 2014). This could be as a result of respondents from this study were in higher classes compare to those in Port-Harcourt study which also included students in junior secondary classes.

In contrary to the belief that type 2 diabetes occurs mainly in adults, in this study, majority of the respondents were of the opinion that it can affect anybody, including children and adolescent. This is similar to the findings in Uyo (Unadike, 2009) and Oghara (Azinge, 2013). In this study, the majority of the respondent often stated frequent urination as the symptom of diabetes; this is similar to the previous report from Oman which is 82% (Al-Mahrooqi, 2013). This is in contrary to 39.9% in Lagos (Ugbangha, 2016), 58.7% Oghara (Azinge, 2013), less than 50% in Pakistan (Mukhopadhyay, et.al, 2010) and 29% in Uyo (Unadike, 2009). The higher values could be attributed to the respondents' high level of awareness of diabetes. Majority of the respondents in this study indicated that testing urine sugar and blood sugar could be used to diagnose

diabetes. This is similar to a result from Oghara (89%) but higher than the finding from Lagos (32.7%). The difference could also result from their level of awareness on diabetes. A higher percentage of the respondents also believed in a non-scientific method to test for urine or sugar, which is similar to a study among diabetic patients (Okolie et al, 2009).
There was a statistically significant difference between age and knowledge of diabetes in this study. The finding shows that respondents who were older had more knowledge about diabetes, which means that as the respondents were growing older the more they become knowledgeable about it.

5.1.4 Preventive practices of type 2 diabetes among adolescents

In this study, 13.6% reported to have ever checked for blood sugar, which was in contrary to a study conducted by Gopichandran, et al. (2012) and Dinesh, et al (2018), where 70% and 65% had tested for blood sugars in at least once in 3months. This is could be as a result of a high level of technology and access to it in those urban areas compared to rural communities. In contrary to a study carried out by Azinge (2013) which in his study reported 15% of the respondents were aware of a family member who is diabetic but in this study, 7.9% of the respondents were aware of a family member who is diabetic.

In this study, less than half of the respondents consumed fruits and vegetables more than 5days in a week. This is opposite to a research conducted by Dinesh, et al, (2018) and Rajasekharan et al. (2015), 3% and 26% of respondents respectively, consumed fruits and vegetables in a week. In a similar study by Ugbangha (2016), 29.6% of respondents consumed fruits more than five times a week. This could be as a result of access to fruits and vegetables, which is most common in the rural areas. Nevertheless, the majority of the respondents diet rich in carbohydrate and sugar which can put them at risk of diabetes. This is the same as research conducted by Omorogiuwa et al (2010). In the same study, 42.1% of the respondents exercise in a week, where 41.7% carried out the exercise between 30minutes to 1hour. This is in contrast to a study in Lagos, where 24.09% of respondents exercise more than five times a week. This is due to the fact that majority of the respondents in this study walk (which is regarded as a form of exercise) at least for five days a week and between 10-30minutes to school. Majority of the respondents had never smoked any tobacco products nor take alcohol. Generally, this study shows that the respondents' had a good practice.

There was a statistically significant difference between class and preventive practices of diabetes in this study. The finding shows that respondents who were in higher classes had good practice about type 2 diabetes, which means as the respondents were growing older the more they become knowledgeable, the more it influences their lifestyle.

There was a statistically significant difference between gender and preventive practices of diabetes in this study. The finding shows that respondents who were male had a good practice about type 2 diabetes, this indicated that male is more physically active; they are more involved in the exercise, like football, tennis.

5.1.5 Anthropometric measurements of respondents

Findings from this study revealed that 5% of the respondents were overweight and obese. This is similar to a study conducted among in-school adolescents in Lagos (Ugbangha, 2016), where 5.20% were overweight. This is lesser to a study conducted in Port-Harcourt in which 14.1% were overweight and in United State of America, where 49% were overweight. (Baranowski, et al. 2006). This might be due to level of globalization and industrialization in the urban areas and level of exposure of the adolescents.

It was revealed from this study that about one fifth of the respondents were underweight and majority had a normal weight. This was in contrast with a study conducted among adolescents in Kolkata (Mukhopadhyay, et al. 2015). The percentage of respondents varies according to their gender, it was discovered that almost one third of the male respondents and less than one fifth of female were underweight and in contrast with a research by Mukhopadhyay (2015) where 41.1% of male and 30.6% of the female respondents were underweight. The result also indicated female respondents had higher percentage (8.1%) than their male counterpart. This is different with a research done by Pelegrini (2015), where male respondents had higher body mass index. This might be to the genetic makeup of females has they have hormone that secrete fat more than in males and also as discovered from this study, female respondents low preventive practices compare to the male respondents. There is statistical significance between the gender of the respondent and their BMI (p=0.001).

It was also discovered using a waist-hip ratio than 8.6% of the respondents were at high risk of diabetes which is similar to research carried out by Kaur, et al. (2007), where

7.84% of respondents were overweight and obese. From these findings, it can be deduced that the majority of those who are obese and overweight, was also at high risk of diabetes.

5.1.6 Implication for Health Promotion and Education

Based on this study, there is need to develop an appropriate and effective intervention that will focus on type 2 diabetes among adolescents that is becoming more increasing in our society/country which can lead to serious complications. This study recorded a fair level of knowledge and fair practices on diabetes which is a gap that needs to be addressed by employing relevant health promotion and education strategies that will target individual, family, community, institutions and government.

Awareness can be used to increase the level of knowledge and motivate respondents to adopt healthy lifestyles. This will enhance respondents' awareness of the risk factor of diabetes and its health challenges if it is not prevented, which will also improve the practices. The use of Behavioural Change Communication (BCC) such as fliers, jingles, billboards and health talk programmes on the radio can also be adapted to create awareness.

Advocacy as one of the strategies in health promotion and education should be targeted to the government to enable them to formulate and implement policies that will include non-communicable disease as a subject in the curriculum of schools. The school authority and community also provide a friendly environment that will enhance healthy practices among the respondents.

Training as one of the strategies of health promotion and education which is used to impart knowledge and skills can be use in educating the teachers so as to equip them with adequate knowledge on type 2 diabetes and its preventive practices in order to pass adequate information to the adolescents. Also food vendors in the school should be thoroughly trained on adequate diets required by the adolescents.

5.2 Conclusion

This study was designed to measure the knowledge and preventive practices of adolescents in rural areas, in which four research questions were developed in this study. Each research questions was built on the knowledge gained from the previous questions.

The data collected from this study revealed that most of the respondents that participated were aware of type 2 diabetes. Despite the awareness, the majority of the respondents had a fair (average) knowledge of type 2 diabetes and more than half of the respondents have good preventive practices of diabetes. Despite the respondents having good practices of diabetes, the majority of the respondents consumed junk foods which can expose them to risk of having type 2 diabetes.

Studies (Hussain, et al 2006; Knowler, *et al* 2002) have shown that type 2 diabetes can be prevented with the modification of lifestyles and by educating people or developing awareness about the risk factors. Therefore, having a good knowledge of diabetes will enable the adolescents to practice a healthy lifestyle which will prevent them from having diabetes, these could be achieved by creating more awareness on the risk of diabetes which may motivate them to adopt a healthy lifestyle and undergo routine medical check-ups.

5.3 Recommendations

In view of the result from this research, the following recommendations are made;

1. Non-communicable disease, especially diabetes should be included in the curriculum of secondary school students. This will enhance and knowledge and help in preventing the disease.
2. There should be provision for a healthy environment for sport and recreation activities for the students in public schools which will be within the school compound.
3. The students should be motivated and encouraged to check their blood sugar level regularly.
4. Food vendors should be enlightened on healthy foods and drinks that are required for sales within the school premises and there should be an appropriate modification of school meals by the school authority.
5. Health Professional should be more involved in school health programmes in order to promote healthy lifestyles among adolescents.
6. More awareness should be made on radio programmes as the majority of the respondents have access to it than any other forms of information.

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APPENDIX 1

INFORMED CONSENT FORM

Introduction: My name is Fasina, Abimbola O, I am a student of Department of Health Promotion and Education in Faculty of Public Health, University of Ibadan. I am carrying out a study which focuses on investigating knowledge and preventive practices relating to type 2 diabetes among in-school adolescents in rural areas of Ejigbo Local Government Area, Osun State.

Voluntary nature of participation: Participation in this study is completely voluntary. Although, you have been selected, you are free to choose whether or not to participate in this study. Otherwise, if you decided to participate, you are free to withdraw from the study at any stage without any reprisals whatsoever.

Study Procedure: You will be asked questions about your knowledge on type 2 diabetes mellitus, potential risk factors of type 2 diabetes and preventive practices against diabetes. Your height, weight and Body Mass Index will be checked

Risk: there are no known risks to which you will be exposed to in your participation in this study.

Confidentiality: The questionnaire will be stored in a safe place where unauthorized people will not have access to it. Quantitative instruments will be numbered to keep track of each questionnaire. All data collected from field will be cleaned, sorted, coded and then kept in a safe place for confidentiality. Please note that your names are not needed on the questionnaire.

Feedback: the researcher is available to answer any question(s) you may have concerning this study. Similarly, throughout the course of this research, the researcher will be available to answer your question or deal with any problem that may arise. You can always reach the researcher on 09052809242 or bimlad0328@gmail.com

Statement of the respondent: I understand all that has been explained above and I am willing to participate in this study. I understand that my participation is voluntary. I am aware of the risks, methods, purpose, and benefits of the research study to judge that I want to take part in the study. I understand that I may freely stop being part of this study at any time.

…… ……..

Signature/Date of the Researcher Signature/Date of Respondent

APPENDIX II

QUESTIONNAIRE

KNOWLEDGE AND PREVENTIVE PRACTICES RELATING TO TYPE 2 DIABETES AMONG IN-SCHOOL ADOLESCENTS IN RURAL AREAS OF EJIGBO LOCAL GOVERNMENT AREA, OSUN STATE.

Serial number:……..

Dear Respondent,

My name is Fasina Abimbola O, I am a postgraduate student of Department of Health Promotion and Education, Faculty of Public Health at the University of Ibadan. I am carrying out this study which focuses on investigating the **Knowledge and preventive practices relating to type 2 diabetes among in-school adolescents in rural areas of Ejigbo Local Government area, Osun State**. This study will yield information that may be used in developing health intervention programs on preventing increase of diabetes type two. I will like to assure you that the information you give will be kept confidential. Your participation will do you no harm. Feel free to complete the questionnaire as honestly as possible. If you are in doubt of any question feel free to let me know.

Thank You.

SECTION A: Socio-Demographic Characteristics of respondents

Please tick [ ] the appropriate response.

1. How old are you? (age as at last birthday)……years
2. Sex (1) Male [ ] (2) Female [ ]
3. What is your religion? (1) Christianity [ ] (2) Islam [ ] (3) Traditional [ ] (4) Others (specify)……..
4. What is the name of your school?.....
5. What class are you?.....
6. What is your ethnic group? (1) Yoruba [ ] (2) Hausa [ ] (3) Igbo [ ] (4) Others (specify)……

SECTION B: Sources of Information on type 2 diabetes

Table 1contains questions/statements on sources of information on type 2 diabetes. Please tick (√) as appropriate.

Table 1

	Sources of Information	Tick(√)		
		Yes	**No**	**I don't know**
7.	Have you ever heard about type 2 diabetes mellitus?			
8.	Where did you hear about type 2 diabetes mellitus?			
8.1	Radio			
8.2	Television			
8.3	School			
8.4	Friends			
8.5	Family member			
8.6	Newspaper			
8.7	Faith Based Organization			
8.8	Others (Specify):			

SECTION C: Knowledge relating to Type 2 Diabetes.

Table 2 contains questions/statements relating to the meaning of diabetes mellitus and its types. Please tick (√) as appropriate.

Table 2

	Meaning and types of diabetes	Tick(√)		
		True	**False**	**I don't know**
9.	**What do you understand by Diabetes Mellitus?**			
9.1	Abnormal increase in blood glucose level			
9.2	Abnormal reduction in blood glucose level			
9.3	Normal blood glucose level			
10.	**How many type of diabetes do you know?**			

11. Table 3 contains questions/statements on meaning of type 2 diabetes. Please tick (√) appropriate.

Table 3

	Type 2 diabetes is a disease that occurs as a result of	**Tick(√)**		
		True	**False**	**I don't know**
11.1	Excessive fat in the blood			
11.2	Inability to convert sugar (glucose) properly			
11.3	Excessive protein in the body			
11.4	Excessive sugar in the blood			
11.5	Excessive vitamin in the blood			
11.6	Lack of insulin			
11.7	Spiritual attack			

12. Table 4 contains questions/statements on the symptoms of type 2 diabetes. Please tick (√)as appropriate.

Table 4

	What are the symptoms of type 2 diabetes?	**Tick(√)**		
		True	**False**	**I don't know**
12.1	Frequent eating			
12.2	Frequent drinking of water			
12.3	Frequent urination			
12.4	Poor (Blurred) vision			
12.5	Slow healing of cuts and wounds			
12.6	Weight loss			
12.7	Sugary urine			
12.8	Fainting while walking			
12.9	Tiredness			
12.10	Inability to eat			
12.11	Frequent stooling / Going to toilet			
12.12	Repeated infections			
12.13	Adding weight			

13. Table 5 contains questions/statements on how type 2 diabetes detected (diagnosis). Please tick (√) as appropriate.

Table 5

	How can type 2 diabetes mellitus can be detected?	Tick(√)		
		True	False	I don't know
13.1	Testing blood sugar with a device			
13.2	Testing urine sugar with a device			
13.3	Tasting the urine to know if sugar is in it			
13.4	Presence of ant/flies on urine			
13.5	Nose test			

14. Table 6 contains questions/statements on those that can be affected by type 2 diabetes. Please tick (√)as appropriate.

Table 6

	Who do can be affected by type 2 diabetes?	Tick(√)		
		False	True	I don't know
14.1	People who smoke			
14.2	People who take alcohol			
14.3	Those who are obese/overweight			
14.4	Those who live sedentary life			
14.5	Children and adolescents only			
14.7	It only affects the rich			
14.8	It can affect anybody			
14.9	It only affects the poor			

15. Table 7 contains questions/statements on the health problems that can result from type 2 diabetes. Please tick (√)as appropriate.

Table 7

	What are the health problems that can result from type 2 diabetes mellitus?	Tick(√)		
		True	False	I don't know
15.1	Blindness			
15.2	Kidney problem			

15.3	Cholera			
15.4	Brain damage			
15.5	Cutting of affected part of the body			
15.6	Typhoid fever			
15.7	Heart attack			
15.8	Hypertension			
15.9	Poor academic performance			
15.10	Others (Specify):			

16. Table 8 contains questions/statements on the management of type 2 diabetes. Please tick (√) as appropriate.

Table 8

		Tick(√)		
	What are the possible ways to manage type diabetes?	**True**	**False**	**I don't know**
16.1	Insulin injection			
16.2	Regular Exercise			
16.3	Eating of fruits and vegetables			
16.4	Taking too much of sugar			
16.5	Not smoking			
16.6	Not taking alcohol			
16.7	Frequent medical check up and care			
16.8	Praying always			
16.9	Reducing weight			
16.10	Use of well prepared traditional medicine			
16.11	Other (Specify)			

Table 9 contains questions/statements on the knowledge relating to potential risk factors for type 2 diabetes. Please tick (√) as appropriate.

Table 9

		Tick(√)		
	Potential risk factors for type 2 diabetes	**True**	**False**	**I don't know**
17.	Drinking too much alcohol can lead to type 2 diabetes			
18.	Having an immediate family member (father, mother, sister or brother) with diabetes increase the risk of developing type 2 diabetes mellitus)			
19.	Being obese or being overweight can be linked to type 2 diabetes			
20.	Lack of regular exercise can cause type 2 diabetes			
21.	People who read too much can have type 2 diabetes			
22.	Smoking increase the chance of having type 2 diabetes			
23.	Eating too much sugary foods can cause type 2 diabetes			
24.	Eating food rich in vegetables reduces the chance of having type 2 diabetes			
25.	Eating too much fruits can lead to type 2 diabetes			
26.	Increase in age can expose one to type 2 diabetes			
27.	Mental stress can lead to type 2 diabetes			
28.	Taking too much of water can cause type 2 diabetes			

Section D: Preventive health practices relating to type 2 diabetes

Table 10 contains questions/statements that are linked to practices that can lead to the prevention of type 2 diabetes. Please tick (√) as appropriate.

Table 10

29.	Have you ever test for blood sugar	1. Yes [ ] 2. No [ ]
30.	Has any member of your family experience diabetes?	1. Yes [ ] 2. No [ ] 3. If no, go to 33
31.	What is your relationship with the family member?	1. Father [ ] 2. Mother [ ] 3. Sister [ ] 4. Brother [ ] 5. Others:……
32.	Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes?	1. Yes, daily [ ] 2. Yes, but not daily [ ] 3. No [ ]
33.	Do you take alcoholic drink? (like beer, wine, palm-wine, etc)	1. Yes [ ] 2. No [ ]
	How many times do you exercise in a week?	1. Once [ ] 2. Twice [ ] 3. More than two times [ ] 4. None [ ] 5. If none, go to quest. 37
35.	How many minutes do you spend in carrying out an exercise?	1. Less than 10 min. [ ] 2. 10 – 20min. [ ] 3. 30min. – 1hr [ ]
36.	How many days do you walk for 10-30minuutes to school last week?	..... days per week
37.	Do you participate in any sport activities in your school?	1. Yes [ ] 2. No [ ] If No, go to question 40
38.	Which type of sport activity do you participate in?	
39.	How many hours do you sit down to watch TV in a day?	……hour(s)

40.	How many days did you eat vegetables (like tete, gbaba, ewedu, ewuro, etc.) last week?	…….day(s)
41.	How many days did you eat fruits (Mango, Orange, Tangerine, etc) last week?	……..days(s)

42. Table 11 contains list of food items consumed during break hour. For each tick(√) how often you take it.

Table 11

	Food substances	**Tick(√)**				
		Everyday	**Twice a week**	**3-4times a week**	**More than 4 times a week**	**I don't take it**
42.1	Rice					
42.2	Doughnut					
42.3	Fish pie					
42.4	Biscuit					
42.5	Spaghetti					
42.6	Fish roll					
42.7	Sweets					
42.8	Beans					
42.9	Others (Specify);					

43. Table 12 contains list of soft / non alcohol drinks. For each tick (√) how often you take it.

Table 12

	Soft drinks	**Tick(√)**				
		Everyday	**Twice a week**	**3-4times a week**	**More than 4 times a week**	**I don't take it**
43.1	Viju Milk					
43.2	Sprite					
43.3	Zobo					

43.4	Pepsi					
43.5	Coke					
43.6	Fanta					
43.7	Others (Specify);					

SECTION E: Anthropometric measurement

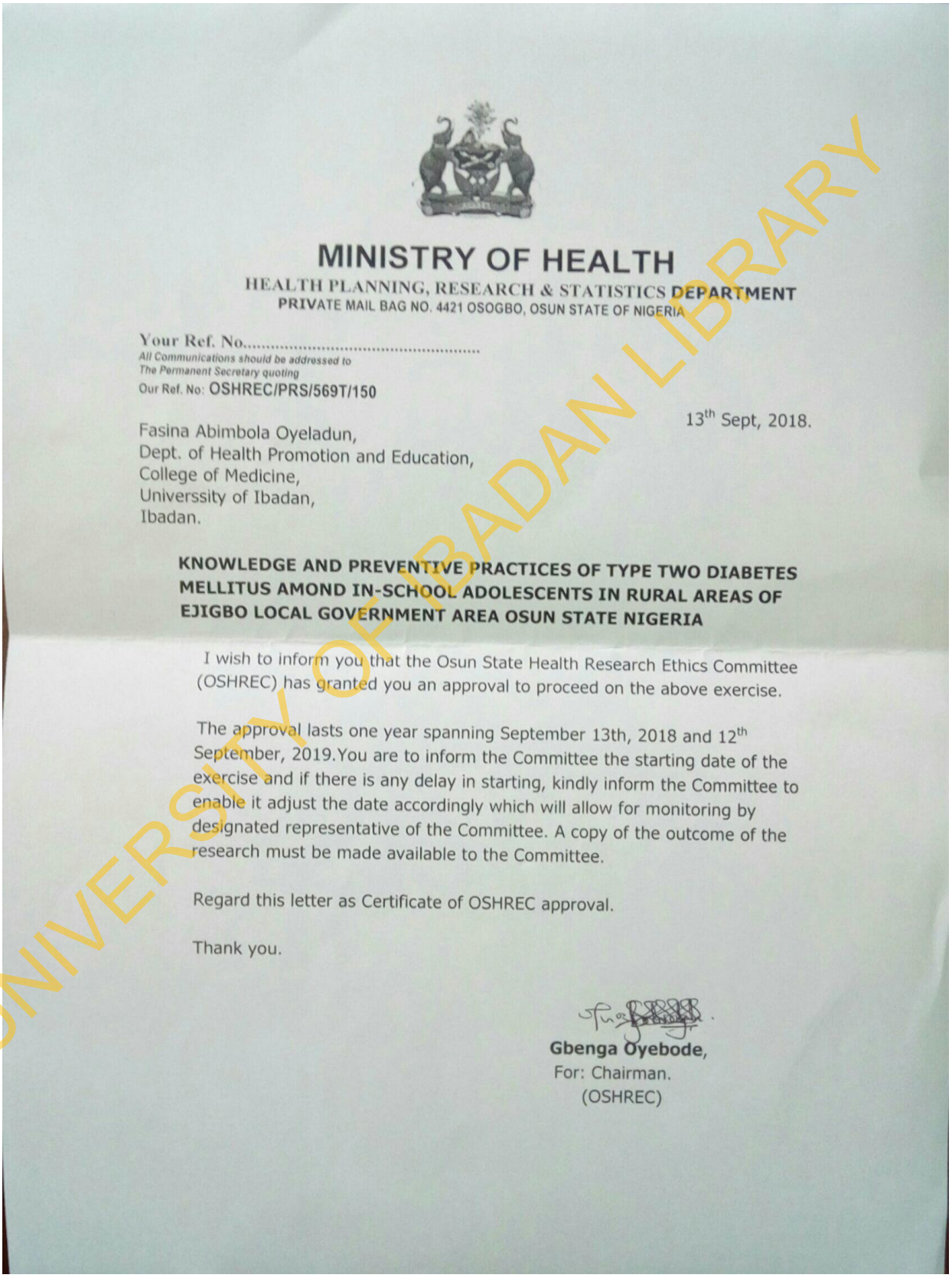
Table13 contains respondents' anthropometric measurements.

Table 13

	Anthropometric measurement	
44.	Height	……cm
45.	Weight	……kg
46.	Body mass index	……..kg/m^2
47.	Waist circumference	……cm
48.	Hips circumference	……..cm

APPENDIX III

ETHICAL APPROVAL LETTER



MINISTRY OF HEALTH

HEALTH PLANNING, RESEARCH & STATISTICS DEPARTMENT

PRIVATE MAIL BAG NO. 4421 OSOGBO, OSUN STATE OF NIGERIA

Your Ref. No.....

All Communications should be addressed to
The Permanent Secretary quoting

Our Ref. No: OSHREC/PRS/569T/150

13th Sept, 2018.

Fasina Abimbola Oyeladun,
Dept. of Health Promotion and Education,
College of Medicine,
Universsity of Ibadan,
Ibadan.

KNOWLEDGE AND PREVENTIVE PRACTICES OF TYPE TWO DIABETES MELLITUS AMOND IN-SCHOOL ADOLESCENTS IN RURAL AREAS OF EJIGBO LOCAL GOVERNMENT AREA OSUN STATE NIGERIA

I wish to inform you that the Osun State Health Research Ethics Committee (OSHREC) has granted you an approval to proceed on the above exercise.

The approval lasts one year spanning September 13th, 2018 and 12th September, 2019.You are to inform the Committee the starting date of the exercise and if there is any delay in starting, kindly inform the Committee to enable it adjust the date accordingly which will allow for monitoring by designated representative of the Committee. A copy of the outcome of the research must be made available to the Committee.

Regard this letter as Certificate of OSHREC approval.

Thank you.

Gbenga Oyebode,
For: Chairman.
(OSHREC)