STATUS AND CORRELATES OF MENTAL AND PHYSICAL HEALTH OF UNDER-FIVES AND THEIR MOTHERS IN KROO BAY COMMUNITY IN FREETOWN, SIERRA LEONE

BY

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MATRIC NUMBER: 189774

A PROJECT SUBMITTED TO THE
CENTRE FOR CHILD AND ADOLESCENT MENTAL HEALTH,
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN CHILD AND ADOLESCENT MENTAL HEALTH OF THE UNIVERSITY OF IBADAN

MAY, 2016

DECLARATION

I hereby declare that this dissertation is my original work and that it has not been submitted for any award in any other institution.

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CERTIFICATION BY SUPERVISOR

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DEDICATION

I dedicate this piece of work to my husband, Thiele and daughter, Kristina.

ACKNOWLEDGEMENTS

I am forever grateful to the all sufficient God whose grace and mercy carried me through to the end of this course.

I wish to express my profound gratitude to my supervisor, Professor Olayinka Omigbodun for her exemplary patience and guidance in going through my work. She tirelessly read through and consistently allowed this paper to be my own work, but steered me in the right direction whenever I needed it. I would also like to express my appreciation to Professor Akinyinka Omigbodun, Dr Bibilola Oladeji, Dr Kofoworola Adediran and the other members of the CCAMH faculty for their contributions towards this work. The CCAMH administrative staff was amazing in providing support and I would especially like to acknowledge Miss Adeola Oduguwa for her contributions.

I would also like to appreciate the CCAMH Set 3 cohort of students for providing shoulders of support and rays of hope throughout the 18 months period of study.

Finally, I must say I am deeply appreciative of my family especially my husband for providing me with unfailing support and continuous encouragement throughout the period of study and through the process of researching and writing this thesis. I am most grateful to my daughter whose presence provided me with motivation and strength. This accomplishment would not have been possible without all these people. Thank you.

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KEY TO ABBREVIATIONS (ACRONYMS)

AIDS	Acquired Immunodeficiency Syndrome
ARI	Acute Respiratory Infection
BMI	Body Mass Index
CHC	Community Health Centre
CHO	Community Health Officer
DALYs	Disability-Adjusted Life-Years
DSM-III	Diagnostic and Statistical Manual of Mental Disorders 3rd Edition
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
LBW	Low Birth Weight
NDHS	National demographic and Health Survey
NCHS	National Centre for Health Statistics
PEM	Protein Energy Malnutrition
SD	Standard Deviation
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund
WB	World Bank
WHO	World Health Organisation

WMH-CIDI	World Mental Health Survey Initiative version of the Composite International Diagnostic Interview

ABSTRACT

Background: Over 200 million children under-five fail to reach their potential in cognitive development because of poverty, poor health and nutrition and deficient care. The discrepancy between their current developmental levels and what they would have achieved in a more nurturing environment with adequate stimulation and nutrition indicates the degree of loss of potential. Twenty percent of children would have a recognizable and treatable mental disorder and it has been shown that severe mental disorders in adulthood often start in childhood or adolescence with less severe disorders that were not treated or presented for clinical attention. Maternal and child undernutrition is highly prevalent in low-income and middle-income countries, resulting in substantial increases in mortality and overall disease burden and in countries with a large proportion of disadvantaged children, national development is likely to be affected. Depression remains the leading cause of disease burden among women aged 15 to 44 years worldwide and recent estimates report higher rates in women from low-income and middle-income countries compared to previous estimates with higher rates from high-income countries. The negative impact of depression in mothers on the physical and mental health of their children has been established in other parts of the world. There is a paucity of data in this environment necessitating this study.

Methodology: This was a descriptive cross-sectional study conducted to examine the physical and mental health, development and nutrition of under-fives in the Kroo Bay Community and their correlates including depression in mothers. Three hundred apparently healthy under fives who met the inclusion criteria and their mothers were recruited. Socio-demographic and other health

information were obtained from the mothers using an adapted questionnaire, and childhood developmental problems were screened for using the ten question screen for childhood disability. The nutritional status of the children were assessed following weight and height measurements and the findings compared with the National Centre for Health Statistics and the World Health Organisation (NCHS/WHO) reference standards. Maternal body mass index (BMI) was also assessed and the mothers that screened positive for depression were administered the World Mental Health Survey Initiative version of the Composite International Diagnostic Interview (WMH-CIDI).

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 16.0 for windows. Continuous variables were summarized using mean and standard deviation while categorical data were summarized using frequencies and proportions. Socio-demographic, child health and maternal health characteristics were presented in frequency tables. The Chi-square test and logistic regression analysis were done to determine association between the child's general health, the child's nutritional status, the mother's physical health, depression in the mother, socio-demographic characteristics and mental and developmental problems in the child. Level of significance was set at $p<0.05$.

Results: Most (47.3%) of the children were aged 12 to 35 months with a mean of 22.7 months. The majority (35.7%) of the mothers were aged 27 to 32 years with a mean of 28.9 years. There were more males (51.3%) than females (48.7%) and Islam was the predominant religion (68.3%).

About 68.0% of the children had presented for one or more health problems at a healthcare facility in the last 6 months: episodes of persistent vomiting (5.7%), one or more episodes of diarrhoeal disease (14.7%), febrile illness (49.0%) or acute respiratory infection (40.0%).

A third (33.0%) of the children were undernourished and 34.3% had one or more problems with development with learning difficulties accounting for most (11.0%) of the delays and sight problems accounting for the least proportion (2.3%).

Most (55.7%) of the mothers had abnormal BMI measurements and 22.3% of them met the DSM-IV criteria for the diagnosis of depression.

Febrile illness, undernutrition, level of social support the mother received and whether the child lived with either or both parents were independent predictors of developmental problems in the child. Diarrhoeal disease in the last 6 months and gross motor difficulties were independent predictors of nutritional problems in the child. Abnormal speech in the child and the level of social support the mother received were independent predictors of maternal depression. The duration of breastfeeding and planning of pregnancy were also independent predictors of BMI in the mother.

Conclusion: Developmental delays, physical health and nutritional problems in under-fives and depression in mothers were prevalent in this community. Services providing holistic care for under-fives and their mothers are needed to tackle the mental and physical health concerns simultaneously.

Key words: Mental health, physical development, maternal depression, nutritional status.

CHAPTER ONE

INTRODUCTION

1.1 Background

Children in developing countries are exposed to multiple risks, such as poverty, malnutrition, poor health, and unstimulating home environments, which detrimentally affect their cognitive, motor, physical and social-emotional development (Grantham-McGregor *et al*, 2007). Over 200 million under-five children fail to reach their potential in cognitive development because of poverty, poor health, poor nutrition and deficient care (Grantham-McGregor *et al*, 2007; WHO, 2012). They lose a great deal of their potential as a result of this discrepancy between their current developmental levels and what they would have achieved in a more nurturing environment with adequate stimulation and nutrition (Engle *et al*, 2007).

Disadvantaged children are likely to underachieve in school or dropout and subsequently have low incomes, high fertility, and provide poor care for their children, thus contributing to the intergenerational transmission of poverty (Grantham-McGregor *et al*, 2007). Countries with a large proportion of children who have failed to reach their developmental potential are likely to have their national development affected (WHO, 2016).

Mental disorders are now recognised as a global public health problem and affect approximately 10% of the world's population with a prevalence of 25% over a lifetime (WHO, 2001). Mental disorders are leading causes of years lived with disability (WHO, 2008; WHO, 2001). One in every 5 (20%) children and adolescents has a recognizable and treatable mental health disorder (WHO, 2005) and 50% of adult psychiatric illness begins before age 14 (Kessler *et al*, 2007). It has been

shown that severe mental disorders in adulthood often start in childhood or adolescence with less severe disorders that were not treated or presented for clinical attention (Omigbodun, 2015).

Maternal and child undernutrition is highly prevalent in low-income and middle-income countries, resulting in substantial increases in mortality and overall disease burden. Black *et al*, (2008) estimated that stunting, severe wasting and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of disability-adjusted life-years (DALYs) for children younger than five years. Suboptimum breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million DALYs (10% of DALYs in children younger than 5 years) (Black *et al*, 2008). The relationship between depression in mothers and child undernutrition has been reported to be bi-directional. Depressed mothers may have difficulties with breastfeeding, cease breastfeeding early or provide inadequate nutrition for their children post the breastfeeding age resulting in undernutrition (Patel *et al*, 2002; Stewart, 2007; Adewuya *et al*, 2008). Depressed mothers may also be less emotionally sensitive and attuned and may provide less stimulation in the home which, in turn, leads to apathy and withdrawal among the infants (Murray and Cooper, 1997; Baker-Henningham *et al*, 2003).

Child undernutrition on the other hand may lead to depression in the mother as she fears for her sickly child, and has anxiety associated with the extra effort required to ensure he/she is adequately nourished. A mother having a child with a poor physical health may also be depressed given the fact that she may be seen as not caring adequately for the child and this pressure may be both external (i.e. disappointment or even overt criticism expressed by family or community) and internal (i.e. the self-perception by the mother of having 'failed') (Stewart, 2007). The high mortality and disease burden resulting from these nutrition-related factors make a compelling case

for the urgent implementation of interventions to reduce their occurrence or ameliorate their consequences.

Depression and depressive symptoms are among the most prevalent treatable mental health problems (Weissman *et al*, 1991; Reiger *et al*, 1992; Katon, 1997). Depressive symptoms are significantly more common in women than in men in both population-based and clinic-based studies. For women aged 15 to 44 years, depression is the leading cause of disease burden worldwide (Murray *et al*, 1996; Parsons *et al*, 2012; WHO, 2013) and recent estimates report higher rates in women from low-income and middle-income countries compared to previous estimates with higher rates from high-income countries. In particular, being the mother of young children especially those with a poor nutritional state and developmental challenge places a woman at increased risk for developing depression and depressive symptoms (Adewuya *et al*, 2005).

Studies conducted in a variety of paediatric practice settings show that rates of depressive symptoms in mothers range from 12% to 47% (Heneghan *et al*, 2000, Adewuya *et al*, 2005).

Unrecognized and untreated depressive symptoms may result in significant psychological, social and occupational disability for mothers and place their children at risk for developing serious developmental, behavioural, and emotional problems (Heneghan *et al*, 2000).

Punitive attitudes toward child rearing, inaccurate expectations of child development, and more negative, unsupportive, or intrusive parent-child interactions have been noted in mothers with depressive symptoms. Infants and preschool children of mothers with depressive symptoms show decreased responsiveness, increased hostility and anxiety, and deviant cognitive and linguistic development that may have long-lasting results (Heneghan *et al*, 2000).

Older children and adolescents of depressed mothers are more likely to experience depression, substance abuse, and conduct disorder during their adolescence than are children in comparison samples (Beardslee and Wheelock, 1994). The presence of high levels of depressive symptoms that are subclinical and not sufficient to make a diagnosis of a depressive disorder may contribute significantly to poor child outcomes from infancy through childhood to adolescence (Heneghan *et al*, 2000).

Recent meta-analysis of studies from developing countries showed an effect of maternal depressive symptoms on both underweight and stunting (Surkan *et al*, 2011). Longitudinal growth trajectory analyses suggested that, children of mothers with greater levels of depressive symptoms during the postpartum period had lower attained height beginning at 9 months that persisted to age 6 years compared to children of mothers with no depressive symptoms. (Surkan *et al*, 2014).

After delivery, maternal mental disorders may also impair the ties of affection (bonding) with the new-born (Schmidt *et al*, 2009) and maternal capacity of caring in the post-partum period. These difficulties in the mother increase the risk for infant infection and malnutrition (Carvalhaes *et al*, 2002) and impaired child growth expressed in low weight and height for age. Behavioural problems and vulnerability leading to mental disorders in adulthood are also consequences on the child of maternal mental health problems (Motta *et al*, 2005; Huot *et al*, 2004; Newport *et al*, 2002).

1.2 Statement of the Problem

According to the World Health organization (WHO) Mental Health Action Plan (2013 – 2020), the vision is for a world in which mental health is valued, promoted, and protected, mental disorders are prevented and persons affected by these disorders are able to exercise the full range

of human rights and to access high-quality, culturally appropriate health and social care in a timely way to promote recovery, all in order to attain the highest possible level of health and participate fully in society and at work free from stigmatization and discrimination (WHO, 2013).

An opinion of debate over the years has been whether young children can have mental health problems. Children under five years cry a lot, do not sleep for prolonged periods, are very active, oppositional and have food fads. These findings in them constitute normal features and are not suggestive of a mental illness. Thompson and Jenkins (2009) suggested that the definition of a disorder in young children should include several components:

- The presence of a pattern of symptoms that goes beyond a transient adjustment to stress or change.
- A cluster of symptoms which is evident in several settings and with people other than the parents.
- Symptoms that are relatively severe
- Symptoms that interfere with the child's ability to negotiate developmental challenges, thereby reflecting some impairment in functioning.

Behaviour-extreme symptoms presenting in young children must therefore be viewed within a developmental context and medical conditions must be excluded or at least factored in. The family's social context should also be considered and it is important to determine the parents' view of what is 'normal behaviour'.

All facets of growth of a nation is highly dependent on the health of its children. The under five period is very important for growth and development therefore appropriate care at every stage is

essential. These children are very vulnerable making them liable to many diseases and disabilities which may lead to adverse outcomes and providing comprehensive health services to these children is important to promote health (Malathi, 2012).

1.3 Justification and Relevance of the Study

The first Sustainable Development Goal (SDG) is to end poverty in all its forms everywhere. The second is to end hunger, achieve food security, improved nutrition and promote sustainable agriculture, the third is to ensure healthy lives and promote well-being for all at all ages and the fourth SDG is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (UN, 2012). Improving early child development is clearly an important step in reaching these goals. Although policymakers recognize that poverty and malnutrition are related to poor health and increased mortality, there is less recognition of their effect on children's development (Grantham-McGregor *et al*, 2007; WHO 2012).

The contribution of maternal depression to infant growth and under-nutrition in Africa has not been well studied and studies determining the prevalence of postnatal depression in Africa are scarce. The prevalence rates in the few available studies vary greatly depending on the design of the study, recruitment methods, sample size, timing of assessment and use of different diagnostic criteria or rating scales (Adewuya *et al*, 2005a).

This study aims to examine the mental and physical health-related correlates among under-fives in an urban low-income community in Sierra Leone. It is hoped that the findings from this study

would serve as a baseline that would help inform policy and planning for health interventions for under-fives, their families and the community. Information on child health and their correlates are key for health planning in this community.

1.4 Aim

The aim of this study is to examine the physical health, mental health and development of under-fives in the Kroo Bay Community in Freetown, Sierra Leone and their correlates including depression in their mothers.

1.5 Specific Objectives

The specific objectives of this cross sectional study in the Kroo Bay Community in Freetown, Sierra Leone are:

1. To characterise the physical and mental health, development and nutritional status of under-fives.
2. To determine the prevalence of problems in the physical and mental health, development and nutrition of the under-fives.
3. To determine the prevalence of depression in mothers of the under-fives.
4. To determine the association between the physical and mental health/development and nutritional status of the under-fives and depression in their mothers
5. To determine the socio-demographic and obstetric health correlates of the physical and mental health status or development of the under-fives and their mothers.

1.6 Null Hypothesis

Maternal factors and socio-economic factors have no association with the developmental and mental health outcomes of children under-five years in the Kroo Bay Community, Freetown.

1.7 Primary Outcome Measure

Prevalence and pattern of mental health problems and developmental problems among under-fives in Kroo Bay Community, Freetown, Sierra Leone.

CHAPTER TWO

LITERATURE REVIEW

"We are guilty of many errors and many faults, but our worst crime is abandoning the children, neglecting the foundation of life.

Many of the things we need can wait.

The child cannot.

Right now is the time his bones are being formed, his blood is being made and his senses are being developed.

To him we cannot answer "Tomorrow".

His name is "Today".

Gabriela Mistral, 1948

2.1. Introduction

Many children in developing countries fail to reach their full human potential because they live in poor families and do not receive adequate nutrition, care and opportunities for development (WHO, 2012). Early childhood is a critical stage of development and is key to a full and productive life for a child and to the progress of a nation.

2.2 Development in Children

Growth and development are intrinsic characteristics of childhood and are probably the most significant of all the differences between children and adults. Growth is defined as the increase in

size of a child while development is the progressive acquisition of physical (motor), cognitive (thought), linguistic (communication) and social (emotional) skills and/or attributes (Azubuike and Nkangieme, 2007).

Development is an increase in function and complexity of skills as a result of maturation and intactness of the nervous system and progresses in a cephalo-caudal direction (head-to-toe). Child development may vary within a specified age range but the sequence of cephalo-caudal progression remains unaltered (Nkangieme and Azubuike, 2007) and for this reason, one child may sit and walk before another but both children will sit before they walk. Though children with normal development may have some lulls or temporary delays within a certain limit, they will eventually reach their age-appropriate milestones (Grantham-McGregor *et al*, 2007). Development can be affected by psychosocial, biological and genetic factors (Grantham-McGregor *et al*, 2007).

Acquisition of different developmental milestones occurs at different stages of childhood, but some ages are more associated with development in one or more areas. For instance, gross motor, some communication and cognitive development can be observed prenatally while a rapid and profound development across all domains occur in the preschool age group (Kliegman and Behrman, 2007).

According to WHO, 7.6 million children under the age of five die each year and more than 25 times that number – over 200 million children – survive, but do not reach their full potential due to one or more developmental problems acquired in their early years resulting in an estimated 20% loss in adult productivity (WHO, 2012). Prevalence rates of developmental delays among children in this environment range between 0.9% and 19.6% (Omigbodun *et al*, 1996; Bakare *et al*, 2016).

The development of a child can be discussed under the following domains (Azubuike and Nkangieme, 2007)

- Gross motor development
- Fine motor development
- Cognitive development
- Language and communication
- Social-emotional development

2.2.1 Motor Development

The motor development of a child encompasses both gross motor skills development and fine motor skills development. Gross motor developmental parameters include neck control, sitting without support, rolling over, crawling, standing without support, walking and running while fine motor skills include palmer grasp, sustained grasp of objects, reaching out for objects, transferring objects from hand to hand, pincer grasp and building towers with blocks (Kliegman and Behrman, 2007).

Differences in development have been observed between sexes and among children with different conditions. Girls are generally seen to acquire motor skills earlier than boys (Iloeje *et al* 1991; Ali *et al*, 2013) and preschool girls are reported to have higher fine motor skills than boys while preschool boys have higher gross motor skill than girls (Akbar and Ahmadizadeh, 2014).

Iloeje *et al* (1991) also reported that Nigerian children rapidly attain milestones like sitting without support, crawling, standing without support and walking but experience delay in attaining

transitional milestones like rolling over, pulling self to stand, and standing with support. This finding is in agreement with previous reports which suggest a more rapid attainment of some motor milestones in black children as compared to white (Akbar and Ahmadizadeh, 2014).

The motor development of a child can be affected by a number of factors including certain diseases/disorders (Jelsma *et al*, 2011) and treatments for some conditions. For example, Cerebral palsy a disorder of movement and posture resulting from a permanent non-progressive injury to the developing brain has been associated with a delay in achievement of gross motor milestones (Beckung *et al*, 2007; Esiegbe *et al*, 2014). Other conditions associated with a delay in achievement of gross motor milestones are learning disability (Westendorp *et al*, 2014), autistic spectrum disorder (Provost *et al*, 2007), emotional, behavioural, and pervasive developmental disorders (Emck *et al*, 2009) and long standing hypoxaemia in infancy as seen in children with cyanotic congenital heart diseases (Stieh *et al*, 1999).

Fine motor development is essential in acquiring life skills and its impairment has been observed in patients with autism (Provost *et al*, 2007), cyanotic congenital heart diseases (Stieh *et al*, 1999) and prematurity with a prevalence of about 40% for mild to moderate impairment (Bos *et al*, 2013). In the case of prematurity, risk factors for fine motor impairment include intrauterine growth restriction, late-onset sepsis, necrotising enterocolitis and dexamethasone therapy for bronchopulmonary dysplasia (Bos *et al*, 2013).

Developmental delay has also been seen to occur as a complication of treatment for one or more health conditions (De kegel *et al*, 2015). Cochlear implant for hearing loss in children for instance has been associated with a decrease in gross motor performance of these children especially around ages 6 to 18 months when most implants are done (De Kegel *et al*, 2015).

The environment of the child is also crucial for motor development of age-level skills. Institutionalized children have been shown to have delayed motor development compared to non-institutionalized children and this effect is not easily eroded by simple environmental enrichment post institutionalization (Roeber *et al*, 2012).

2.2.2 Cognitive Development

The first years of life are important for cognitive development as the brain develops rapidly through neurogenesis, axonal and dendritic growth, synaptogenensis, cell death, synaptic pruning, myelination and gliogenesis (Grantham-McGregor *et al*, 2007). Brain development is modified by the quality of the environment and poverty with its attendant problems have been implicated as a major risk factor for poor cognitive development (Grantham-McGregor *et al*, 2007).

Studies have established that early cognitive development predicts later schooling and academic achievements (Stith *et al*, 2003; Liddell and Rae, 2001; Daniels and Adair, 2001; Mendez and Adair, 1999; Walker *et al*, 2005) and where large numbers of children are affected; national development will be substantially affected.

2.2.3 Language Development

Language is an essential key for learning which enables children to make sense of the world around them, providing an opportunity for the child to socialize with others and to realize him or herself (Obiweluozo *et al*, 2014). According to Oxford and his friend Spieker, emerging literacy consists of those practices, attitudes, and skills that are precursors to literacy and are developed early in life before formal instruction or school entry (Oxford and Spieker, 2006). Of the indicators of emerging literacy which include language, pretend reading and writing, alphabet knowledge, and

emerging decoding, language development has an enduring relationship with later academic and cognitive attainment (Oxford and Spieker, 2006).

Children's language development is a dynamic process and is affected by multiple factors including genetics, gender, temperament, the child's own skills in other developmental domains (cognitive, motor, socio-emotional), and a host of biological and social risk and resilience factors, for example, premature birth, prenatal exposure to substances, parental education, caregiver interactive style, parent–child mutual regulation, bilingualism, and other cultural influences (Beeghly, 2006). Poor language-learning environment has been associated with more language problems than the other factors and having more than one risk factor increases the likelihood of having a language problem (Obiweluozo *et al*, 2014)..

There is a wide range of normal variability in the early stages of typical language development and many toddlers with delayed language development and normal cognitive and motor development, function within normal limits on language assessments by school age. Also, language impairment can occur without any genetic cause and in the presence of nonverbal intelligence accounting for about 2% to 8% of disorders (Beeghly, 2006).

Language impairment has been observed in patients with hearing impairment (Ching *et al*, 2010), in children with cleft palate (Schönweiler *et al*, 1996) and in poor children with deficits increasing between 36 and 72 months of age compared with wealthier children (Grantham-McGregor *et al*, 2007)

2.2.4 Social-emotional Development

A child's social-emotional development influences all other areas of development and contributes to a child's self-confidence and empathy, her ability to develop meaningful and lasting friendships and partnerships, and her sense of importance and value to those around her. Professionals sometimes define healthy social-emotional development in young children as early childhood mental health. Healthy social-emotional development includes the ability to form and sustain positive relationships, experience, manage, and express emotions, explore and engage with the environment. The greatest influence on a child's social-emotional development is the quality of the relationships that he develops with his primary caregivers (Ali *et al*, 2013).

2.3 Child Nutrition

Nutrition is a key universal factor that affects as much as it defines the health of all people. The effects of nutrition not only on growth and physical development but also on cognitive and social development are well understood (Brundtland, 1999).

Malnutrition is a widespread problem with devastating consequences. It weakens immune systems and worsens illnesses. Good nutrition helps to protect natural immunity which is particularly important for health as resistance to drugs increases and new diseases emerge (UN, 2004).

Malnutrition continues to be a major public health problem throughout the developing world, particularly in southern Asia and sub-Saharan Africa (WHO, 2002; Brabin and Coulter, 2003; WHO, 2004; UN, 2004) and is prevalent in developing countries where it affects one out of every three preschool-age children (UN, 2004).

Malnutrition defined as "the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions" encompasses both undernutrition and overnutrition (WHO, 2006).

Malnutrition and undernutrition are often used interchangeably however, undernutrition is synonymous with protein-energy malnutrition (PEM) which signifies an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function (WHO, 2006)

2.3.1 Epidemiology of Malnutrition

Globally, an estimated 165 million or 26% of children under five years of age are stunted; 101 million or 16% are underweight and 52 million or 8% are wasted (UNICEF, 2012). More than 50% of child deaths worldwide is attributed to malnutrition (Rahman *et al*, 2004) and nutritional deficiencies at all stages of growth have long-term damaging effects on the intellectual and psychological development of children. Malnutrition thus contributes to a waste in potential of millions of children (Rahman *et al*, 2004).

Recent estimates reveal that Sierra Leone has a prevalence of stunting of 44.4%, underweight 21.7% and wasting 8.5% (UNICEF, 2012). The current estimates are similar to those obtained four years previously (UNICEF, 2008) indicating that tackling child undernutrition is still a challenge.

2.3.2 Underlying causes of undernutrition (WFP, 2009)

Food.... The food-related underlying cause is inadequate household food security (access to food)

Health… This refers to household access to adequate health services and the adequacy of

environmental health conditions

Care… Care relates to the social and care environment within the household and local community and its impact upon nutrition, particularly with regard to women and children.

For an individual to be adequately nourished, all three of these preconditions need to co-exist.

2.3.3 Anthropometric indicators of malnutrition (WHO, 2004)

Underweight – refers to low weight-for-age, when a child can be either thin or short for his/her age. It reflects a combination of chronic and acute malnutrition

Wasting – refers to a low weight-for-height where a child is thin for his/her height but not necessarily short. It is also known as acute malnutrition.

Stunting – refers to low height-for-age, when a child is short for his/her age but not necessarily thin. It is also known as chronic malnutrition.

Malnutrition can be mild, moderate or severe depending on the anthropometric cut-off points.

2.3.4. Impact of malnutrition

- Child malnutrition impacts on educational attainment. The degree of cognitive impairments is directly related to the severity of stunting and iron deficiency anaemia (UN, 2009).
- Vitamin A deficiency is a leading cause of preventable blindness in children. Together with iodine deficiency it reduces immunity and increases the risk for infection (Torpy *et al*, 2004)

- Child malnutrition impacts on economic productivity. The mental impairment caused by iodine deficiency is permanent and directly linked to productivity loss (UN, 2009)

Sub-saharan Africa is grossly affected by the undernutrition epidemic. Agriculture has been and remains the largest sector of Sierra Leone's economy, and crop production the main contributor to this sector's Gross Domestic Product (GDP) has shown declining performance in the past two decades (SLDHS, 2008). Migration of people from the rural to the urban areas has resulted in overpopulation of the city and people have therefore resorted to live in the deprived areas of the city which have poor sanitary conditions and lack adequate medical facilities. These factors further contribute to the decline in the health status of the country.

A lot of attempts have been made by government and related agencies to tackle the problem of disease in under fives, but as Potera (2004) once said "even if antibiotics and immunization keep children alive, their quality of life is miserable if they are malnourished.

2.4. Correlates of Child Nutrition and Development

Several factors have been seen to influence a child's nutritional status, physical health, mental health and development.

2.4.1 Education and Child Nutrition and Development

Education is recognized around the world as a basic prerequisite for development (WHO, 2012). Studies have established an association between mothers' education and the nutritional status and

development of their children (Olukemi, 2004; Smith and Haddad, 2000; Mittal *et al*, 2007, Deolalikar, 1998; Moestue, 2008).

Several mechanisms have been postulated in literature to explain this relationship;

- Education provides women with knowledge and skills, which enable them to earn higher incomes.
- Women's income generation leads to greater control over income which in turn leads to expenditure patterns favouring nutrition (NDHS, 2003)
- Education also improves the quality of day-to-day care women give to their children (Smith and Haddad, 2000)

On the other hand, women's income-generating occupation diverts time from childcare to the occupation (NDHS, 2003).

Though studies have shown that education is positively correlated with child nutrition, it is important to note that women that are highly educated may have occupation types that prevent them from personally providing care for their children. Olukemi (2004) reported that women from the middle socioeconomic strata had children that were better nourished than women from the high socioeconomic strata further emphasising the point. .

Other studies have also been done to explore the effect exerted by the education of other individuals – mother's friends, neighbours and family on the nutritional status of children. Moestue (2008) found out that child nutrition was positively and independently associated with mothers' fathers and grandmothers' education.

2.4.2 Occupation and Child Nutrition

The economic status of the family is known to correlate with child nutrition and physical and mental development. Studies have revealed that children from low socioeconomic families are less nourished and lag in development compared to those from middle or high socioeconomic families (Olukemi, 2004; Popkin, 1980; Engle *et al*, 1999). Mother's absence from the home influences a child's nutritional status and development. The time spent in generating income is an important (positive) determinant of household food security and nutritional status but this effect may be less than expected as mothers may allocate more time to earning money and less to child care with less stimulating environment in the home for development (Popkin, 1980; Pierre Louis *et al*, 2007).

When care is compromised, even a good diet has less an effect than it should. This reduces nutritional status and thus, in the process weakens any advantage of income on nutrition (Olukemi, 2004). This is in line with the concept of "care", one of the underlying determinants of child undernutrition.

Engle *et al*, (1999) further described care as the behaviours and practices of caregivers (mothers, siblings, fathers, and child-care providers) to provide the food, health care, stimulation and emotional support necessary for children's healthy growth and development. These practices translate food security and health care resources into a child's wellbeing. Not only the practices themselves, but also the ways they are performed with affection and responsiveness to children are critical to children's growth and development. Maternal supervision of feeding is also a positive predictor of children's nutritional state (Engle et al, 1999).

2.4.3 Depression in Mothers and Child Development

Depression undermines a woman's confidence, impairs her social functioning and quality of life and is associated with elevated rates of depression in their partners and also with adverse effects upon cognitive, social, and emotional developments in the infants (Adewuya *et al*, 2005a).

2.4.3a Epidemiology of Depression in Mothers

Depression is still a leading cause of disease burden among women of the reproductive age group worldwide though higher estimates are found among women from low-income and middle-income countries than among women from high-income countries (WHO, 2013). Adewuya *et al*, (2005) reported a rate of 6.3% among women in Southwest Nigeria. This was lower than 16% found in Zimbabwean women (Nhiwatiwa *et al*, 1998); 15.6% in Arabian women (Ghubash *et al*, 1997); 17% in Japanese women (Yoshida *et al*, 2001); and approximately 10 - 15% in western societies (O'Hara *et al*, 1996).

There is paucity of data on depression among women in Sierra Leone.

2.4.3b Risk Factors for Depression in Mothers

The possible risk factors for depression in mothers could be grouped into three categories (Adewuya et al, 2005)

- Socio-demographic factors
- Obstetric practice factors (pregnancy and delivery related) and
- Child factors.

Socio-demographic Factors

Depressed mothers were likely to be younger than 25 years of age or over 35 years of age and single rather than married with single motherhood being the topmost socio-demographic factor suggesting an association between depressive symptoms and a lack of intimacy or support from partners (Adewuya *et al*, 2009).

Polygamy, a source of marital disharmony in Africa also contributes to depression in women as women from polygamous homes tend to receive less support from their spouses and in most of these marriages, the new mother is often left alone by the father, who seeks sexual gratification with his other wives (Adewuya *et al*, 2009).

It has been reported that families with 2 or more young children have increased risk of depression in their women (Rahman *et al*, 2004). With increasing number of children the mother may spend less time in attending to the new infant's needs and the situation is further worsened if the family is from a low socioeconomic background. It is also believed that with 4 or more children in the home there are additional difficulties such as financial constraints and overcrowding (Rahman *et al*, 2004).

Women from nuclear families (parents and children only) are also likely to be depressed than women from extended families (3 generations, i.e., one or both parents with married sons and their wives and children). The extra support from an extended family could have a protective influence on the infant's health, especially if the mother's care-taking abilities are compromised because of poor mental health (Adewuya *et al*, 2009).

Obstetrics Practice Factors

Hospital admission during pregnancy is reported to have a significant effect on the risk of developing postnatal depressive symptoms with poor maternal health during pregnancy and the

stress of pregnancy being contributing factors in addition to poverty and malnutrition which are prevalent in Africa (Adewuya *et al*, 2005; Adewuya *et al*, 2006).

Obstetric practice is poor in Africa and delivery is associated with higher rates of maternal mortality and morbidity (WHO, 2015). Mothers who stay in the hospital for more than a week after delivery are more likely to be depressed than mothers who stay fewer than 3 days (Adewuya *et al*, 2005).

Primiparity and caesarean section or instrumental delivery in this environment are more associated with depression than multiparity and spontaneous vaginal delivery respectively and these findings are comparable to those obtained in western cultures (Adewuya *et al*, 2009).

Child factors

Several studies have shown that some child factors are associated with depression in mothers (Adewuya *et al*, 2005; Rahman *et al*, 2004; Adewuya *et al*, 2009). In some African cultures like Nigeria, there is a deep-rooted preference for male children and women are usually blamed for the gender of the baby, so that giving birth to a girl, especially if the woman is delivering for the first time or has not had a male child, could threaten her mental health (Adewuya *et al*, 2005; Rahman *et al*, 2004).

Preterm delivery or low birth weight (LBW) – birth weight less than 2.5 kg- is also seen to contribute to maternal depression. The problems of few neonatal intensive-care units, reduced chance of survival for preterm and LBW babies, and the fact that most mothers have a fatalistic attitude towards ill or preterm neonates further worsens the problem (Adewuya *et al*, 2009).

2.4.3c Impact of Depression in the Mother on Child Growth and Development

There is evidence that depression in the mother is a risk factor for impairment in infant psychoemotional development, with these deficits persisting to at least school age (Murray & Cooper, 1997; Stewart, 2007), but it has also been seen to impact on infant growth in environments which do not cater for successful child rearing (in terms of economic resources, hygiene and healthcare availability), as there would be less of a nutritional 'safety-net' for the infants of depressed and struggling mothers (Rahman *et al*, 2004).

Poor infant growth, undernutrition and poor development are prevalent in Africa (Onayade *et al*, 2004) and poor growth in the context of maternal depression is postulated to be either as a result of direct exposure to mother's depressive symptoms; parenting difficulties, or other independent risk factors for postnatal depression (Murray and Cooper, 1996). These mothers are emotionally unavailable to their babies, and this can lead to psychosocial deprivation and non-organic failure to thrive (Adewuya *et al*, 2008).

There are several ways by which depression in the mother and infant growth and development impairment may be associated;

1. Confounding factors which may lead to both depression in the mother and poor infant growth and development
2. Depression in the mother as a causal risk factor for poor infant growth and development
3. Depression in the mother as a result of caring for a child who is slow to grow/develop and
4. The role of contextual factors

Confounding Factors may lead to both depression in the mother and Poor Infant Growth and Development.

Confounding factors such as poverty, maternal age, maternal education, family size and birth weight have been seen to contribute significantly to poor infant growth and development. In situations where depression in the mother and infant undernutrition coexist, the relationship is no longer seen to be significant after these confounders are accounted for (Patel *et al*, 2003; Rahman *et al*, 2004). On the other hand, further research showed that in situations where the relationship was no longer significant after confounding factors have been considered, the gross socio-economic indicators used might not have captured the relevant factors impacting upon both maternal mood and infant growth. There is also paucity of data on assessment of maternal physical health in relation to infant's growth but Rahman e*t al*, (2004) found that depression is associated with poor physical health and, as such, a physical health problem affecting both mother and child could underlie both low maternal mood and low infant weight. It could also be that personality traits, such as introversion and neuroticism, that are recognized risk factors for depression, might also impact upon the mother's ability to provide adequate nutritional care.

Depression in the mother as a causal risk factor for infant undernutrition.

It is possible that depression affects the mother's ability to provide adequate nutritional care to her infant. Depression, especially when marked, may lead to fatigue, impaired concentration, psychomotor slowing and feelings of hopelessness and worthlessness and such symptoms may lead to functional impairment affecting breastfeeding, weaning, hygiene and healthcare-seeking behaviours (Stewart, 2007).

Depressed mothers are more likely to have difficulties with breastfeeding, or to cease breastfeeding early (Patel *et al*, 2002; Adewuya *et al*, 2008). During weaning, depressed mothers may be less successful in preparing foods and persisting with feeding of the infant. Amongst the Yorubas in

Western Nigeria, there is the belief that mental illness is infectious and can be transferred through the breast milk, so early cessation of breastfeeding, which is a key factor in infant under-nutrition is common (Onayade *et al*, 2004).

Children of depressed mothers are exposed to poor feeding hygiene, breastfeeding problems, breastfeeding cessation and incomplete immunization. These children are therefore at increased risk of frequent or severe childhood illness (Rahman, *et al*, 2007; Stewart, 2007) and poor infant growth may be caused by frequent or severe childhood illness.

Most maternal and child health programmes include significant amounts of health education and advice. Because depression affects concentration and the learning of new material and a depressed mother may not adequately access health care for herself and her children, there is a further increased risk for poor maternal and infant health.

Depression in the mother may affect infant nutrition through its effect on mother–child interaction. Depressed mothers may be less emotionally sensitive and attuned and may provide less stimulation in the home which, in turn, leads to apathy and withdrawal among the infants (Murray and Cooper, 1997; Baker-Henningham *et al*, 2003). Both low levels of stimulation in the home and dysfunctional mother–child interaction have been shown to be associated with infant undernutrition (Murray and Cooper, 1997).

It has been debated that the impact of these factors on infant undernutrition depends on the age of the child but Harpham *et al*, (2005) reported that there was no difference in their outcomes if infant groups younger or older than 12 months were analysed separately.

Nurturing and feeding an infant requires tenacity, patience and concentration. Normally, the mother will be encouraged in this task by the positive feedback of watching her healthy growing child, and through the pleasure of their developing relationship. A depressed mother, however,

may no longer enjoy her interaction with her child or take pride in her own actions. She may be tired, unable to concentrate and preoccupied by feelings of guilt, worthlessness and hopelessness (Stewart, 2007).

Depression in the mother as a result of caring for a child who is slow to grow/develop

Depression in the mother may result from the mother's fears for her sickly child, and the anxiety associated with the extra effort required ensuring he/she is adequately nourished. Having a child with poor physical health may also contribute to maternal low self-esteem given the fact that she may be seen as not caring adequately for the child and this pressure may be both external (i.e. disappointment or even overt criticism expressed by family or community) and internal (i.e. the self-perception by the mother of having 'failed') (Stewart, 2007). Contact with healthcare services may exacerbate this; terms such as 'failure-to-thrive' and 'growth failure' may add to a mother's sense of being solely responsible for her child's difficulties (Stewart, 2007).

The role of contextual factors.

These also impact on depression in mothers and infant growth. In high-income countries the evidence is equivocal, with maternal depression impacting negatively on infant growth among the most socio-economically deprived. The difference between high-income and low-income countries supports the hypothesis that it is in a more 'hostile' environment (in terms of poverty, healthcare availability, etc.) that the functional impairment secondary to maternal depression impacts on infant nutrition (Stewart 2007). In developed nations, there are universal surveillance programmes designed to detect infant weight faltering, there is easy access to safe and affordable formula feeding, and infant immunization coverage is sufficient to convey 'herd immunity' in the

population. Screening programmes for maternal depression are also common. Under such conditions, problems of infant care are likely to be detected early and to have less-marked effects if missed.

In conditions of extreme poverty, the association may also be absent. In an area affected by severe food insecurity, any measurable impact of maternal depression may be swamped by the impact of the lack of food. It may not just be economic indicators that differentiate the developing countries from developed countries, but also socio-cultural factors.

Harpham *et al*, (2005) noted that the role of women in Asia may be especially pressured, and motherhood particularly disempowering, in a manner that is not the case elsewhere. In this environment, a depressed mother may find it especially difficult to function adequately (sufficient to ensure that her child receives appropriate nutrition). The impact of maternal mental health may be one factor explaining the so-called 'Asian Paradox' whereby rates of malnutrition in the Indian subcontinent are higher than would be expected given food availability.

It is probable that there are multiple interacting processes mediating the association between maternal mental ill-health and infant nutrition/ growth, both those described above and others not as yet identified.

2.4.3d Depression in Mothers and Child Mental Development

The consequences of postpartum depression are not restricted to infancy, but can also extend into toddlerhood, school age and even adulthood. Infancy is a vulnerable period, as at this stage they are dependent on their mothers/caregivers for primary interactions, therefore, infants of mothers with depressive symptoms acquire fewer cognitive, motor and orientation/engagement skills than

infants whose mothers were non-depressed (Black *et al*, 2007; Sutter *et al*, 2011). Cornish *et al*, (2005) reported an association of chronic maternal depression lasting throughout the first one year with lower infant cognitive and psychomotor development. Poobalan *et al*, (2007) have demonstrated that treatments for depression in mothers had some benefits in improving the level of behavioural management problems and cognitive development in children.

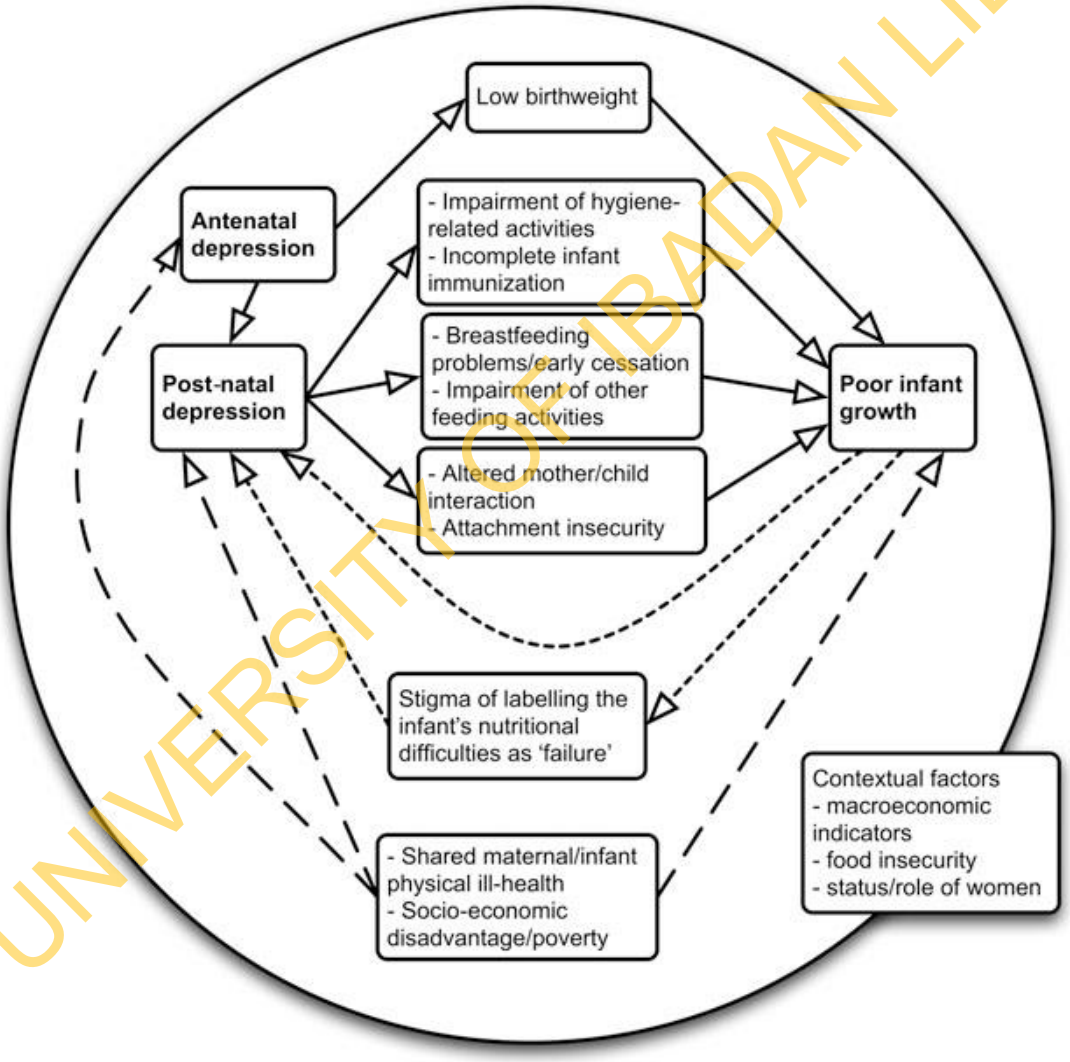

Fig 2.1: Possible interactions of maternal depression and infant growth

Sinclair and Murray have reported that 5 year old children whose mothers had postpartum depression were found to be more behaviourally disturbed than controls (Sinclair and Murray, 1998). Postpartum distress is also seen to contribute to cognitive and socio-emotional delay in infants from birth to 1 year of age. Murray *et al*, (2009) have also reported an association with postpartum depression and impairments in mother-infant interactions as well as longer term disruption of emotional and cognitive development of the infant.

Hadley *et al*, (2008) have found that children of mothers with high symptoms of depression scored significantly lower on the personal-social, fine motor and gross motor scales. The first year of life is a crucial period for a child's language development. It is one of the most complex developmental challenges and many children do not develop language easily. Brennan et al, (2000) have reported that the severity and duration of maternal depression increases the behavior problems and vocabulary problems of the children. There is paucity of data regarding the impact of maternal depression on children in developing countries across the domains of mental development.

2.5 Relevance of the Study to CAMH in Africa

This study will add to the body of knowledge in CAMH particularly in the area of physical and mental health and development of children less than five years of age. It is hoped that the findings from this study would serve as a baseline that would help inform policy and planning for health interventions for under-fives, their families and the community.

CHAPTER THREE

METHODOLOGY

3.1. Study Location

The study was carried out in the Kroo Bay Community in Central Freetown, Sierra Leone. The Kroo Bay Community is a low-income, overcrowded, informal urban housing settlement located along the coastline of Sierra Leone. It has a total population of 6,947 of which 3,441 (49.53%) are males and 3,506 (50.47%) are females living within 1,419 households (Statistics Sierra Leone, 2015).

Sierra Leone is located along the west coast of Africa between latitude 7^0N and 10^0N of the equator and is situated on a total land area of 27,699 square miles (71,620 square kilometers) (CIA: World Factbook, 2016). It is bounded on the north and northeast by Guinea, the south and southeast by Liberia and on the west by the Atlantic Ocean (See Figure 3.1). It has four distinct geographical regions - coastal belt of mangrove swamps, wooded hill country, upland plateaus and the eastern mountains – and four provincial regions: the Northern Province, the Southern Province, the Eastern Province and the Western Area (CIA, 2016). According to Statistics Sierra Leone, the climate is tropical with two seasons. The rainy season lasts from May to October and the dry season from

November to April and this includes the period of the harmattan winds. The average temperature ranges from 26°C to 36°C. Sierra Leone has a variety of natural resources such as diamonds, bauxite, iron ore and gold, a population of about 7 million people (Statistics Sierra Leone, 2015) and the major religions being Islam and Christianity. There are about sixteen ethnic groups but the four major ethnic groups are Mende, Temne, Limba and Creole. The official language of Sierra Leone is English. There are a range of local languages but Krio (pidgin English) is the primary language of communication.

The capital Freetown, located in the Western Area, is the largest city in Sierra Leone and is a major port city on the Atlantic Ocean. Freetown is Sierra Leone's major urban, economic, financial, cultural, educational and political centre with a population of about 951,000 people (Statistics Sierra Leone, 2015). The city's economy revolves largely around its harbour, which occupies a part of the estuary of the Sierra Leone River. Freetown is the seat of government of Sierra Leone and is home to the State House, the House of Parliament and the Supreme Court. The municipality of Freetown is ethnically, culturally, and religiously diverse and is divided into the East End, Central and West End, locally governed by a directly elected city council, headed by a mayor.

The Kroo Bay community in Central Freetown is a heterogenous community. The majority of the inhabitants are Temne by tribe and Muslim by religion. The Temnes are migrants from the north of the country who came to Freetown during the civil war. Because of inadequate housing facilities they resorted to live in low income, overcrowded and low sanitary settlements, Kroo Bay being one of them. Another similar settlement is the Susan's Bay Community located in the east end of Freetown. Petty trading is the main source of income for the inhabitants. A small fraction of the

population are involved in the sale of coal, wood and fence sticks that are brought to the bay from Lungi, a coastal town in the north of the country and from other villages. Unlike other parts of Freetown which are well structured with constructed roads and houses well numbered, the Kroo Bay Community has only one constructed road and a number of footpaths (see figure 3.2). The numbering of the houses is haphazard. There are public toilets and a number of public taps providing pipe borne water to the community.

Structures catering for the religious, educational and health needs of the community are five mosques and three churches, a day-care facility for infants, two nursery schools and a primary school. The day-care facility, one of the nursery schools and the primary school are owned by a non-governmental organization (NGO) and the other nursery school is run by the government. There is a government run Community Health Centre manned by a Community Health Officer (CHO) and 20 nursing staff. The Kroo Bay Community has suffered several flooding disasters in the past and though the government and several NGOs have provided some facilities to the community, attempts are being made by government to resettle the inhabitants.

Figure 3.1 Map of Sierra Leone showing its borders

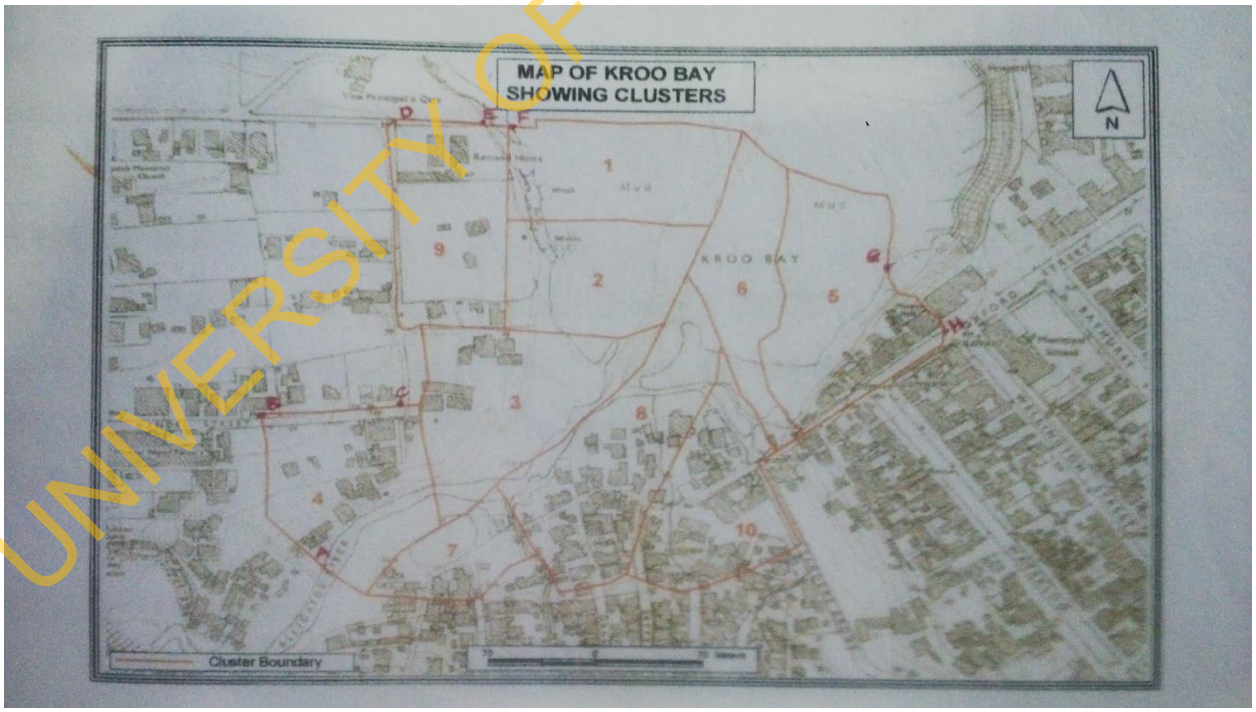

Figure 3.2: Map of Kroo Bay showing its clusters

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3.2. Study Design

The study adopted a cross sectional design to examine the physical health, mental health and development of under-fives in the Kroo Bay Community and their correlates including depression in their mothers..

3.3. Study Population

The study involved apparently healthy under fives and their mothers in the Kroo Bay Community, Freetown.

Inclusion criteria

1. Mothers and children aged 0 – 59 months who were resident in the Kroo Bay Community at the time of the study.
2. Children whose mothers consented to their being included in the study.

Exclusion Criteria

1. Women who did not speak English or Krio (broken English).
2. Women unable to give informed consent or who refused to participate.
3. Children with any severe illness that made them unfit for inclusion in the study.
4. Children who spent the day at Kroo Bay but did not live there

3.4. Sample Size Calculation

According to the World Health Organisation (2005), the prevalence of mental disorders among children and adolescents is 20%. Using a precision of 5% (0.05) and a confidence interval of 95% (1.96), the sample size was calculated using the formula:

$$n = \frac{Z^2pq}{d^2}$$

Where; n = sample size

Z = Z statistic for a level of confidence, 95% = 1.96

p = prevalence = 20% = 0.2

q = 1 – p = 1 – 0.2 = 0.8

d = precision = 5% = 0.05

Thus, the minimum sample size (n) proposed for this study was = $\frac{(1.96)^2 \times 0.2 \times 0.8}{(0.05)^2}$

n = 245.8624

n = 246

Adjusting for an anticipated non-response rate of 20%, the minimum sample size was 295. The sample size was rounded up to 300.

3.5. Sampling Technique

Cluster sampling of 300 under fives and their mothers at the Kroo Bay Community was done. The sampling unit was a household with at least a child under five years of age and the informant was the mother. The sampling was done in stages.

Stage one – Using the map obtained from Statistics Sierra Leone (figure 3.2), the Kroo Bay Community was divided into ten (10) clusters and simple random sampling was done to select one cluster from the 10. This was the starting cluster.

Stage two – With the aid of the map, the centre of the starting cluster selected was identified. At this point on the map, a pen was spun and the direction to which its tip pointed marked the starting direction for data collection.

Stage three – At the starting direction selected by the pen, the starting house was randomly selected from the first three houses. Alternate houses were visited and a maximum of two (2) children who met the inclusion criteria per household were randomly selected from each house. This selection of a maximum number of children from each household was done in order to achieve a good coverage of the community. The houses were visited in a clockwise direction from the first house. At the end of the starting cluster, the adjacent cluster was visited in a clockwise direction. This was done until the required sample size was obtained.

3.6. Study Instruments

Three questionnaires were utilized for data collection (See appendix)

1. The socio-demographic and health questionnaire (Omigbodun *et al,* 2008)

This is a 51-item questionnaire that obtains information on the respondent's personal and family life, and on the respondent's health and child health. The questionnaire was adapted from the school health questionnaire, a 40-item questionnaire designed by Omigbodun and Omigbodun (2004), which obtains information on the personal, family and school life of respondents. The adapted questionnaire is written in both English which is the official language in Sierra Leone and translated to Krio (broken English); the most common language of communication in Sierra Leone, for ease of administration and to ensure that the respondents understood the questions.

2. The ten questions screen for childhood disability (2 – 9 years) (Durkin, 2001)

This is a 10-item questionnaire that screens for childhood disabilities. The 10 questions in the screen were designed to cover each of the childhood developmental domains and the responses are coded no and yes. Any positive screen result for a childhood disability is considered significant. The instrument's diagnostic accuracy was evaluated in three developing countries; Bangladesh, Jamaica and Pakistan and was found to have percentage screening positive ranges from 7% to 19% in general populations, a sensitivity of greater than 80% for serious cognitive, motor and seizure disabilities, a specificity of greater than 85% for any serious disability and a positive predictive value of less than 30% (Durkin, 2001).

3. The World Mental Health Survey Initiative version of the Composite International Diagnostic Interview (WMH-CIDI) (Kessler *et al,* 1994; Bella and Omigbodun, 2008)

Depression in the mothers was assessed using the CIDI which is a comprehensive, fully structured interview developed by the WHO and based on the National Institute Mental Diagnostic Schedule and the Present State Examination. The WMH-CIDI primarily ascertains lifetime disorders and generates diagnosis according to the ICD 10 and DSM IV criteria. For respondents with lifetime occurrence of a disorder, follow-up questions allow a determination of whether they have also experienced such disorders in the prior 12 months. It has been used in a variety of cultures including Nigeria and reliability and validity have been demonstrated in major international WHO field trials (Kessler *et al,* 1994; Bella and Omigbodun, 2008). It contains initial screening questions and the full diagnostic questions are asked only if the respondents screen positive.

The depression screening section enquires about a period of time during which the respondent has felt unhappy, empty or depressed, or lost interest in pleasurable activities.

The depression module probes for the core symptoms of depression and associated features (such as insomnia, poor appetite, significant weight loss, impaired concentration and memory, feelings of hopelessness and worthlessness, and suicidal ideation) which have been going on for at least two weeks and are a cause of significant distress or impairment in functioning. The respondents' answers are coded yes, no, don't know or refused. The DSM IV criteria for major depression is made if five or more symptoms including at least one core symptom is present for two weeks or more, and for minor depression if at least two symptoms including at least one core symptom is present.

3.7. Study Procedure

Ethical approval to conduct study in the Kroo Bay Community, Central Freetown, Sierra Leone, was obtained from the Sierra Leone Ethics and Scientific Review Committee (see appendix I).

Permission was also obtained from the Chief of the Kroo Bay Community. The healthcare workers at the Community Health Centre (CHC) were informed before commencement of the study and assistance was sought to weigh the children from two of the nurses to whom the procedure was explained and demonstrated.

Mother-child pairs who met the inclusion criteria were administered the informed consent; written in English and translated into Krio (broken English) which explained the aims and objectives of the study. Mothers who agreed to participate in the study were recruited after signing or thumb printing the informed consent form (see appendix II).

The following were then done sequentially;

1. Administration of the adapted socio-demographic and health questionnaire
2. Screen for childhood disability using the 10 questions screen
3. Nutritional assessment of the children
4. Body mass index (BMI) assessment of the mothers
5. Assessment for maternal depression using the WMH-CIDI

1. Administration of the adapted socio-demographic and health questionnaire

The adapted socio-demographic and health questionnaire was administered in English and Krio (broken English) and information obtained on the respondent's personal life and health, the family and child health were immediately recorded in the questionnaire (see appendix III).

2. Screen for childhood disability using the 10 questions screen

Having obtained the socio-demographic and health information from the respondents, the 10 questions screen for childhood disability was then administered to the mothers and the responses immediately checked on the questionnaire (see appendix IV).

3. Nutritional assessment of the children

Following the interview session, the researcher then proceeded to assess the nutritional status of the children. This involved recording the weight and height/length of the children and performing a physical examination.

Weight

All children were weighed after all forms of clothing (remaining underpants) had been removed. Children less than 24 months were weighed using the hanging 25 kg Salter scale. The scale was calibrated to zero with weighing pants hanging before measurement of each child. The accuracy of the scale was checked each morning before the start of data collection.

All weights were recorded to the nearest 0.1kg.

Height/Length

The length of children less than 24 months was measured supine. The child was placed barefooted and without head covering on the measuring board with the head against the fixed (non-movable) end. An assistant held the child's head so that the eyes are pointed straight up and gentle traction was applied to bring the top of the child's head into contact with the fixed end of the measuring board. The child's knees were then held together and pushed down against the table top with one

hand or forearm fully extending the child. With the other hand, the movable footboard was slided to the sole of the child's feet until the heels of both feet touched the footboard. The measurement was then read off.

Children above 24 months were measured standing using the standard height board placed on a flat surface. With the shoulders relaxed and feet flat, the shoulder blades, buttocks and heels were made to touch the vertical surface of the board. The child was made to stand straight and tall and look straight ahead. The movable board was then made to rest firmly on the crown of the child's head and the measurement read off.

All heights/lengths were recorded to the nearest 0.1cm.

Physical Examination

This was done with the children still undressed. The following were assessed;

- General appearance (miserable, anxious, etc)
- Hair changes (thin and sparse, dyspigmented, straightened, etc)
- Face (puffiness, characteristic old man's look, etc)
- Skin changes (dryness, hyperpigmentation, flaking, etc)
- Musculoskeletal; signs of wasting (baggy pants, axillary folds, etc), loss of subcutaneous fat, etc)
- Abdominal distension
- Oedema; this was assessed in all children by pressing on the medial malleolus for about 5 seconds. If an indentation was left on both feet, the child was then classified positive for

oedema. Grade 1 – up to the ankle; Grade 2 – up to the mid-point of the leg; Grade 3 – up to the knee; Grade 4 – beyond the knee.

Using the Waterlow's classification of malnutrition (Hendrickse, 1991), the children were then classified as follows:

Weight for Height % (wasting)	
Normal	> 90
Mild	80 – 90
Moderate	70 - 79
Severe	< 70

Table 3.1: J.C. Waterlow's Classification of Malnutrition

According to the National centre for Health Statistics (NCHS)/WHO weight/height reference tables (see Appendix V), these values correspond to:

- > 90% (standard deviation (SD) Score > -1)
- 80 – 90% (- 2 ≤ SD Score ≤ - 1)
- 70 – 79% (- 3 ≤ SD Score < - 2)
- < 70% (SD Score < - 3)

Obesity was assessed using the WHO BMI-for-age percentile charts with BMI > 97th percentile classified as obese (see Appendix VI). Children identified with health problems were appropriately referred.

4. Body mass index (BMI) assessment of the mothers

The fourth aspect of data collection involved measurement of the respondent's weight and height to calculate the BMI.

Weight

This was assessed using a standard clinical scale which was calibrated to zero before weighing each mother. The accuracy of the scale was checked each morning before starting data collection and all weights were recorded to the nearest 0.1kg

Height

The heights of the mothers were measured standing using the standard height board placed on a flat surface. With the shoulders relaxed and feet flat, the shoulder blades, buttocks and heels were made to touch the vertical surface of the board. The women were made to stand straight and tall and look straight ahead. The movable board was then made to rest firmly on the crown of the women's head and the measurement read off. All heights were recorded to the nearest 0.1m.

The BMI was calculated using the formula; weight (kg) / [height (m)]^2. BMI was then interpreted as follows (WHO 2004):

BMI (kg/m^2)	
Underweight	< 18.5
Normal range	18.5 – 24.9
Pre Obese	25.0 – 29.9

Obese class I	30.0 – 34.9
Obese class II	35.0 – 39.9
Obese class III	≥ 40.0

5. Assessment for maternal depression using the WMH-CIDI

The final stage of data collection involved assessment for maternal depression. Mothers who screened positive for depression were administered the depression module of the CIDI and the responses were recorded in the questionnaire (see appendix VII).

3.7.1 The Pretest Study

Prior to the commencement of the study, the study instruments were tested among 20 mothers in the Susan's Bay Community; a low income and overcrowded settlement in the east end of Freetown with socio-demographic characteristics similar to the Kroo Bay Community. Following the pretest study, the adapted socio-demographic questionnaire was reviewed and questions on how religion influences family life and behaviour were omitted. The participants noted that the questions were clear and easy to understand.

3.8. Data Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 16.0 for windows. Continuous variables such as weight and height were summarized using mean and standard deviation while categorical data such as sex, age were summarized using frequencies and proportions. Socio-demographic, child health and maternal health characteristics were presented in frequency tables. The Chi-square test and logistic regression analysis were used

to determine association between mental and developmental problems in the child, the child's nutritional status, maternal BMI, maternal depression and the socio-demographic, child health and maternal health characteristics. Level of significance was set at $p<0.05$.

3.9. Ethical Considerations

Permission to conduct the study was obtained from the Sierra Leone Ethics and Scientific Review Committee and the following ethical issues were considered:

Autonomy

The purpose of the study was clearly explained to the participants in simple language in order to facilitate informed decision making. They had the liberty to decide whether to participate in the study or not and they had the free will to withdraw from the study at any time with no consequences and were informed as such.

Confidentiality of data collected from Subjects

The data provided by the participants was coded using study numbers in order to ensure confidentiality and to facilitate data analysis. No names were recorded and no form of personal identification was used in the questionnaires.

Beneficence to participants

Participants had their body mass index assessed and received health advice based on their calculated BMI. The nutritional status of the children was also assessed and those identified with health problems were appropriately referred.

In addition, the findings of this study will be reported to the Ministry of Health and Sanitation in Sierra Leone so that they can adequately plan for the health needs of young children in the community.

Non-maleficence to the participants

The risks and inconveniences to the participants in this study were minimized by ensuring that the time of data collection was most convenient for them and data collection from the participants did not involve any invasive process or collection of physical biological samples.

Justice

The study participants were objectively selected and every mother and child had an equal opportunity to participate.

Voluntariness

Efforts were made to ensure that participants were not coerced against their freewill to participate, or unduly favoured on account of participating in the study.

CHAPTER FOUR

RESULTS

This chapter presents the findings of this descriptive cross-sectional study, conducted to examine the physical and mental health of under fives and their correlates including depression in their mothers at the Kroo Bay Community, Central Freetown, Sierra Leone. Divided into four sections, sections one to three present the socio-demographic, child health and maternal health characteristics of the study population while section four on the other hand presents the correlates of the child's mental and physical development.

Section 1 – Socio-demographic Characteristics of the Study Population

The socio-demographic characteristics of the study population are presented under two categories:

- 4.1a. Personal information
- 4.1b. Family-related information

4.1a. Socio-demographic Characteristics: Personal Information

Table 4.1a presents the personal socio-demographic information of the respondents and their children. The highest proportion (25.3%) of the children were between ages 12 and 23 months with a mean age of 22.7 months (SD: 14.6) and the least proportion (13.3%) of children were between 48 and 59 months. The proportion of males and females were almost equal with 51.3% and 48.7%, respectively. The mean age of the mothers was 28.9 years (SD: 6.5) with 29.3% of them aged 21 to 26 years and 2.0% aged 45 to 50 years. The predominant religion found among the study population was Islam (68.3%). About two thirds (65.3%) of the respondents were married while 18.7% were single and 4.3% were divorced/separated.

4.1a. Socio-demographic Characteristics of the Study Population: Personal Information n = 300

Variables	n (%)	Minimum	Maximum	Mean	SD
Age of child (months)					
0 – 11	74(24.7)				
12 – 23	76(25.3)				
24 – 35	66(22.0)	0.3	53.0	22.7	14.6
36 – 47	44(14.7)				
48 – 59	40(13.3)				
Sex of child					
Male	154(51.3)				
Female	146(48.7)				
Mother's age (years)					
15 - 20	27(9.0)				
21 - 26	88(29.3)				
27 - 32	107(35.7)	17.0	49.0	28.9	6.5
33 - 38	47(15.7)				
39 - 44	25(8.3)				
45 - 50	6(2.0)				
Religion					
Islam	205(68.3)				
Christianity	93(31.0)				
Others	2(0.6)				
Mother's marital status					
Married	196(65.3)				
Single	56(18.7)				
Separated/divorced	13(4.3)				
Co-habiting	35(11.7)				

SD = Standard deviation

4.1b. Socio-demographic Characteristics: Family-related Information

Table 4.1b shows the family-related characteristics of the respondents and their children. About half (54.7%) of respondents had monogamous family types whilst 22.3% had polygamous family types and 22.0% were single parents. Over half of them (53.0%) claimed they were very satisfied with the relationship they had with their spouses and 57.7% reported they received good social support from their spouses and other family members. On the other hand, 25.0% and 13.0% respectively reported they were not satisfied with the relationship they had with their spouses and received poor social support from their husbands and other family members.

About half (51.3%) of the mothers and fathers had secondary level of education and 98.3% and 87.7% of them respectively were either unskilled or semi-skilled. Unskilled occupations included trading, being a house wife and doing security jobs. Semi-skilled occupations included carpentry, hairdressing and plumbing. Two thirds (66.7%) of the children were primarily supported financially by their fathers while individuals other than their parents played a similar role in 9.3% of children. The other individuals were the grandfathers, grandmothers, aunties and uncles. Of the people that were supporting the children financially, 53.7%, 26.7% and 19.7% had a total of 4–6, 1–3, and more than 6 dependants respectively with a mean of 5.2 dependants (SD: 3.1). Most (69.3%) of the households had 1–2 children and 5% had more than 4 children with a mean of 2.1 children (SD: 1.2).

4.1. b. Socio-demographic Characteristics of the Study Population: Family-related Information n = 300

Variables	n (%)
Family type	
Monogamous	164(54.7)
Polygamous	67(22.3)
Single parent	69(23.0)
Mother's level of satisfaction with spousal relationship	
Not satisfied	75(25.0)
Fairly satisfied	66(22.0)
Very satisfied	159(53.0)
Level of support received from husband/family	
Poor	39(13.0)
Fair	88(29.3)
Good	173(57.7)
Father's level of education	
Less than secondary	114(38.0)
Secondary and above	154(51.3)
I don't know	32(10.7)
Mother's level of education	
Less than secondary	140(46.7)
secondary and above	139(51.3)
I don't know	6(2.0)
Number of children in household	
1 - 2	208(69.3)
3 - 4	77(25.7)
> 4	15(5.0)
Father's occupation	
Unskilled & semi-skilled	263(87.7)
University & professional	9(3.0)
I don't know	28(9.3)
Mother's occupation	
Unskilled & semi-skilled	295(98.3)
University & professionals	5(1.7)

4.1. b. Socio-demographic Characteristics of the Study Population: Family-related Information (continued) n = 300

Variables	n (%)
Primary sponsor of the child	
Both parents	29(9.7)
Father	200(66.7)
Mother	43(14.3)
Others	28(9.3)
Primary sponsor's occupation	
Unskilled & semi-skilled	287(95.6)
University & professional	8(2.7)
I don't know	5(1.7)
Number of dependants	
1 - 3	80(26.7)
4 - 6	161(53.7)
> 6	59(19.7)

Section 2 – Child Health Information

Tables 4.2a – 4.2c present information on the child's health and are subdivided into the following headings:

- 4.2a. General health
- 4.2b. Nutritional status assessment
- 4.2c. Mental health and developmental characteristics

4.2a. Child Health Information: General Health

Most (84.7%) of the children had normal birth weights (2.5kg – 3.9kg) and 5.6% had low birth weights with a mean birth weight of 3.1 kg (SD: 0.5). Only 38.7% of the children were still being breastfed at the time of the study. About half (54.4%) of those that had stopped breastfeeding were breastfed for 7 – 12 months with a mean breastfeeding period of 5.9 months (SD: 6.3).

Febrile illness was the most frequent childhood illness reported with 49% having had at least 1 episode in the last 6 months. Acute respiratory infection defined as presence of cough, nasal/postnasal discharge and fast breathing with each episode separated by at least 7 days was the next frequent childhood illness with 40% reporting at least 1 episode in the last 6 months. Persistent vomiting and diarrhoeal episodes accounted for 5.7% and 14.7% of responses, respectively with diarrhoea defined as 3 or more loose stools in a 24 hour period and a diarrhoeal episode defined as episodes separated by at least 3 diarrhoea-free days.

4.2a Child Health Information: General Health n = 300

Variables	n (%)
Child's birth weight (kg)	
< 2.5	17(5.6)
2.5 - 3.9	254(84.7)
>4	21(7.0)
I don't know	8(2.7)
Current breastfeeding	
No	184(61.3)
Yes	116(38.7)
Duration of breastfeeding*	
0 - 6 months	17(9.2)
7 - 12 months	100(54.4)
13 - 18 months	42(22.8)
19 - 24 months	24(13.0)
> 24 months	1(0.5)
Persistent vomiting in last 6 months	
No	283(94.3)
Yes	17(5.7)
Episodes of vomiting	
None	283(94.3)
1 – 2 episodes	13(4.3)
3 - 4 episodes	4(1.3)
Diarrhoea in last 6 months	
No	256(85.3)
Yes	44(14.7)
Episodes of diarrhoea	
None	256(85.6)
1 – 2 episodes	37(12.3)
3 - 4 episodes	6(2.0)
> 4 episodes	1(0.3)
Febrile illness in last 6 months	
No	153(51.0)
Yes	147(49.0)
Episodes of febrile illness	
None	153(51.0)
1 – 2 episodes	111(37.0)
3 - 4 episodes	34(11.3)
> 4 episodes	2(0.7)

*n = 184

4.2a Child Health Information: General Health (continued) n = 300

Variables	n (%)
Acute respiratory infection in last 6 months	
No	180(60.0)
Yes	120(40.0)
Episodes of acute respiratory infection	
None	180(60.0)
1 – 2 episodes	81(27.0)
3 - 4 episodes	36(12.0)
> 4 episodes	3(1.0)
Number of hospital visits in last 6 months	
None	126(42.0)
1 – 2	136(45.3)
3 – 4	34(11.3)
> 4	4(1.3)
Immunised for age	
No	31(10.3)
Yes	269(89.7)

4.2b. Child Health Information: Nutritional Status Assessment

Table 4.2b presents the findings of nutritional status assessment of the children. Majority (67.0%) of the children had normal weight and height measurements (weight/height % > 90; SD score > - 1). The assessment also revealed that 17.7%, 14.3% and 1.0% of them were mildly (weight/height = 80–90%; - 2 ≤ SD score ≤ - 1), moderately (weight/height = 70–79%; - 3 ≤ SD score < - 2), and severely undernourished (weight/height % < 70%; SD score < - 3) respectively. None (0.0%) of the children was overweight.

4.2b. Child Health Information: Nutritional Status Assessment n = 300

Variables	n (%)
Nutritional status	
Normal	201(67.0)
Undernourished	99(33.0)
Degrees of undernutrition	
Mild	53(17.7)
Moderate	43(14.3)
Severe	3(1.0)

4.2c. Child Health Information: Mental Health and Developmental Characteristics

Table 4.2c shows that 103 (34.3%) of the children had 1 or more childhood developmental or mental health problems. Most (13.3%) of those that had problems had only 1 disability, 32 (10.7%) had 2 disabilities and only 1 (0.3%) had 7 disabilities. The most prevalent childhood disability was problems with learning (11.0%) followed by mental backwardness (9.0%). Problems with

understanding commands, speech delay or absence and inability to name at least one object each accounted for 8.3% of those that had disabilities.

4.2c Child Health Information: Mental Health and Developmental Characteristics n = 300

Variables	n (%)
Developmental or mental problems	
None	197 (65.7)
1 or more	103 (34.3)
Number of developmental or mental problems	
0	197 (65.7)
1	40 (13.3)
2	32 (10.7)
3	13 (4.3)
4	9 (3.0)
5	4 (1.3)
6	4 (1.3)
7	1 (0.3)
Isolated childhood disabilities	
1. Serious delay in sitting, standing or walking	21 (7.0)
2. Difficulty seeing either in the daytime or at night	79 (2.3)
3. Difficulty hearing	9 (3.0)
4. Problem with understanding commands	25 (8.3)
5. Difficulty with movement of limbs or weakness and/or stiffness of limbs	6 (2.0)
6. Seizure disorder	18 (6.0)
7. Problem with learning	33 (11.0)
8. Speech delay or absent speech	25 (8.3)
9. Speech not clear enough to be understood by other people (3-9years)	12 (4.0)
Cannot name at least one object (≤ 2 years)	25 (8.3)
10. Mentally backward, dull or slow	27 (9.0)

Section 3 – Respondent's Health Information

This section describes the health characteristics of the respondents and is further divided into the following subheadings:

- 4.3a. Obstetric characteristics
- 4.3b. Mother's physical health
- 4.3c. Depression in the mothers

4.3a. Respondent's Health Information: Obstetric Characteristics

Table 4.3a presents the obstetric characteristics of the study population. Virtually all (97.3%) of the respondents had no history of child death. Three quarters (76.0%) of pregnancies were planned and antenatal attendance was by 91.3%. Respondents who had to be admitted during pregnancy and received care for either pre-eclampsia, malaria in pregnancy or hypertension in pregnancy were 9.3%. Majority (77.7%) of deliveries took place at either the Community Health Centre or a referral hospital whereas 22.3 % of deliveries took place at a traditional birth attendant's or at home. Almost 80% of respondents delivered by spontaneous vaginal delivery while 12.7% and 8.0% had assisted vaginal delivery and caesarean section delivery, respectively. About 5% of respondents had to stay longer than 3 days at the institution of delivery and the reasons for prolonged stay were maternal post partum illness, caesarean section delivery or difficult vaginal delivery with a mean duration of hospital stay of 1.8 days (SD: 1.8). Most (92.7%) deliveries were at term (gestational age 37 – 42 weeks). However, 6.3% of deliveries were preterm (< 37 weeks) and 1.0% of respondents could not ascertain their gestation at delivery. The mean gestational age at delivery was 38.5 weeks (SD: 1.6).

4.3a. Respondent's Health Information: Obstetric Characteristics n = 300

Variables	n (%)
History of child death	
No	292(97.3)
Yes	8(2.7)
Pregnancy planned	
No	72(24.0)
Yes	228(76.0)
Antenatal visit in pregnancy	
No	26(8.7)
Yes	274(91.3)
Admissions in pregnancy	
No	272(90.7)
Yes	28(9.3)
Gestational age at delivery	
< 37 weeks	19(6.3)
37 - 42 weeks	278(92.7)
I don't know	3(1.0)
Place of delivery	
Institutional	233(77.7)
Others*	67(22.3)
Mode of delivery	
Spontaneous vaginal delivery	238(79.3)
Assisted vaginal delivery	38(12.7)
Caesarean section	24(8.0)
Duration of hospital stay	
1 - 3 days	217(72.3)
> 3 days	16(5.3)
Not applicable	67(22.3)

*-home, traditional birth attendant

4.3b. Respondent's Health Information: Body Mass Index (BMI) Assessment

Table 4.3b presents information on the mother's BMI assessment. Their weights ranged from 40 kg – 115 kg with a mean weight of 63.3kg (SD: 13.1). Heights ranged from 120 cm – 182 cm with a mean height of 155.6 cm (SD: 8.3). Over half (55.7%) of the respondents had BMI measurements outside the normal range with 3.0% being underweight and 52.6% been overweight and obese. The mean BMI was 26.2 kg/m^2 (SD: 5.1).

4.3b. Respondent's Health Information: Body Mass Index (BMI) Assessment n = 300

Variables	n (%)
Maternal BMI	
Normal	133(44.3)
Outside normal	167(55.7)
BMI classification (kg/m^2)	
Underweight (< 18.50)	9(3.0)
Normal (18.50 - 24.90)	133(44.3)
Pre obese (25.00 - 29.99)	94(31.3)
Obese class I (30.0 - 34.9)	43(14.3)
Obese class II (35.00 - 39.99)	16(5.3)
Obese class III (> 40)	5(1.7)

4.3c. Respondent's Health Information: Depression

Table 4.3c presents the findings from the assessment for depression in the mothers interviewed. Most (35.3%) of the respondents reported having had a period lasting several days or longer when most of the day they were discouraged about how things were going on their lives. About a third (31.3%) reported they have had a period lasting several days or longer when most of the day they

felt unhappy, empty or depressed and 28.7% reported they have had a period lasting several days or longer when they lost interest in most things they usually enjoy like work, hobbies and personal relationships. A fourth (25.0%) of the respondents screened positive and were administered the depression module of the WMH-CIDI and a DSM IV criteria for the diagnosis of depression was met in 67 (22.3%) of them. Major depression was diagnosed in 27 (9.0%) of the respondents when they had five or more depressive symptoms including at least one core symptom present for two weeks or more. A diagnosis of minor depression was made in 13.3% of the respondents when they had at least two symptoms including at least one core symptom present for two weeks or more.

4.3c. Respondent's Health Information: Depression n = 300

Variables	n (%)
Screening for depression	
Have you ever in your life had a period lasting several days or longer when most of the day you felt unhappy, empty or depressed?	94(31.3)
Have you ever had a period lasting several days or longer when most of the day you were very discouraged about how things were going in your life?	106(35.3)
Have you ever had a period lasting several days or longer when you lost interest in most things you usually enjoy like work, hobbies, and personal relationships?	86(28.7)
A diagnosis of depression in the mothers	
No	233(77.7)
Yes	67(22.3)
Type of depression	
Major depression	27(9.0)
Minor depression	40(13.3)

Section 4 – Correlates of the Child's Mental and Physical Development

This section presents the findings from the analysis for an association between the child's mental and physical development and socio-demographic, maternal health and other child health characteristics. Section 4 is further divided into 3 namely;

- 4.4. a. Child physical health correlates of mental and physical development
- 4.4. b. Maternal health correlates of the child's mental and physical development
- 4.4. c. Socio-demographic correlates of the child's mental and physical development

4.4a Child Physical Health Correlates of Mental and Physical Development

Table 4.4a presents the general health and nutritional status correlates of the child's mental and physical development. Almost half (47.1%) of children born with low birth weights (< 2.5kg) and 57.1% of those born macrosomic (birth weight ≥ 4kg) had one or more developmental problems compared to 32.3% in those born with normal birth weight (2.5kg – 3.9kg). This difference was found to be significant p = 0.040.

About half (47.5%) of underfives with nutritional problems had one or more developmental delays while 27.9% of those with one or more developmental problems were normally nourished. This difference was also statistically significant p = 0.000.

Less than half (44.2%) of children with a history of febrile illness in the last 6 months had one or more developmental delay compared to 24.8% of children with no history of febrile illness who also had one or more developmental delay and this difference was statistically significant p = 0.000. Almost half (47.1%), 24.5% and 6.5% of children who presented on 1-2 occasions, 3-4

occasions and more than 4 occasions respectively at a health care facility for a febrile illness, acute respiratory infection, diarrhea and vomiting or skin infection had one or more developmental delay while 22.2% of those with developmental problems had no reason to present for care at a health care facility in the last 6 months. This difference was statistically significant p = 0.000.

On the other hand, 41.2% and 38.6% of children that had persistent vomiting or diarrhoeal disease in the last 6 months respectively, also had one or more developmental delay compared to 33.9% and 33.6% of those that did not have persistent vomiting or diarrhoeal disease in the last 6 months respectively but this difference was however not statistically significant p = 0.541 and p = 0.515 respectively.

4.4a. Child Physical Health Correlates of Mental and Physical Development n = 300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
General health information						
Birth weight (kg) [b]						
< 2.5	9(52.9)	8(47.1)	17	6.442	2	0.040
2.5 – 3.9	172(67.7)	82(32.3)	254			
≥ 4	9(42.0)	12(57.1)	21			
Current breastfeeding						
No	122(66.3)	62(33.7)	184	0.086	1	0.770
Yes	75(64.7)	41(35.3)	116			
Duration of breastfeeding (months)						
0 – 6	10(58.8)	7(41.2)	17	4.439	4	0.332*f
7 – 12	65(65.0)	35(35.0)	100			
13 – 18	32(76.2)	10(23.8)	42			
19 – 24	15(62.5)	9(37.5)	24			
> 24	0(0.0)	1(100.0)	1			
Persistent vomiting in last 6 months						
No	187(66.1)	96(33.9)	283	0.374	1	0.541
Yes	10(58.8)	7(41.2)	17			
Diarrhoeal disease in last 6 months						
No	170(66.4)	86(33.6)	256	0.423	1	0.515
Yes	27(61.4)	17(38.6)	44			
Febrile illness in last 6 months [a]						
No	115(75.2)	38(24.8)	153	12.491	1	<0.001
Yes	82(55.8)	65(44.2)	147			

a-relationship is significant; *f-Fischer's Exact Test; b- 2.7% of mothers did not know their child's birth weight and were excluded from this analysis

4.4a. Child Physical Health Correlates of Mental and Physical Development (continued) n = 300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
Acute respiratory infection in last 6 months						
No	112(62.2)	68(37.8)	180	2.368	1	0.124
Yes	85(70.8)	35(29.2)	120			
Number of hospital visits in last 6 months [a]						
0	98(77.8)	28(22.2)	126	19.481	3	<0.001*f
1 – 2	72(52.9)	64(47.1)	136			
3 – 4	25(73.5)	9(24.5)	34			
> 4	29(93.5)	2(6.5)	31			
Immunised for age						
No	23(74.2)	8(25.8)	31	1.115	1	0.291
Yes	174(64.7)	95(35.3)	269			
Nutritional status[a]						
Normal	145(72.1)	56(27.9)	201	11.318	1	0.001
Nutritional problems	52(52.5)	47(47.5)	99			
Acute respiratory infection in last 6 months						
No	112(62.2)	68(37.8)	180	2.368	1	0.124
Yes	85(70.8)	35(29.2)	120			

a-relationship is significant; *f-Fischer's Exact Test

4.4b. Maternal Health Correlates of the Child's Mental and Physical Development

Table 4.4b presents the maternal health correlates of the child's mental and physical development. About 36% of mothers who had BMI measurements outside the normal range had children with one or more developmental problems compared to 33.1% of children with one or more developmental delays whose mothers had normal BMI measurement but this difference was not statistically significant p = 0.684.

Half of children whose mothers had a history of child death had developmental delays while 33.9% of children with developmental delay had no history of child death. This difference was however not statistically significant p = 0.453. Gestational age at delivery was found to be significantly related (p = 0.028) to developmental delays in children as 57.9% of children born preterm (< 37 weeks) had one or more developmental delays compared to 33.1% in those delivered at term (37 – 42 weeks).

4.4b. Maternal Health Correlates of the Child's Mental and Physical Development n = 300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
Mother's BMI						
Normal	89(66.9)	44(33.1)	133	0.166	1	0.684
BMI outside normal	108(64.7)	59(35.3)	167			
Depression in the mothers						
No	152(65.2)	81(34.8)	233	0.086	1	0.770
Yes	45(67.2)	22(32.8)	67			
Obstetric Factors						
Previous history of child death						
No	193(66.1)	99(33.9)	292	0.895	1	0.453*[f]
Yes	4(50.0)	4(50.0)	8			

*f-Fischer's Exact

4.4b. Maternal Health Correlates of the Child's Mental and Physical Development (continued) n = 300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
Was pregnancy planned						
No	54(75.0)	18(25.0)	72	3.660	1	0.056
Yes	143(62.7)	85(37.3)	228			
Antenatal visits in pregnancy [a]						
No	22(84.6)	4(15.4)	26	4.534	1	0.033
Yes	175(63.9)	99(36.1)	274			
Hospital admission during pregnancy						
No	175(64.3)	97(35.7)	272	2.281	1	0.131
Yes	22(78.6)	6(21.4)	28			
Gestational age at delivery [a, b]						
< 37 weeks	8(42.1)	11(57.9)	19	4.829	1	0.028
37 - 42 weeks	186(66.9)	92(33.1)	278			
Institutional delivery [c]						
No	40(59.7)	27(40.3)	67	1.362	1	0.243
Yes	82(55.8)	65(44.2)	147			
Spontaneous Vaginal delivery						
No	36(58.1)	26(41.9)	62	2.003	1	0.157
Yes	161(67.6)	77(32.4)	238			
Duration of hospital stay						
1 - 3 days	147(67.7)	70(32.3)	217	0.186	1	0.666
> 3 days	10(62.5)	6(37.5)	16			

a-relationship is significant; *f-Fischer's Exact Test; b-1% of mothers did not know their gestational age at delivery and were excluded from this analysis c- 22.3% of the deliveries were not in institutions and were excluded from this analysis

4.4c. Socio-demographic Correlates of the Child's Mental and Physical Development

Table 4.4c presents the socio-demographic correlates of the child's mental and physical development.

About 40% of females had one or more developmental delays compared to 31.8% of males who had one or more developmental delays but this difference was not statistically significant p = 0.346. Assessment revealed that 47.9% of children who lived with their mothers only had developmental problems compared to 30% who lived with both parents and this difference was statistically significant p = 0.005.

Forty percent of mothers who were not satisfied with the relationship they had with their spouses had children with developmental problems while 27.3% and 34.6% of developmental delays occurred in children of mothers who were fairly satisfied and very satisfied with the relationship they had with their spouses respectively. This difference was however not found to be statistically significant p = 0.082. Of the children that were more than 4 in their households, 40% had developmental delay compared to 35.1% and 31.2% in those who were 1 or 2 and 3 or 4 respectively in their households. This difference was not statistically significant p = 0.737.

4.4c Socio-demographic Correlates of the Child's Mental and Physical Development n=300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
Personal information						
Age of child (months) [a]						
0 – 11	58(78.4)	16(21.6)	74	9.788	4	0.044
12 – 23	42(55.3)	34(44.7)	76			
24 – 35	45(68.2)	21(31.8)	66			
36 – 47	28(63.6)	16(36.4)	44			
48 – 59	24(60.0)	16(40.0)	40			
Sex of child						
Male	105(68.2)	49(31.8)	154	0.888	1	0.346
Female	92(63.0)	54(37.0)	146			
Mother's age (years)						
15 – 20	18(66.7)	9(33.3)	27	1.088	5	0.955
21 – 26	59(67.1)	29(32.9)	88			
27 – 32	68(63.6)	39(36.4)	107			
33 – 38	33(70.2)	14(29.8)	47			
39 – 44	15(60.0)	10(40.0)	25			
45 – 50	4(66.7)	2(33.3)	6			
Religion						
Islam	136(66.3)	69(33.7)	205	0.095	1	0.758
Christianity	60(64.5)	33(35.5)	93			
Family related information						
Parent's address [a]						
Stays with both parents	159(70.0)	68(30.0)	227	7.929	1	0.005
Stays with mother only	38(52.1)	35(47.9)	73			
Mother's marital status						
Married	123(62.8)	73(37.2)	196	2.126	1	0.145
Others	74(71.2)	30(28.8)	104			
Family type						
Monogamous	106(64.6)	58(35.4)	164	2.086	2	0.352
Polygamous	41(61.2)	26(38.8)	67			
Single parent	50(72.5)	19(27.5)	69			
Mother's level of satisfaction with spousal relationship						
Not satisfied	45(60.0)	30(40.0)	75	2.532	2	0.282
Fairly satisfied	48(72.7)	18(27.3)	66			
Very satisfied	104(65.4)	55(34.6)	159			

a-relationship is significant; *-single, separated/divorced, co habiting

4.4c Socio-demographic Correlates of the Child's Mental and Physical Development (continued) N=300

Variables	Developmental problems None n (%)	1 or more n (%)	Row Total	x^2	df	p value
Level of social support received from husband/family [a]						
Poor	31(79.5)	8(20.5)	39	7.491	2	0.024
Fair	49(55.7)	39(44.3)	88			
Good	117(67.6)	56(32.4)	173			
Father's level of education [b]						
Less than secondary education	76(66.7)	38(33.3)	114	0.703	1	0.402
Secondary education and above	95(61.7)	59(38.3)	154			
Mother's level of education [c]						
Less than secondary education	93(66.4)	47(33.6)	140	0.006	1	0.940
Secondary education and above	101(66.0)	52(34.0)	153			
Father's occupation [d]						
Unskilled & semi-skilled	165(62.7)	98(37.3)	263	0.847	1	0.493*[f]
University & professional	7(77.8)	2(22.2)	9			
Mother's occupation						
Unskilled & semi-skilled	195(66.1)	100(33.9)	295	1.486	1	0.343*[f]
University & professional	2(40.0)	3(60.0)	5			
Primary sponsor of the child						
Both parents	18(62.1)	11(37.9)	29	7.507	3	0.057
Father	123(61.5)	77(38.5)	200			
Mother	35(81.4)	8(18.6)	43			
Others	21(75.0)	7(25.0)	28			
Primary sponsor's occupation [e]						
Unskilled & semi-skilled	186(64.8)	101(35.2)	287	0.356	1	0.718*[f]
University & professional	6(75.0)	2(25.0)	8			
Number of dependants						
1 – 3	50(62.5)	30(37.5)	80	1.168	2	0.558
4 – 6	105(65.2)	56(34.8)	161			
> 6	42(71.2)	17(28.8)	59			
Number of children in the household						
1 – 2	135(64.9)	73(35.1)	208	0.609	2	0.737
3 – 4	53(68.8)	24(31.2)	77			
> 4	9(60.0)	6(40.0)	15			

a-relationship is significant; b-10.7% of mothers did not know the father's level of education and were not included in this analysis; c-2.3% of mothers did not know their level of education and were not included in this analysis; d-9.3% of mothers did not know the father's occupation and were not included in this analysis; e-1.7% of the mothers did not know the occupation of the individual that supports the child financially and were not included in this analysis; *f-Fischer's Exact Test

4.4d Predictors of the Child's Mental and Physical Development

All socio-demographic, child health and maternal health characteristics that were statistically significant were entered into a logistic regression equation (see Table 4.4d). At the end of the analysis the following were strongly and independently associated with having one or more mental or physical development problem as measured by the ten questions screen for childhood disability. Having a febrile illness in the last 6 months (OR 0.51 [95% CI 0.27 – 0.96] p = 0.036), having a nutritional problem (OR 0.49 [95% CI 0.28 – 0.84] p = 0.010), living with their mothers only (OR 0.44 [95% CI 0.23 – 0.84] p = 0.012) and mothers receiving low levels of social support from either their husbands or other family members (OR 0.35 [95% CI 0.13 – 0.92] p = 0.034).

4.4d Predictors of the Child's Mental and Physical Development n = 300

Variables	Adjusted odds ratio	p value	95% Confidence Interval	
			Lower	Upper
Birth weight of the child	1.354	0.377	0.692	2.649
Febrile illness in last 6 months	0.512	0.036	0.274	0.958
Number of hospital visits in last 6 months	1.035	0.874	0.673	1.592
Nutritional status of the child	0.488	0.010	0.282	0.844
Antenatal visits in pregnancy	0.329	0.057	0.104	1.036
Gestational age at delivery	0.364	0.055	0.130	1.022
Child lives with either or both parents	0.436	0.012	0.227	0.835
Low level of social support from husband or family members	0.351	0.034	0.134	0.922

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

This study examined the physical health, mental health and development of under-fives in the Kroo Bay Community in Freetown, Sierra Leone. The correlates of physical health, mental health and development of the children including depression in their mothers were also determined.

The discussion of findings from this study is presented under the following headings:

5.1a Socio-demographic characteristics

5.1b Child health characteristics

5.1c Health characteristics of mothers of the under-fives

5.1d Correlates of mental and developmental problems in the child

5.1a Socio-demographic Characteristics

The proportion of male and female under-fives examined in this study was almost equal with 51.3% and 48.7% respectively. The roughly equal proportions of males and females are similar to the rates found in Sierra Leone's national estimates of under-fives which revealed that 50.7% are females and 49.3% males, although the national estimate has a preponderance of females (SLDHS, 2013). The proportion of males to females in this study is also similar to that obtained in a study that investigated the nutritional status of under-fives in Ipokia local government area of Ogun

State, Southwest Nigeria where a male proportion of 50.7% and a female proportion of 49.3% was obtained (Amosu *et al*, 2011). The proportion of males in this study was lower than another study which investigated the socio-demographic determinants of recurrent diarrhoea among under-fives in rural India that reported a much higher male proportion of 55.4% (Avachat *et al*, 2011). The slight variations in these studies are likely due to sampling differences in the various studies.

The proportion of under-fives recruited reduced with increasing age such that about a quarter were aged 0 – 11 months and 12 – 23 months, and just over 10% were aged 36 – 47 months and 48 – 59 months, respectively. The figures may be a reflection of perinatal and under-five mortality that affect children in many low-income settings. In Sierra Leone, 14.3% of children under five years do not survive to their fifth birthday (SLDHS, 2013).

Most of the mothers were in the 27 to 32 years age bracket, which is in keeping with the national estimates that revealed that most mothers of under-fives were aged 25 – 34 years (SLDHS, 2013).

Over two-thirds of mothers interviewed in this study reported that they were Muslims while the remaining third were Christians. National estimates in Sierra Leone show a distribution of 80.0% Muslim and 20.0% Christian (SLDHS, 2013). However, the religious distribution in this community in Freetown could also be a reflection of the demographic transition that has occurred in Sierra Leone over the last one decade. Up until recently, the population in Freetown was predominantly Christian while the other provinces were mostly Muslim, but during the 10-year civil war in Sierra Leone, there was a massive migration of people fleeing the conflict regions from the provincial areas into Freetown. Many of the internally displaced persons settled in makeshift overcrowded and poor sanitary areas of the city with Kroo Bay being one of such areas. The

Government has long sought to resettle those who live in the Kroo Bay community into a more decent environment but this is yet to be implemented.

About two thirds of the mothers in this study were married which is a similar finding to the Sierra Leone national estimate of 63.0% married women (SLDHS, 2013). However, it is important to note that over a third of mothers were single, cohabiting, divorced or separated and a quarter were single parents. Studies have revealed that single mothers are more likely to have mental health problems due to the stresses of managing their homes alone and a lack of intimacy and support from partners and this has implications for children's growth and development (Adewuya *et al*, 2009).

About half of the mothers interviewed reported they received low levels of social support from their husbands and other family members and that they were not satisfied with the relationship they had with their spouses. Studies have revealed that the absence of the partner from the home or the lack of practical or social support results in emotional problems in the mother, and emotional and other developmental problems in the child (Cooper *et al*, 1999; Adewuya *et al*, 2009; Parsons *et al*, 2012).

Over 50% of the mothers and fathers of the under-fives in this study had at least secondary education. National estimates in Sierra Leone reveal that 56.0% of women and 40.0% of men do not have a formal education (SLDHS, 2013). The relatively high proportion of educated fathers and mothers of under-fives in this community may be attributed to the fact that living in the capital city of Sierra Leone, Freetown would have made for increased awareness about education and access to educational facilities.

Almost 90% of the fathers and virtually all of the mothers had unskilled and semi-skilled occupations with most of them being petty traders. The Kroo Bay Community has a predominance of the Temne ethnic group whose main preoccupation is trading, and this may account for the observed distribution.

Over two thirds of the households had 1 or 2 children, about a quarter had 3 or 4 children and just 5.0% had more than 4 children. The relatively high proportion of households with one or two children may be attributed to the fact that living in the capital city of Sierra Leone, Freetown would have made for increased awareness about family planning practices. National estimates in Sierra Leone reveal a family planning knowledge rate of 95% with 17% of married women using at least a method of contraception (SLDHS, 2013). Studies have revealed that the greater the number of children in the household, the more difficult it is to cater for their needs effectively resulting in nutritional problems, developmental problems, and other deficiencies (Dwivedi *et al*, 1992; Mahgoub *et al*, 2006; Amsalu and Tigabu, 2008). It has also been reported that the greater the number of children in the home the more likely it is for the mother to be depressed (Rahman *et al*, 2004).

5.1b Child Health Characteristics

Over a third of the children in this study had one or more symptoms of developmental delay. The proportion of children with developmental problems in this study is higher than that obtained in a study conducted to assess neurodevelopmental delay among children less than three years at immunization clinics in Lagos State, Nigeria where a proportion of 0.9% was found (Bakare *et al*, 2016). Developmental problems and other health problems are likely to be more prevalent in

community settings than in the hospital setting as parents may refrain from presenting their children for care either due to ignorance or fear of stigmatization. The observed finding in this study is in keeping with WHO's statement that developmental problems in children may go unnoticed in communities and result in a national loss of developmental potential (WHO, 2012).

A third of the children studied were undernourished and this proportion is higher than 9.0% reported in the national statistics for Sierra Leone (SLDHS, 2013). The relatively high proportion of undernourished under-fives in this study could be attributed to the low socioeconomic, overcrowded and poor sanitary conditions in this particular community. The proportion of undernourished children in this study is lower than that obtained from a study conducted to investigate the nutritional status of children under five years in the Ipokia local government area of Ogun State, Nigeria where a rate of 85.2% was obtained (Amosu *et al*, 2011). The proportion of undernourished underfives in this study is however higher than that obtained in another study conducted to determine the prevalence of undernutrition and associated factors among children under five years in Bule Hora district, South Ethiopia where a proportion of 13.4% was obtained (Asfaw *et al*, 2015). The variations in these studies are likely due to sampling differences in the various studies.

About a sixth of the children studied had at least one episode of diarrhoeal disease in the 6 months preceding the study. This proportion of children reported to have had diarrhoeal disease is higher than the proportion (11.0%) revealed in the national estimates for diarrhoea among underfives in Sierra Leone (SLDHS, 2013). The relatively high proportion of underfives with diarrhoea in this study may be attributed to the low socioeconomic and poor sanitary conditions in the environment. The proportion of children with diarrhoea in this study is similar to that obtained in a study conducted to determine the prevalence of diarrhoea among under-five children in an urban slum

of Delhi where a rate of 14.8% was obtained (Basa, 2015). The proportion of underfives with diarrhoea in this study is lower than that obtained in another study conducted to determine the risk correlates of diarrhoea in children under five years of age in slums of Bankura, West Bengal where a rate of 22.4% was found (Gupta *et al*, 2015).

Forty percent of children had one or more episodes of acute respiratory infection (ARI) in the 6 months preceding the study. The proportion of under fives with ARI is higher than that revealed in the national estimates where a proportion of 5% was reported (SLDHS, 2013). The high proportion of ARI among children under five years in this study could be attributed to the poor sanitary conditions which increase the prevalence of ARI and other childhood illnesses (WHO, 2014). The proportion of children under five years with ARI in this study is higher than that obtained in a study conducted to profile ARI in children under five years in Assam, India where a rate of 26.2% was found (Islam *et al*, 2013). The proportion of under fives with ARI in this study is also higher than that obtained in another study conducted to determine the prevalence of ARI in underfive children in Lucknow district, India where a prevalence rate of 23.0% was obtained (Arun *et al*, 2014). The variations in these studies are likely due to sampling differences in the various studies.

It is notable that a higher proportion (90%) of the children in this study were immunised for age compared to the national estimate of 68% (SLDHS, 2013). Studies conducted among under-fives in slums in countries such as Kenya and India reported immunization rates of 62.2% and 64.8% respectively (Kamau and Esamai, 2001, Phadnis *et al*, 2015). The relatively high immunisation coverage for under-fives in this study may be due to the availability of a health care facility within the community. Another possibility may be the fact that the community is an urban slum located

within the capital city of the country, thus, parents are exposed to sensitisation messages on the importance of childhood immunisation and health care facilities.

It is quite interesting that although a relatively high proportion of under-fives in this study were immunized for age compared to the national statistics, a higher proportion of them had neurodevelopmental delays, malnourishment, diarrhoeal and ARI, when compared with the national estimates. This may be a pointer to the fact that although parents understood the value of immunization and appreciated its effect on their child's health, they lacked the capacity or wherewithal to provide an enabling or healthy environment for their children.

5.1c Health Characteristics of Mothers of the Under-fives

The prevalence of depression among mothers of the under-fives in this study was 22.3%. in other words, approximately one in every four or five mothers met the criteria for a depressive illness. Studies among women from other parts of the world reveal a prevalence of 6.3% to 17% for depression (Nhiwatiwa *et al*, 1998; Ghubash *et al*, 1997; Yoshida *et al*, 2001; Adewuya *et al*, 2005). Sierra Leone has recently emerged from several extremely stressful and prolonged events. The recent Ebola Virus epidemic with numerous deaths, restriction of movements, closure of schools, ban on public gatherings and a virtual stop of economic activities must have caused much stress for these young mothers living in already difficult circumstances. Just as the Ebola Virus epidemic was subsiding, several areas of Freetown experienced floods. Mothers in this study may have been exposed to unfavourable environmental conditions such as the repeated flooding leading to property loss, a common occurrence in the study community. These might have accounted for the high prevalence of depression seen in the women. Another possibility may be the relatively

high prevalence of single parenting and low socioeconomic circumstances of the mothers. Research has established a link between depression and adverse psychosocial factors such as poverty or natural disaster (WHO, 2012; Dent and Hoogendijk, 2014).

Compared to the reported rate of 95% for family planning literacy among women of childbearing age in Sierra Leone (SLDHS, 2013), about a fourth of the mothers studied did not plan their pregnancies. This is not surprising as it has been reported that, women living in slums are at greater risk of having unplanned pregnancies, early childbearing and other adverse sexual and reproductive health outcomes compared with their non-slum counterparts (Mumah *et al*, 2014)

Majority (92%) of the mothers interviewed received antenatal care during pregnancy. National statistics show that 97% of communities in Sierra Leone have facilities that provide free antenatal care (SLDHS, 2013), which may account for the high rate of antenatal attendance among women in this study. The relatively high prevalence of childhood illnesses, developmental delays and undernutrition among the children studied despite the high antenatal coverage, may be due to the fact that the women lacked the capacity to provide an enabling environment for their children.

5.1d Correlates of Physical and Mental Developmental Delays in the Children

A significant association was observed in this study, between single parenting and the child having one or more developmental problems. Several studies reveal the negative consequences of disruption in the family on children. Single mothers are more likely to have emotional problems due to the stresses involved in managing their homes alone and the lack of intimacy and support from partners (Adewuya *et al*, 2009). Mothers who cannot provide an enabling emotional environment for their children would experience difficulty in adequately providing care and

support to them thereby predisposing them to nutritional, emotional and other developmental problems (Udani, 1992; Cooper *et al*, 1999; Rahman *et al*, 2004).

The level of social support the mothers received from their husbands or other family members was observed to have a significant association with developmental problems in the child. This finding is consistent with several other studies that report that the absence of the partner from the home or the lack of practical or social support results in emotional problems in the mother, and emotional and other developmental problems in the child (Cooper *et al*, 1999; Adewuya *et al*, 2009; Parsons *et al*, 2012).

Lack of formal education in the mother has been reported to have a significant relationship with developmental problems in a child (Olukemi, 2004; Mittal *et al*, 2007). Increasing level of education in the mother on the other hand may result in the mother having occupation types that prevent her from providing immediate care, support and stimulation for the child with consequent developmental problems in the child (Popkin, 1980; Pierre Louis *et al*, 2007). These findings may account for the positive correlation between developmental problems in the child and academic attainment of both parents, in the current study.

Studies have revealed that the more time the mother spends in income generating activities, the less time she spends with her children, cannot provide care for them and enough stimulation for development, which may result in developmental delays (Popkin, 1980; Pierre Louis *et al*, 2007). Although this difference was observed in the current study it did not reach statistical significance. The observed lack of significance in this study may be due to attenuating effect of the presence of other family members and the practical support they provide.

Households with more than 2 children reported more children with developmental problems compared to households with fewer children, but this observed difference did not reach statistical significance. The finding in this study is consistent with that from studies that revealed that the greater the number of children in the household, the more difficult it is to cater for their needs effectively resulting in nutritional problems, developmental problems, and other deficiencies (Dwivedi *et al*, 1992; Mahgoub *et al*, 2006; Amsalu and Tigabu, 2008).

Children who had at least one developmental delay in this study were more likely to be undernourished and this association was statistically significant. The relationship between developmental problems in the child and undernutrition was observed to occur both ways with developmental problems being both an outcome and a predictor of child undernutrition. Studies have established that developmental delays affect a child's physical activity and because physical activity is essential to a child's social development, educational process, disease prevention and quality of life improvement, developmental delays may affect the child's total health including nutrition (Coella *et al*, 2011, WHO, 2015). The findings in the current study are also consistent with studies that have reported that undernutrition in children is a significant predictor of physical and mental development especially cognitive development (Udani 1992; Parsons *et al*, 2012; Ali *et al*, 2013).

A significant association was observed in this study between gestational age at delivery, history of one or more episodes of febrile illness over the 6 months prior to the study and developmental delays in the child. In a study conducted to screen for developmental delay among children attending a rural community welfare clinic in Ghana, Bello and his colleagues found that gestational age of a child at birth and febrile illness in a child impact on the child's ability to perform in one or more developmental domain (Bello *et al*, 2013).

No significant relationship was observed in this study between depression in the mothers and developmental delays in the children. This may be due to the blunting effect of confounding factors such as support provided by other family members on the child's development. The lack of a significant association between depression in the mothers and developmental delays in the child contrasts with previous studies that have reported depression in the mother to have a significant association with developmental outcomes in the child (Rahman *et al*, 2004; Black *et al*, 2008; Parsons *et al*, 2012). Depression in mothers has negative implications for children's growth and development. A depressed mother would be emotionally unavailable to her children and would experience difficulty in providing adequate care and support to them thereby predisposing them to nutritional, emotional and other developmental problems (Udani, 1992; Cooper *et al*, 1999; Rahman *et al*, 2004).

The present study revealed no statistically significant relationship between planning of pregnancy and developmental delays in the child. The finding in this study contrasts with that in studies that reported a significant relationship between unplanned pregnancies and developmental problems (Cooper *et al*, 1999; De La Rochebrochard and Joshi, 2013; Khajehei, 2015). Unplanned pregnancies result in delay in accessing prenatal care, pregnancy associated complications and child health problems including developmental delays (Thomas and Monea, 2011; CDC, 2015). The observed lack of significance may be due to the smaller sample size recruited in this study compared to the previous studies.

5.2 Strengths and Limitations

This is the first study of such nature to be conducted in the study location but the sample size recruited was small compared to other similar studies.

5.3 Conclusion

This study examined the physical health, mental health and development of underfives in Kroo Bay Community in Freetown, Sierra Leone. The correlates of physical health, mental health and development of the children including depression in their mothers were also determined.

Undernutrition and developmental delays among under fives are prevalent in this community with problems with learning being the most prevalent developmental delay. The prevalence of maternal depression was also high compared to other settings and this could be attributed to the low socio-economic circumstances, relatively high prevalence of single parenting, poor living conditions and repeated floodings with loss of property.

5.4 Recommendations

In view of the findings from this study, the following are recommended:

1. Government of Sierra Leone should continue efforts to resettle this community
2. Childhood developmental and mental health screening is included into the routine care of children in the community.
3. Mental health services for mothers are incorporated into the health care services in order to provide holistic care to the mothers.

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APPENDIX I

GOVERNMENT OF SIERRA LEONE
Ministry of Health and Sanitation
Office of the Sierra Leone Ethics and Scientific Review Committee
Directorate of Policy Planning and Information, 5th Floor, Youyi Building

3rd February, 2016

TO: Dr. Ronita D. C. Luke (M.Sc. Candidate) **Principal Investigator**
Centre for Child & Adolescent Mental Health
University of Ibadan
Ibadan, Federal Republic of Nigeria

Study Title: **Mental and Physical Development and their Correlates among Under Fives in the Kroo Bay Community, Freetown**

Version: January, 2016

Committee Action: Expedited Review

Approval Date: 29th January, 2016

The Sierra Leone Ethics and Scientific Review Committee (SLESRC) having conducted an expedited review of the above study protocol and determined that it presents minimal risk to subjects, **hereby grants ethical and scientific approval** for it to be conducted in Sierra Leone. The approval is valid for the prior, **29th January, 2016 – 28th January, 2017.** It is your responsibility to obtain re-approval for any on-going research prior to its expiration date. The request for re-approval must be supported by a progress report.

Review Comments;

- **Amendments;** Intended changes to the approved protocol such as the informed consent documents, study design, recruitment of participants must be submitted for approval by the SLESRC prior to implementation.

For further enquiries please contact: efoday@health.gov.sl

- **Termination of the study:** When study procedures and data analyses are fully complete, please inform the SLESRC that you are terminating the study and submit a brief report covering the protocol activities. Individual identifying information should be destroyed unless there is sufficient justification to retain, approved by the SLESRC. All findings should be based on de-identified aggregate data and all published results in aggregate or group form.

Professor Hector G. Morgan
Chair

APPENDIX II

INFORMED CONSENT (ENGLISH & KRIO)

I am a medical doctor from the Centre for Child and Adolescent Mental Health, University of Ibadan, Nigeria & the Ministry of Health, Sierra Leone. I am a conducting a study on the growth and development of children aged less than five years in the Kroo Bay Community, Freetown. I want to identify ways in which the health of children can be improved and health problems prevented. I also want to find out about your health as the child's mother because the growth and development of children is closely linked to the health of their mothers.

The study involves a single interview with you, a physical examination of your child and weight and height measurements of you and your child. Your participation in the study is voluntary and you are free to withdraw from the study at any time. Children identified with health problems will be appropriately referred. Your withdrawal from the study does not prevent your child from receiving this service.

The data from this study is strictly confidential and will be managed by the Centre for Child and Adolescent Mental Health. In addition, a report from the study will be submitted to the Ministry of Health and Sanitation in Sierra Leone so that they can adequately plan for the health needs of young children in your community. You are not at any risk if you agree to participate in the study. Some of the questions are personal but accurate answers are encouraged as much as possible. Please feel free to seek further clarification from me.

If you agree to participate in the study described above, please sign or thumb print below.

Thank you very much.

Mi na wɛl bɔdi dɔkta we kɔmɔt na d Sɛnta fɔ Pikin ɛn Yɔŋ Pɔsin Wɛl bɔdi ɛn Maynd na d Yunivasiti ɔf Ibadɔn, Nayjiriya ɛn d Ministri fɔ Wɛlbɔdi biznɛs na Salone. A d do wan stɔdi bɔt pikin dɛn gro ɛn divɛlɔp wan, ɛn na fɔ dɛn pikin we nɔ fayv iya yet na dis Kru Be Kɔmuniti insay Fritɔŋ. A wan fɔ fɛnɔt we dɛm aw pikin dɛn wɛlboɔdi biznɛs go bɛtɛ ɛn aw fɔ ɛp dɛm nɔ fɔ d sik sik. A ɔlso wan fɔ fɛnɔt bɔt u d mami in wɛlbɔdi bicɔz pikin in gro ɛn divɛlɔp wan gɛt fɔ do wit d mami in wɛlbɔdi.

Pan dis stɔdi ya a go gɛt fɔ aks u sɔm kwɛshɔn dɛm, a go luk u pikin, chɛk di pikin in wet ɛn hayt ɛn u sɛf yon wet ɛn hayt. A nɔ d fos u fɔ de pan d stɔdi ɛn u kin fil fri fɔ lɛf ɛni tɛm. Pikin dɛm we a fɛnɔt se gɛt ɛni wɛlbɔdi prɔblɛm we pas di Wɛlbɔdi Sɛnta na ya a go sɛn am go na d rayt ples. If u se u nɔ d mix pan d stɔdi u pikin go stil gɛt dis savis ya if I nid am.

D wɔd we a go pul pan dis stɔdi d go to d Sɛnta fɔ Pikin ɛn Yɔŋ Posin Wɛl bɔdi ɛn Maynd we go tek kiya ɔf am. Dɛn bak, a go rayt ripɔt we a go sɛn to d Ministri for Wɛlbɔdi biznɛs na Salone ya so dɛn go yuz am fɔ plan fayn d wɛlbɔdi biznɛs fɔ dɛn pikin na dis kɔmuniti ya. Natin bad nɔ gɛt fɔ apin to u if u gri fɔ jɔyn. Sɔm pan d kwɛshɔn dɛm na posin to posin tɔk bɔt a d beg mek u gi mi d tru ansa dɛm to d bɛst we we u ebul. U kin fil fri fɔ aks mi fɔ kliya ɛni tin wit u.

If u d gri fɔ jɔyn pan d stɔdi we a dɔn tɛl u bɔt so duya sayn ɔ tɔmbprint dɔŋ ya.

Tɛnki ya.

------- I agree to the interview, physical examination of my child and the weight and height measurements of me and my child (A gri fɔ mek u aks me kwɛshɔn, luk mi pikin ɛn do mi wet ɛn hayt).

_____

Signature/ Thumb print of Mother & date

_____

Signature of Investigator & date

APPENDIX III

Serial Number: __ __ __ __

Today's Date: __ __/__ __/__ __

ADAPTED SOCIO-DEMOGRAPHIC QUESTIONNAIRE (ENGLISH & KRIO)

Please write the answers to the questions or draw a circle where it applies to you. This is not an examination it is only to find out about you, your health and that of your child.

Duya rayt d ansa dɛm to dɛn kwɛshɔn ya ɔ sakul usay u fɔ sakul. Dis nɔ to ɛxam. Na fɔ fɛnɔt bɔt u, u pikin ɛn una wɛl bɔdi wan.

SECTION I

Personal Information

1. How old are you? (1. ɔmɔs iya u ol?) _____

2. Where do you live? (Address of present abode):

2. Usay u tap? (d adrɛs usay u lib naw):

3. Do you practise any religion? No Yes:

3. U de biliv pan ɛni tin? Nɔ Yɛs:

4. Please write down the exact place you attend for worship

4. Duya rayt dɔŋ d ples gbɛt we u d wɔship

_____

(a) Islam (b) Orthodox Christian (c) Pentecostal Christian (d) Traditional religion

(e) Other

Family Information

5. Marital status.

5. U na mared uman?

(a) Single (b) Married (c) Separated/divorced (d) Co habiting

(a) A nɔ mared (b) Mi na mared uman (c) Mi ɛn mi man dɔn skata (d) Wi jɛs d lib na os

6. If married, type of marriage:

6. If u na mared uman, na us kayn mared u gɛt?:

(a) Monogamous (b) Polygamous

(a) Na u wan to u man (b) U man gɛt oda wɛf

7. If polygamous, how many other wives?

7. If nɔ to u wan, ɔmɔs ɔda wɛf dɛm i gɛt? _____

8. What is your level of satisfaction with your marriage or relationship?

8. Aw pliz u bi wit dis mared ya?

(a) Not satisfied (b) Fairly satisfied (c) Very satisfied

(a) A nɔ pliz at ɔl (b) A pliz smɔl (c) A pliz bad

9. What is the level of social support you receive from your husband/partner/family?

9. Wetin u go se bɔt aw u man ɛn famili d bato u?

(a) Poor (b) Fair (c) Good social support

(a) Dɛn nɔ d bato (b) I bɛtɛ smɔl (c) Dɛn d bato gud wan

10. Where does your husband/partner live? (Address of present abode)

10. Usay u man tap? (d adrɛs usay u man lib naw)

11. Level of education of the father?

11. Aw fa d pikin in papa rich pan buk biznɛs?

(a) No Formal Education (b) Koranic School (c) Primary School (d) Secondary School

(a) I nɔ go skul at ɔl (b) I go ali wala (c) I tap praymari (d) I tap sɛkɔndari

(e) Post Secondary (Non-University) (f) University Degree and above (e) I do not know

(e) I pas sɛkɔndari (bɔt nɔ to yunivasiti) (f) I gɛt pas yunivasiti digri (e) a nɔ no

12. Occupation of father: [Write the exact occupation] _____/ I do not know

12. Us wok in papa d do: [Tɛl mi d ɛxact wan] _____/A nɔ no

13. Level of mother's education?

13. Aw fa u rich pan buk biznɛs?

(a) No Formal Education (b) Koranic School (c) Primary School (d) Secondary School

(a) A nɔ go skul at ɔl (b) A go ali wala (c) I tap praymari (d) I tap sɛkɔndari

(e) Post Secondary (Non-University) (f) University Degree and above (e) I do not know

(e) A pas sɛkɔndari (bɔt nɔ to yunivasiti) (f) A gɛt pas yunivasiti digri (e) a nɔ no

14. Occupation of Mother: [Write in the exact occupation] _____/ I do not know

14. Us wok u d do: [Tel mi d exact wan] _____/ A nɔ no

15. Who is responsible for the financial support of your child?

15. Udat d pul kɔpɔ fɔ mɛn dis pikin? _____

16. What is the occupation of the individual mentioned in 15? (If different from parents)

16. Us wok d pɔsin we u jɛs tɔk bɔt na nɔmba 15 d do? (if nɔto u ɔ d dadi) _____

17. Does this individual support the entire household? No Yes

17. Na dis pɔsin ya d pul kɔpɔ fɔ d wan o los? Nɔ Yɛs

18. If yes, how many people are in the household?

18. If yɛs, ɔmɔs pipul d it frɔm d sem pɔt? _____

19. If no, how many people does he support?

19. If na nɔ, ɔmɔs pipul i d pul kɔpɔ fɔ? _____

Obstetric Questions

20. How many children do you have?

20. ɔmɔs pikin u gɛt? _____

21. Are all your children alive?

21. U ol ɔl u pikin dɛm? _____

22. Was this child's pregnancy planned? No Yes

22. U bin want dis pikin in bele? Nɔ Yɛs

23. Did you get antenatal care for this child? No Yes

23. U bin d go ɔspitul we u gɛt dis pikin in bɛlɛ? Nɔ Yɛs

24. Were you admitted in the hospital during this child's pregnancy? No Yes

24. U bin eva admit na ospitul we u bin get dis pikin in bele? Nɔ Yɛs

25. What was the gestational age at delivery?

25. ɔmɔs mɔnt d bɛlɛ we u put to bɛd? _____

26. Place of delivery

26. Usay u bin bɔn am?

(a) home (b) Traditional Birth Attendant (c) Health Centre (d) Hospital

(a) Os (b) TBA (c) ɛlt Cɛnta (d) ɔspitul

27. Mode of Delivery

27. Aw u bɔn am?

(a) Spontaneous vaginal delivery (b) Assisted vaginal delivery (c) Caeserean Section

28. Time interval between the last confinement and index child's delivery

28. ɔmɔs tɛm de bitwin d las bɛlɛ ɛn dis pikin in yon? _____

Child Related Questions

29. What is the age of your child?

29. ɔmɔs iya u pikin ol? _____ (months/years)

30. Sex of the child. Male Female

30. Na us kayn pikin? Bɔbɔ Titi

31. Birth weight

31. ɔmɔs i bin we we u bɔn am? _____

32. Length of stay in the hospital/place of delivery?

32. Aw lɔŋ i bin de na ɔspitul fɔ afta u bɔn am? _____

33. Is the child breastfeeding? No Yes

33. I stil d sɔk bɔbi? Nɔ Yɛs

34. If No, How long did he/she breastfeed for?

34. Fɔ aw lɔŋ i sɔk fɔ if i dɔn lɛf bɔbi? _____

35. Any persistent vomiting in the last 6 months? No Yes

35. I dɔn ɛva vɔmit fɔ lɔŋ tɛm insay d las 6 mont? Nɔ Yɛs

36. If yes, how many episodes

36. If na yɛs, ɔmɔs tɛm i apin? _____

37. Any episodes of diarrhoea in the last 6 months? No Yes

37. I bin ɛva gɛt run bɛlɛ insay d las 6 mont? Nɔ Yɛs

38. If yes, how many episodes

38. If na yɛs, ɔmɔs tɛm i apin? _____

39. Any episodes of febrile illness in the last 6 months? No Yes

39. I bin ɛva dɔn sik wit wam bɔdi insay d las 6 mont? Nɔ Yɛs

40. If yes, how many episodes?

40. If na yɛs, ɔmɔs tɛm i apin? _____

41. Any episodes of Acute Respiratory Infection in the last 6 months? No Yes

41. I dɔn ɛva sik wit kɔf ɛn kol insay d las 6 mont? Nɔ Yɛs

42. If yes, how many times?

42. If na yɛs, ɔmɔs tɛm i apin? _____

43. How many hospital presentations in the last 6 months?

43. ɔmɔs tɛm u dɔn kɛr am go ɔspitul insay d las 6 mont? _____

44. What was/were the reason(s) for the hospital presentation?

44. Wetin mek u bin kɛr am go ɔspitul? _____

45. Is the child immunised for age? (ask for record) No Yes

45. Dis pikin dɔn tek ɔl in maklet dɛm? (we in kad) Nɔ Yɛs

46. What do you consider to be normal behaviour in a child? Explain

46. Wetin u tink se na nɔmal bievyɔ pan pikin? Tɛl mi ba

_____

_____

47. Do you have concerns about your child's behaviour (e.g eating, sleeping, play)? If yes, explain.

No Yes

47. U tink se ɛnitin nɔ rayt bɔt d we u pikin d kɛri ɔn (in it biznɛs, slip, ple)? If na yɛs, tɛl mi bɔt am.

Nɔ Yɛs

_____

_____

48. Do you have concerns about your child's vision? If yes explain. No Yes

48. ɛnitin d mɔna u bɔt u pikin in si wan? If na yɛs, tɛl mi bɔt am. Nɔ Yɛs

_____

_____

49. Do you have concerns about your child's hearing? If yes, explain. No Yes

49. ɛnitin d mɔna u bɔt d we u pikin d yɛri? If na yɛs, tɛl mi bɔt am. Nɔ Yɛs

_____

_____

50. Do you have any concerns about your child's growth and development? If yes, explain. No Yes

50. ɛnitin d mɔna u bɔt aw u pikin d gro ɛn machɔ? If na yɛs, tɛl mi bɔt am Nɔ Yɛs

_____

_____

51. Does anything about your child worry you? If yes, explain. No Yes

51. ɛnitin ɔltogɛda d mɔna u bɔt u pikin? If na yɛs, tɛl mi bɔt am. Nɔ Yɛs

_____

_____

SECTION II

Nutritional Assessment of the child

(a) Length/ height (cm) _____
(b) Weight (Kg) _____
(c) Physical examination: (circle that which applies)

	No	**Yes**
1. **General appearance**		
Miserable and apathetic	√	√
Anxious	√	√
Normal	√	√
Other; specify _____		
2. Hair		
Thin and sparse	√	√
Straightened	√	√
Dyspigmented	√	√
Normal	√	√
3. Face		
Puffy	√	√
Old man's face	√	√
Normal	√	√
4. Skin		
Dry	√	√
Hyperpigmented	√	√
Flaking	√	√
Hypopigmentation	√	√
Wrinkled	√	√
Skin ulcers	√	√
Normal	√	√
5. Musculoskeletal		
Muscle wasting	√	√
Persistent open fontanelle	√	√
Loss of subcutaneous fat	√	√
Normal	√	√
6. Abdomen		
Distended	√	√
Normal	√	√

7. Oedema

Present: grade 1, grade 2, grade 3, grade 4; Absent

SECTION III

BMI Assessment of the mother

(a) Weight (Kg) _____
(b) Height (cm) _____

APPENDIX IV

THE TEN QUESTIONS SCREEN FOR CHILDHOOD DISABILITY (ages 2-9 years)

Circle One Response For Each Question
Sakul d wan kɔrɛkt ansa fɔ dɛn kwɛshɔn ya

1.	Compared with other children, did the child have any serious delay in sitting, standing or walking?	NO	YES*
	We u luk u pikin wit ɔda pikin dɛm I bin te pasmak fɔ sidɔm, tinap ɔ waka?	Nɔ	Yɛs*
2.	Compared with other children does the child have difficulty seeing, either in the daytime or at night?	NO	YES*
	We u luk u pin wit ɔda pikin dɛm u pikin bin gɛt ɛni prɔblɛm fɔ si de tɛm ɔ na nɛt ?	Nɔ	Yɛs*
3.	Does the child appear to have difficulty hearing?	NO	YES*
	U pikin d gɛt ɛni prɔblɛm fɔ yɛri?	Nɔ	Yɛs*
4.	When you tell the child to do something, does he/she seem to understand what you are saying?	NO*	YES
	We u tɛl u pikin fɔ do somtin, I kin tan lɛk I d ɔndastand wetin u se?	Nɔ*	Yɛs
5.	Does the child have difficulty in walking or moving his/her arms or does he/she have weakness and/or stiffness in the arms or legs?	NO	YES*
	u pikin d gɛt prɔblɛm fɔ waka ɔ fɔ muf in an dɛm, ɔ ɛni wan pan in an ɔ fut day ɔ stif?	Nɔ	Yɛs*
6.	Does the child sometimes have fits, become rigid, or lose consciousness?	NO	YES*
	Som tɛm de u pikin kin gɛt kɔnvɔlshɔn ɔ I kin stif ɔ go ɔf?	Nɔ	Yɛs*
7.	Does the child learn to do things like other children his/her age?	NO*	YES
	U pikin d lan fɔ do tin dɛm lɛk ɔda pikin dɛm we dɛn na sem ej?	Nɔ*	Yɛs
8.	Does the child speak at all (can he/she make himself/herself understood in words; can he/she say any recognizable words)?	NO	YES*
	u pikin d tɔk at ɔl (I kin tɔk fɔ lɛ u ɔndastand am ɔ I d tɔk ɛni wɔd we u kin kech ɔp)?	Nɔ	Yɛs*
9.	**For 3 to 9 year-olds ask:** Is the child's speech in any way different from normal (not clear enough to be understood by people other than his/her immediate family)?	NO	YES*
	d we we u pikin d tɔk nɔ fiba nɔmal (I nɔ kliya we ɔda pipul we nɔto una de na os go ɔndastand am)?	Nɔ	Yɛs*
	For 2 year-olds ask: Can he/she name at least one object (for example, an animal, a toy, a cup, a spoon)?	NO*	YES
	I ebul kɔl lɛk wan tin so (lɛ wi se wan animal, wan tɔy, kɔp ɔ spun)?	Nɔ*	Yɛs
10.	Compared with other children of his/her age, does the child appear in any way mentally backward, dull or slow?	NO	YES*
	We u kɔpiya u pikin wit ɔda pikin dɛm ɔf d sem ej, I luk dɔl ɔ slo?	Nɔ	Yɛs*

* Screening result is positive if any one or more of the responses with an asterisk (*) is circled.

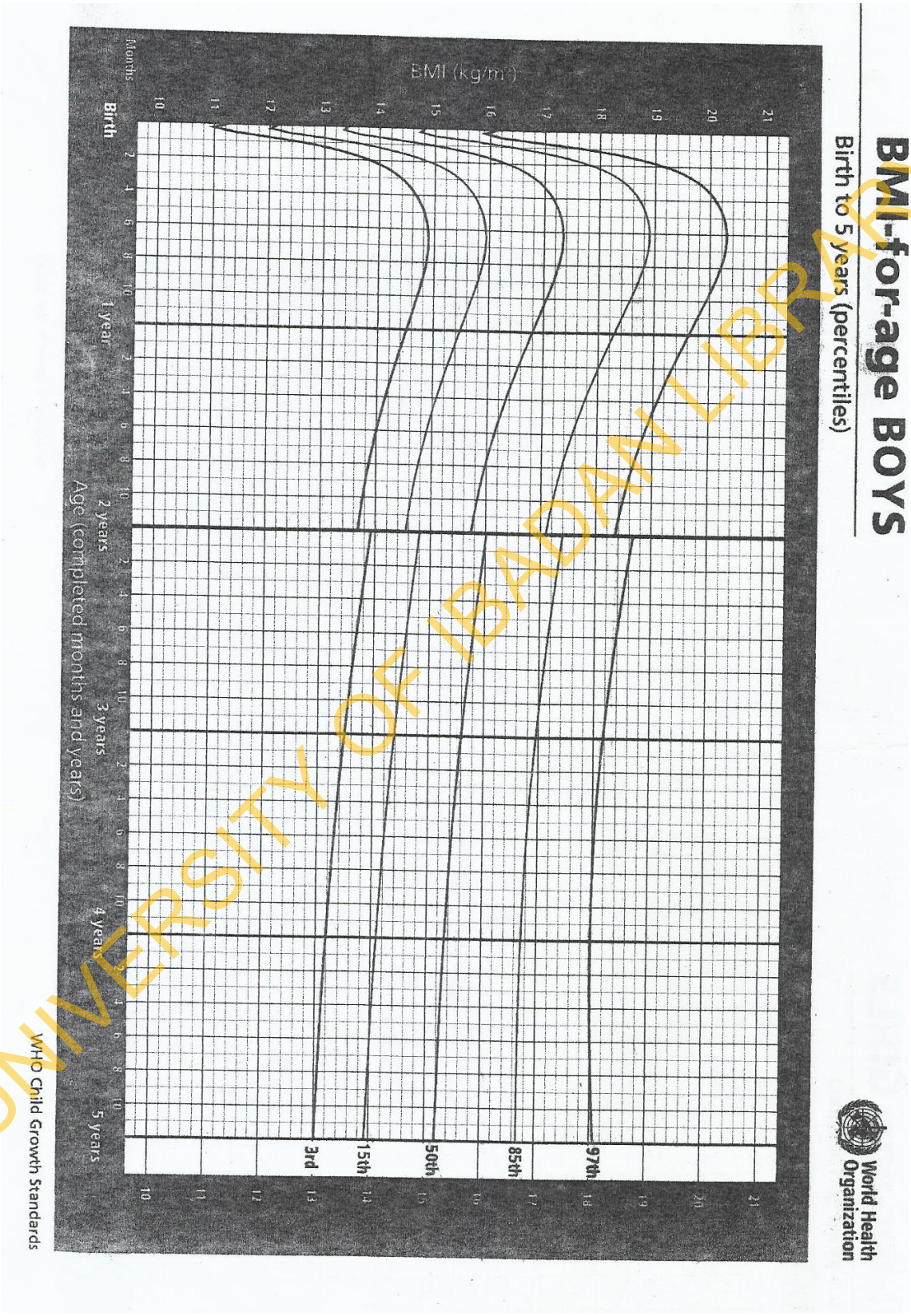
APPENDIX V

WHO/NCHS normalized reference weight-for-length (49–84 cm) and Weight-for-height (85–110 cm), by sex

Boys' weight (kg)							Girls' weight (kg)				
-4SD 60%	-3SD 70%	-2SD 80%	-1SD 90%	Median	Length (cm)	Median	-1SD 90%	-2SD 80%	-3SD 70%	-4SD 60%
1.8	2.1	2.5	2.8	3.1	**49**	3.3	2.9	2.6	2.2	1.8
1.8	2.2	2.5	2.9	3.3	**50**	3.4	3	2.6	2.3	1.9
1.8	2.2	2.6	3.1	3.5	**51**	3.5	3.1	2.7	2.3	1.9
1.9	2.3	2.8	3.2	3.7	**52**	3.7	3.3	2.8	2.4	2
1.9	2.4	2.9	3.4	3.9	**53**	3.9	3.4	3	2.5	2.1
2	2.6	3.1	3.6	4.1	**54**	4.1	3.6	3.1	2.7	2.2
2.2	2.7	3.3	3.8	4.3	**55**	4.3	3.8	3.3	2.8	2.3
2.3	2.9	3.5	4	4.6	**56**	4.5	4	3.5	3	2.4
2.5	3.1	3.7	4.3	4.8	**57**	4.8	4.2	3.7	3.1	2.6
2.7	3.3	3.9	4.5	5.1	**58**	5	4.4	3.9	3.3	2.7
2.9	3.5	4.1	4.8	5.4	**59**	5.3	4.7	4.1	3.5	2.9
3.1	3.7	4.4	5	5.7	**60**	5.5	4.9	4.3	3.7	3.1
3.3	4	4.6	5.3	5.9	**61**	5.8	5.2	4.6	3.9	3.3
3.5	4.2	4.9	5.6	6.2	**62**	6.1	5.4	4.8	4.1	3.5
3.8	4.5	5.2	5.8	6.5	**63**	6.4	5.7	5	4.4	3.7
4	4.7	5.4	6.1	6.8	**64**	6.7	6	5.3	4.6	3.9
4.3	5	5.7	6.4	7.1	**65**	7	6.3	5.5	4.8	4.1
4.5	5.3	6	6.7	7.4	**66**	7.3	6.5	5.8	5.1	4.3
4.8	5.5	6.2	7	7.7	**67**	7.5	6.8	6	5.3	4.5
5.1	5.8	6.5	7.3	8	**68**	7.8	7.1	6.3	5.5	4.8
5.3	6	6.8	7.5	8.3	**69**	8.1	7.3	6.5	5.8	5
5.5	6.3	7	7.8	8.5	**70**	8.4	7.6	6.8	6	5.2
5.8	6.5	7.3	8.1	8.8	**71**	8.6	7.8	7	6.2	5.4
6	6.8	7.5	8.3	9.1	**72**	8.9	8.1	7.2	6.4	5.6
6.2	7	7.8	8.6	9.3	**73**	9.1	8.3	7.5	6.6	5.8
6.4	7.2	8	8.8	9.6	**74**	9.4	8.5	7.7	6.8	6
6.6	7.4	8.2	9	9.8	**75**	9.6	8.7	7.9	7	6.2
6.8	7.6	8.4	9.2	10	**76**	9.8	8.9	8.1	7.2	6.4
7	7.8	8.6	9.4	10.3	**77**	10	9.1	8.3	7.4	6.6
7.1	8	8.8	9.7	10.5	**78**	10.2	9.3	8.5	7.6	6.7
7.3	8.2	9	9.9	10.7	**79**	10.4	9.5	8.7	7.8	6.9
7.5	8.3	9.2	10.1	10.9	**80**	10.6	9.7	8.8	8	7.1

Boys' weight (kg)						Girls' weight (kg)				
-4SD 60%	-3SD 70%	-2SD 80%	-1SD 90%	Median	Length (cm)	Median	-1SD 90%	-2SD 80%	-3SD 70%	-4SD 60%
7.6	8.5	9.4	10.2	11.1	**81**	10.8	9.9	9	8.1	7.2
7.8	8.7	9.6	10.4	11.3	**82**	11	10.1	9.2	8.3	7.4
7.9	8.8	9.7	10.6	11.5	**83**	11.2	10.3	9.4	8.5	7.6
8.1	9	9.9	10.8	11.7	**84**	11.4	10.5	9.6	8.7	7.7
7.8	8.9	9.9	11	12.1	**85**	11.8	10.8	9.7	8.6	7.6
7.9	9	10.1	11.2	12.3	**86**	12	11	9.9	8.8	7.7
8.1	9.2	10.3	11.5	12.6	**87**	12.3	11.2	10.1	9	7.9
8.3	9.4	10.5	11.7	12.8	**88**	12.5	11.4	10.3	9.2	8.1
8.4	9.6	10.7	11.9	13	**89**	12.7	11.6	10.5	9.3	8.2
8.6	9.8	10.9	12.1	13.3	**90**	12.9	11.8	10.7	9.5	8.4
8.8	9.9	11.1	12.3	13.5	**91**	13.2	12	10.8	9.7	8.5
8.9	10.1	11.3	12.5	13.7	**92**	13.4	12.2	11	9.9	8.7
9.1	10.3	11.5	12.8	14	**93**	13.6	12.4	11.2	10	8.8
9.2	10.5	11.7	13	14.2	**94**	13.9	12.6	11.4	10.2	9
9.4	10.7	11.9	13.2	14.5	**95**	14.1	12.9	11.6	10.4	9.1
9.6	10.9	12.1	13.4	14.7	**96**	14.3	13.1	11.8	10.6	9.3
9.7	11	12.4	13.7	15	**97**	14.6	13.3	12	10.7	9.5
9.9	11.2	12.6	13.9	15.2	**98**	14.9	13.5	12.2	10.9	9.6
10.1	11.4	12.8	14.1	15.5	**99**	15.1	13.8	12.4	11.1	9.8
10.3	11.6	13	14.4	15.7	**100**	15.4	14	12.7	11.3	9.9
10.4	11.8	13.2	14.6	16	**101**	15.6	14.3	12.9	11.5	10.1
10.6	12	13.4	14.9	16.3	**102**	15.9	14.5	13.1	11.7	10.3
10.8	12.2	13.7	15.1	16.6	**103**	16.2	14.7	13.3	11.9	10.5
11	12.4	13.9	15.4	16.9	**104**	16.5	15	13.5	12.1	10.6
11.2	12.7	14.2	15.6	17.1	**105**	16.7	15.3	13.8	12.3	10.8
11.4	12.9	14.4	15.9	17.4	**106**	17	15.5	14	12.5	11
11.6	13.1	14.7	16.2	17.7	**107**	17.3	15.8	14.3	12.7	11.2
11.8	13.4	14.9	16.5	18	**108**	17.6	16.1	14.5	13	11.4
12	13.6	15.2	16.8	18.3	**109**	17.9	16.4	14.8	13.2	11.6
12.2	13.8	15.4	17.1	18.7	**110**	18.2	16.6	15	13.4	11.9

APPENDIX VI



APPENDIX VII

SCREENING SECTION (SC)

Serial No: _ _ _ _

Today's date: _ _ / _ _ / _ _

	YES (1)	NO (5)	DK (8)	RF (9)
1) Have you ever in your life had a period lasting several days or longer when most of the day you felt unhappy, empty or depressed? U dɔn ɛva de na u layf we boku de dɛm u nor kin gladi, u kin fil lɛk natin nɔ de pan u ɔ u kin fil lo?	1	5	8	9
2) Have you ever had a period lasting several days or longer When most of the day you were very discouraged about how things were going in your life? U dɔn ɛva de we boku de dɛm ɛn most ɔf d de u kin fil vɛri bad bɔt aw tin de bi to u?	1	5	8	9
3) Have you ever had a period lasting several days or longer When you lost interest in most things you usually enjoy like work, hobbies, and personal relationships? U dɔn ɛva de we boku de dɛm u nɔ kin fil fɔ wok ɔ do d tin dɛm we u lɛk ɔ aw u d rɔb bɔdi wit pipul?	1	5	8	9