PREVALENCE AND IMPLICATIONS OF OVERWEIGHT AND OBESITY IN CHILDREN'S HEALTH AND LEARNING BEHAVIOUR

The Case of Kinondoni and Njombe Districts in Tanzania

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By

Ayoub Cherd Kafyulilo

A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Arts (Education) of the University of Dar es salaam

University of Dar es salaam
September 2008

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the University of Dar es Salaam a dissertation entitled: ***Prevalence and Implications of Overweight and Obesity in Children's health and Learning Behaviour,*** in fulfillment of the requirements for the degree of Masters of Arts (Education) of the University of Dar es Salaam

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DECLARATION

AND

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I, **Ayoub Cherd Kafyulilo,** declare that this dissertation is my own original work and that it has not been presented and will never be presented to any other University for a similar or any other degree award.

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DEDICATION

This work is dedicated to my beloved parents

ABSTRACT

The purpose of this study was to investigate the extent to which overweight and obesity are challenges among primary school children in Kinondoni and Njombe districts. The study sought to investigate those aspects in terms of prevalence, causes and impacts on social, health as well as children learning behaviours and outcomes.

Systematic random sampling was used to select schools while stratified sampling and simple random sampling were used in selecting pupils and teachers. Measurement of weights and height were done to determine Body Mass Index (BMI), measurements of skinfolds were also done to determine body fat percentage. Questionnaires, semi-structured interview schedule and focus group discussion guides were also used.

Findings revealed an average of 13.5% children, were overweight and obese. Economy status, household occupations, nutrition and inactivity were significant causes of overweight and obesity. Hypertension, excessive sweating, teasing and peer rejection were common to obese children. In addition, overweight and obese children were reported to underperform in academic and physical activities.

The study revealed that overweight and obesity were not friendly healthy conditions to children, thus a need to work it out. The study suggests for establishment of education programs through mass Medias, to raise people's awareness on implications of obesity in children's health, social, and learning behaviours and outcomes.

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LIST OF ABBREVIATION

AIDS – Acquired Immunodeficiency Syndrome

BMI – Body Mass Index

HIV – Human Immunodeficiency Virus

IQ – Intelligence Quotient

mmHg – Millimetre of Mercury

REE – Resting Energy Expenditure

RP – Rural pupils

RS – Rural School

RT – Rural Teacher

SPSS – Statistical Package for Social Science

TEE – Total Energy Expenditure

TV – Television

US – Urban Schoool

UP – Urban Pupils

UT – Urban Teacher

WHO - World Health Organization

X^2 - Chi-square

$ - Dollars

CHAPTER ONE

INTRODUCTION

This chapter introduces a study of overweight and obesity among primary school children in Kinondoni and Njombe districts in Tanzania. It comprises the background and context of the study, statement of the problem, objectives and significance of the study. It also covers the research hypothesis, delimitations and limitation of the study and finally the definition of key terms.

1.0 Background and Context of the Study

Overweight and obesity are considered a multivariate syndrome which can negatively affect the whole body functioning (WHO, 2005). They were previously common in highly developed countries, but in recent years a progressive increase is noticeable in developing countries including Tanzania (Villamor, Urassa, Petraro, Hunter & Fawzi, 2004). They were also considered health conditions for adults; currently they are highly prevalent among children and adolescents (Wang, 2004).

The present children's morphological appearance in Tanzania entails reduced fitness and increased fatness, a condition which might be resulting from long term adiposity (Kafyulilo, 2006). The increase in fatness among children that was observed by the author during his first study on overweight and obesity was the primary motivation for undertaking another study in this field. In the first study, an immense adiposity among urban children was noticed (Kafyulilo, 2006).

Gavin (2005) and Wang (2004) report that the prevalence of overweight and obesity is increasing among school children worldwide. They further argue that, high percentage of the world's population is overweight and obese, with USA having 50%, Australia 37%, Western Europe 30% and India 17%. Such an increase in overweight and obesity levels is associated with an increased risk of developing cancer, cardiovascular diseases, non-insulin-dependent diabetes, severe articular dysfunctions, and hypertensions worldwide (WHO, 2005).

Developing countries also experience the problem of overweight and obesity. Puoane, Steyn, Lambert & Mbananga (2002) reported that approximately 40% of South African population was overweight and obese. On the other hand, Sobngwi, Mbanya, Unwin & Albert (2002) observed that 22% of the urban population and 1.8% of rural population in Cameroon were overweight and obese.

Tanzania is also at a great risk of overweight and obesity for both adults and children. Kigwangallah (2005) and WHO (2006) stress that, impacts resulting from overweight and obesity in Tanzania are on an increase. Prevalence amongst adults and children is increasing at an alarming rate (Kisembo, 2006). WHO (2005) projects that this prevalence will increase at the rate of 3% by 2015. Besides, technological advancement and consumption of modern foods are sought to mitigate this trend from increasing arithmetically to increasing geometrically (WHO, 2005). Technological

advancement limits children's opportunity to participate in sports and physical activities as many of them got done by machines (Mood, Musker & Rink, 1995).

At present children are changing the nature of their leisure activities, from actively participating in sports to electronically played games that they play while seated (Gavin, 2005). Ekblom (2005) and Gavin (2005) asserts that at present, more than ever, life is sedentary, whereby children spend more time playing with electronic devices, in computers and handheld video games, than actively participating in physical activities.

Since 2001, the Tanzanian government abolished competitive sports and physical education in schools (Bulamile, 2002). At the same time, many of the urban schools have neither a plot for cultivation nor a play ground for sports activities. This makes urban children to have limited opportunity for sports and becoming more vulnerable to overweight and obesity than their counterparts in rural areas who engage in farming and other physical activities after school hours.

Participation in physical activities and sports has a lot to do with children's life. It is considered important in enhancement of physical fitness and good health as well as development of good mind. The ancient Greeks believed that a sound mind existed in a health body as it was previously stated by Plato that "*mens sana en corpore sano*" (cited in Rowland, 1990). According to Mabagala (2002), sports and physical activities have a potential role in the development of good body health and fitness. It

is also potential in developing good mind and thus improving academic performance among school children (Mabagala, 2002). Mood *et al.* (1995) argued that in order to provide and maintain optimum health, it was necessary for people of all ages to participate in physical exercises such as walking, jogging, swimming and cycling.

1.2 Statement of the Problem

Overweight and obesity entail health risks with potential effects in social and economic wellbeing of an individual and community at large. Poor health condition resulting from overweight and obesity may act as a barrier to the development of good mind and thus pave the way for poor learning behaviour and outcomes.

Despite the fact that overweight and obesity are identified as a serious health and social problem with economic and academic impacts all over the world, studies on their prevalence amongst primary school children in rural and urban settings are quite limited in Tanzania. Thus, it has not been easy to establish statistics on causes, social problems and health implications as well as implication of overweight and obesity in children's learning behaviour and outcomes in the classroom.

Therefore, this study sought to identify the prevalence of overweight and obesity by identifying the causes, social complications and health implications as well as academic implications among primary school children in rural and urban settings in Tanzania.

1.3 Purpose of the Study

The purpose of this study was to investigate the extent to which overweight and obesity pose challenges among primary school children in Kinondoni and Njombe districts (urban and rural settings respectively) in Tanzania. That was deemed possible by observing prevalence, causes and impacts on children's social, health and learning behaviours including outcomes.

1.4 Objectives of the Study

Specific objectives of this study were the following:

i. To determine the difference in prevalence of overweight and obesity among primary school children between urban and rural settings;
ii. To identify lifestyles which cause overweight and obesity among primary school children in urban as well as rural settings;
iii. To assess health and social problems that overweight as well as obesity conditions impact upon primary school children; and
iv. To determine impacts of overweight and obesity on children's learning behaviours and outcomes.

1.5 Research Hypothesis

This study had to test the following hypotheses:

i. There is no significant difference in prevalence of overweight and obesity between urban and rural primary school children.

ii. Overweight and obesity have no significant relationship with primary school children's lifestyles.

iii. Overweight and obesity have no significant implication on health and social wellbeing of the primary school children

iv. Overweight and obesity have no significant implications for children's learning behaviours and outcomes.

1.6 Significance of the Study

This study sought to establish the status of overweight and obesity among urban as well as rural school children in Kinondoni and Njomnbe districts. Findings from this study would be helpful in raising awareness among teachers, parents and other stakeholders in education, health and sports context about the impacts that overweight and obesity have to the children's health, social and academic welfare.

The study findings would enhance teachers and parents' plan on effective use of leisure time at schools and homes by putting great emphasis on sports as well as physical activities. In due regards, children would be able to expend extra energy that could otherwise be stored in their bodies and cause overweight as well as obesity.

The study also aimed at providing information that can be useful in developing ways to avoid heart diseases, diabetes, blood pressure and respiratory disorders that are derivatives of overweight and obesity. In another vein, control of problems resulting

from overweight and obesity will be a way forward to reduce absenteeism in offices and schools (Sharkey, 1997).

The study could facilitate social relationships between obese and non-obese school children who would otherwise experience social rejection and bullying from peers as well as teachers. Bullying and teasing of obese children undermine children's potentials in academic and social well being. Thus understanding causes of overweight and obesity will make preventive measures easier and hence help in minimizing the extent of teasing and bullying behaviours at schools.

1.7 Delimitations and Limitations of the Study

This study was delimited to investigation of prevalence, causes as well as health, social, and academic implications of overweight and obesity among primary school children, aged 7 to 14 years, from Kinondoni and Njombe districts. This study may lack relevance to represent some country-patterns, because there are many social classes and geographical locations that were not represented. However, for a centralized education system and life patterns of the Tanzanians, results may be feasible for generalization.

On the other hand, the study faced impediments caused by the highly limited studies on overweight and obesity among school children in Tanzania and developing countries. Many of the studies on overweight and obesity were for adults. This required the researcher to use the electronically available resources to supplement the

information obtained from the few books and journals. Also there were no established norms for African children's Body Mass Index (BMI) and body fat percentages. Thus, the researcher was forced to use norms established for American and Australian children. Again, during measurements for skinfolds to determine body fat percentage, the researcher was required to use the vernier calipers instead of a skinfold calipers, after efforts to look for an appropriate skinfold measure, were not successful.

1.8 Definition of Key Terms and Concepts

Overweight is a possession of extra weight that is unproportional to the height and age. It is the body weight falling above the range associated with minimum mortality (Sharkey, 1997).

Obesity refers to much higher body fat percentages than that considered normal for age and sex. It can also be termed as the condition of having excess of non-essential body fat, Body Mass Index (BMI) above 30 (Sharkey, 1997).

Body mass index (BMI) refers to a measure of relative body weight that takes height into account and is correlated with direct measures of body fat (Sharkey, 1997)

Essential fat is fat in the body necessary for the normal body functioning (Insel and Roth, 2002).

Non-essential fat is percentage of total body weight that is composed of fat (Insel and Roth, 2002).

Hypertension refers to sustained abnormally high blood pressure (Insel and Roth, 2002).

Stroke is an impeded blood supply to the brain resulting in destruction of brain cells (Johnson, 2002).

Diabetes mellitus is a disease that causes a building of glucose in blood streams. It is associated with kidney failure, nerve damage, blood circulation problems and blindness (Ekblom, 2005).

Commorbidness refers to quality of being unhealthy and generally bad (Australian Institute of Health and Welfare, 2004).

Resting energy expenditure (REE) refers to energy expended for normal cellular and organ function during post absorptive resting conditions (Mazengo *et al*, 1997).

Urban refers to settlements with advanced infrastructures, industrialization and reliable on modernized resources.

Rural refers to settlements with dependence on natural resources, such as agriculture and forests and with a weak industrial, health and transport infrastructures.

1.9 Organization of the Study

This dissertation is composed of six chapters. Chapter one presents Background information; Statement of the Problem; Objectives of the Study; Delimitation as well as Limitation of the Study; and Definition of Key Terms and Concepts. Chapter Two is about Literature Review, while Chapter Three presents Research Methodology. Chapter Four presents Results. Chapter Five is about Discussion, while chapter six presents Summary of the Study, Conclusion and Recommendations.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter gives a brief account of theoretical and empirical reviews about overweight and obesity globally, regionally and nationally. It presents the theoretical concept of overweight and obesity as well as prevalence of overweight and obesity. Other parts covered are the causes of overweight and obesity, health and social implication of overweight and obesity, impacts of overweight and obesity in children learning behaviour and outcome, conceptual framework and knowledge gap.

2.1 Concept of Overweight and Obesity

The human body is divided into fat free mass and body fat (Insel and Roth, 2002). The fat free mass composed of all body's non-fat tissues such as bones, water, muscles, teeth and connective tissues (Insel and Roth, 2002). Body fat composes of essential and non-essential fats. Essential fats are crucial for normal body functioning such as provision of warmth, and carrying out metabolic activities. They make up 3% and 12% of the total body weight in men and women respectively (Insel and Roth, 2002). Non-essential fat exists within adipose tissues located below the skin and around major organs. Adiposity of non-essential fats results from a long-term energy surplus in the body where energy intake exceeds energy expenditure. Excess non-essential fat in the body is what causes overweight and obesity (Sharkey, 1997).

2.2 Prevalence of Overweight and Obesity

2.2.1 Global Trend of Overweight and Obesity

Prevalence of overweight and obesity is increasing at an alarming rate all over the world (WHO, 2006). It is estimated that by 2010 the number of overweight and obese children across European Union will be set to top 26 million 6.4 million of them being obese (International Obesity Taskforce, 1996). Number of Overweight and obese in Europe is rising by 1.3 million a year (Schokker, Visscher, VanBaak & Seidell, 2007).

In the ten years period from 1985 to 1995, in Australia, there was a high increase in the proportion of children who were either overweight but not obese, or obese (Magarey, Boulton & Daniel, 2001). Table 2.1 shows the percentage increase of overweight and obesity among Australian children in ten years period.

Table 2.1: Percentage increase of overweight and obesity among Australian children

Gender	Year	Overweight but not obese	Obese	Total overweight and obese
Boys	1985	9.3	1.4	10.7
	1995	15.3	4.7	20.0
Girls	1985	10.6	1.2	11.8
	1995	16	5.5	21.5

Source: Magarey *et al.* (2001)

From Table 2.1, there is 9.3% increase of overweight and obesity among boys, and 9.7% among girls. This means that there is 1% increase of overweight and obesity among Australian children each year.

The 1993 Hong Kong growth survey revealed a striking high prevalence of obesity in children and adolescents especially boys with peak before the growth spurt. It is reported that one out of five boys at 11 years old was obese (Kai-Ming, 1998). Besides, the number of obese children aged between 6 and 8 years was estimated to be above 14000 in Hong Kong (Kai-ming, 1998). At age 7 children had a mean testing serum total cholesterol level of 4.57mmol/l, which was found to be the second highest in the world at the same age (Kai-ming, 1998).

In USA, the proportion of population who are either obese or overweight has reached 50% (Wang, 2004). Gavin (2005) says that since 1970s, the percentage of overweight children and adolescents in USA has been more than doubled. 10% of 2 to 5 years old and more than 15% of 6 to 19 years old children are overweight. Accordingly, if the percentage of children who are overweight is combined with the percentage of those who are at risk, about one third ($^1/_3$) of children in USA are affected (Gavin, 2005).

2.2.2 Regional Trend of Overweight and Obesity

Developing countries especially African countries are clearly facing a double burden of diseases (Doak, 2001). This is due to increasing prevalence of overweight and obesity among adults and children simultaneously with high rates of deaths resulting from cardiovascular diseases. These concerns are combined with continued need to address the problem of poverty and infectious diseases such as HIV/AIDS in the continent (Doak, 2001). The situation is worse in South of Sahara, where there is a triple burdens, which are; the poverty related infectious diseases, violence related

injuries and increased lifestyle-related to non-communicable diseases such as diabetes, hypertension and heart problems which are all by-products of overweight and obesity (Doak, 2001).

A study of overweight and obesity in South Africa revealed prevalence of 29.2% among young and adult men, and 56.6% among young and adult women (Puoane *et al.,* 2002). In Cameroon obesity was negligible among rural population (0.5%) for men and (3.0%) for women but considerable in urban areas accounting to 22% (Sobngwi *et al.*, 2002).

2.2.3 National Trend of Overweight and Obesity

Prevalence of overweight and obesity in Tanzania rose steadily as well as progressively from 3.6% in 1995 to 9.1% in 2004 (Villamor *et al.,* 2004). Kafyulilo (2006) reported that over 30% children were overweight and obese in urban areas in Tanzania. WHO (2005) adds that, out of 571,000 deaths in Tanzania, in a year 2005, 107,000 were due to chronic diseases which are by-products of overweight and obesity. WHO estimates that, deaths from chronic diseases in Tanzania will rise by 33% and deaths from cancer will rise by 45% by 2025. Chronic diseases, heart diseases, artery diseases, diabetes, cirrhosis of liver, gall stones, digestive system diseases and cancer are among the indicators of overweight as well as obesity (Insel and Roth, 2002).

Prevalence of overweight and obesity differs between rural and urban Tanzania. A study by Kuga, Njelekela, Noguchi, Kanda, Yamori & Mtabaji (2002) showed that prevalence of hypertension and overweight was higher in urban areas of Tanzania than in rural areas. Plasma leptin concentration was also the highest in urban areas. Mendez, Monteiro & Popkin (2005) added that hypertension, diabetes, and cholesterol level were minor in rural Tanzania compared to most other populations. Table 2.1 shows prevalence of overweight in Dar es Salam (urban), Handeni (rural) and Monduli (rural).

Table 2.1: Prevalence of Overweight in Dar es Salaam (Urban), Handeni and Monduli (Rural) Tanzania

Study area	Male	Famale
Dar es salaam	44.7	60.6
Handeni	6.8	37.5
Monduli	3.4	24.1

Source: Kuga *et al.* (2002)

From Table 2.1, prevalence of overweight in Dar es Salaam is the highest compared to other parts where urbanization is still low. This is one indication that overweight and obesity is likely higher among urban population than rural population in Tanzania.

2.3 Causes of Overweight and Obesity among School Children

Various studies addressed different causes of overweight and obesity among both adults and children which are physical inactivity as well as nutrition. Other causes were such as medications, inheritances and socioeconomic factors (O'dea, 2003).

2.3.1 Inactivity and Dietary Behaviours

Pangrazi (1995) argued that majority of overweight and obesity among children occur as a consequence of inactivity and overeating. If a person consumes food comprising of more fat and carbohydrates than proteins and vitamins, he/she might become overweight or obese, especially when he/she expends little energy compared to what he/she consumes (Pangrazi, 1995; Wessel and Macintyre, 1997). Ka-iming (1998) stated that physical activities, such as walking, cooking, washing etc, should be encouraged at household level instead of using a machine in every action. Physical activities can help in cutting down the excess fat deposit in the body.

2.3.2 Metabolic Factors

Resting Energy Expenditure (REE) accounts for approximately 65%-75% of the Total Energy Expenditure (TEE). REE plays a major role in regulation of energy balance and body composition in humans. Low REE is a significant predictor for subsequent weight gain. Mazengo, Simell, Lukmanji, Shirima & karvetti (1997) argued that lower physical activity levels contributed to a lower REE in healthy individuals. If the amount of energy expended in tissue metabolism is lower than the total energy consumed, the body finds a new place to store excess energy (Rowland, 1990).

2.3.3 Genetic, Environmental and Medical Complications

Complex interactions between genes, environment and habits are other causes of overweight as well as obesity among children and adults (Newbold, 2004). Endocrine problems, genetic syndromes and medications are associated with excessive weight gain (Sharkey, 1997). It is hypothesized that *in utero* or newborn, exposure to chemicals such as endocrine disruptors (xenoestrogen bisphenol A), in food and drink containers may damage the body's weight-control mechanisms (Newbold, 2004). Also children may inherit fatness from their parents or it can occur as a consequence of glandular problems where endocrine glands secrets hormones that exert considerable influence on metabolism, leading to an increase in sugar (Bourchard and Stephen, 1990). Also restrain from underlying emotional and psychological satisfactions contributes to overweight and obesity among children (Sharkey, 1997).

2.3.4 Socio-Economic Factors

O'dea (2003) argued that family's economic status can help in determining overweight and obesity among children. O'dea (2003) further reported that children from families with good economic backgrounds had higher average weights than those from poor families. According to Gavin (2005), children from economic well off families were becoming obese because after getting home from school, nearly all their free time was spent in front of a screen rather than actively playing.

2.4 Health, Social and Economic Implication of Overweight and Obesity

Overweight and obesity are reported to have various social, economic, health, physical and psychological consequences to an individual who is affected, also there are consequences to community and government, which expends a lot of money in care and treatment of obesity related diseases (Ekblom, 2005; and Johnson, 2002).

2.4.1 Health Implication of Overweight and Obesity

Overweight and obese children are at risk of serious health conditions such as high cholesterol, insulin resistance, bone problems, joint problems and shortness of breath that make exercise, and physical activity greatly difficult such that they may aggravate the chances of developing asthma (Johnson, 2002). Accordingly, problems of restless or disordered sleep patterns and tendency to mature earlier than usual are common. Overweight children may be taller and more sexually mature than their peers.

Overweight girls may have irregular menstrual cycles; fertility problems in adulthood, gall bladder diseases and depression are common - all once considered exclusively adult diseases (Ekblom, 2005). Children are more susceptible to easy fracture due to osteoporosis and too much weight that cannot be sustained by leg bones (Gavin, 2005). Accordingly, many people have been suffering from degenerative diseases of weight-bearing joints, such as knees. Such osteoarthritis is a very common complication of overweight and obesity. Pains in the lower back are also more

common in obese people and may be one of the major contributors to obesity-related absenteeism from work as well as schools (Newbold, 2004).

Overweight and obesity entail health risks to the affected individual and the public. Some of the health risks of overweight and obesity include occurrence of chronic diseases (Johnson, 2002). The relationship between obesity level and associated health risks are illustrated in Table 2.3.

Table 2.3: Classification of Body Mass Index (BMI) versus Risk Level

BMI (kg/m2)	Classification	Risk of comorbidities
Less than 18.5	Underweight	Low (but increase risk of other clinical problems)
18.5 to less than 25	Normal weight range	Average (desirable)
25 to less than 30	Overweight	Increased
30 to less than 35	Obese class 1	Moderate
35 to less than 40	Obese class 2	Severe
40 or more	Obese class 3	Very severe

Source: Australian Institute of Health and Welfare (2004)

From Table 2.3, BMI beyond 30 may cause health, social and psychological problems. BMI above 40 is dangerous and requires closer medical attention (Newbold, 2004).

2.4.2 Social Implications of Overweight and Obesity

Overweight children are prone to low self-esteem which results from being teased, bullied, or rejected by peers (Janssen, Craig, Boyce & Pickett, 2006). They are likely to develop unhealthy dieting habits and eating disorders, such as anorexia (eating

disorder due to prolonged loss of appetite) and bulimia nervosa (too much eating). They are also prone to depression and substance abuse. Gavin (2005) cautioned that "…obese children have to contend with discrimination from peers…" Of no less importance than health, is the effect that obesity has in psychological and physical appearance of one's body image. Wessel and Macintyre (1997) argued that desires for participation in pleasurable activities such as sport, is influenced by weight. Obese children may be rejected by peers because they are perceived as lazy, dirty, stupid, ugly and cheats (Janssen *et al.,* 2006).

2.4.3 Economic Implication of Overweight and Obesity

The Health Protection Association (2006) argues that economic costs of overweight and obesity account between 2% and 7% of the total health care costs all over the world. In France, direct costs on obesity-related diseases amounted to 2% of total health expenditure. In Netherlands, the proportion of the country's total expenditure attributable to obesity is around 3-4%. Accordingly, overweight and obesity accounted for 9.1% of total U.S.A medical expenditures in 1998, and may have reached $78.5 billion or $92.6 billion in 2002 (Health Protection Association, 2006).

2.5 Implication of Overweight and Obesity in Children Learning

Overweight and obesity are said to affect children's psychosocial outcomes, leading to low self-esteem and depression which all together affect other aspects of children's lives, such as academic performance with potentially even more serious adverse social

outcomes in the long term (Swan, 2002). Datar, Sturm & Magnabosco (2004) reports that lower educational achievements among adults are associated with obesity and obese adolescents consider themselves worse students than normal weight students.

Social and psychological effects of obesity, which result from teasing and bullying, have also been undermining overweight and obese children's ability in academic performance (Datar *et al.,* 2004). Bullying is reported to be the highly prevalent (30%) form of aggression that involves repeated use of power and aggression. Social and psychological ramifications induced by bullying-victimization process hinder the social development of overweight and obese children, because children are extremely reliant on peers for social support, identity, and self-esteem (Janssen *et al*, 2006).

Swan (2002) revealed that teachers had negative impressions over obese children. In due regards, they were paying little attention to overweight and obese children during teaching and learning process. Swan (2002) added that both pre-service and in-service teachers perceived obese children more negatively than average weight children. Rejections from teachers and peers cause majority of overweight and obese children to be underperformers in academic and fail to complete their studies.

2.6 Conceptual Framework

Overweight and obesity are mainly a consequence of imbalance between energy in and energy out of the body (Maziak, Ward & Stockton, 2007). Activity patterns of children have changed dramatically worldwide, as more people are driven by

technology-based and comfort-oriented lifestyles. Maziak and Colleagues (2007) argued that "…Reduced activity and factors contributing to inactive lifestyles such as TV/screen time, school curricula and neighbourhood structure have all been indicated in the obesity epidemic…" consequently, an increase in sedentary life plus consumption of junk foods have led to increased adiposity due to decreased energy expenditure. According to Sharkey (1997) if energy intake exceeds energy output, excess energy tends to accumulate under the skin as non-essential fats.

The Law of Thermodynamics dictates that energy entering the system minus energy leaving equals to energy stored in the system (Rowland, 1990). This applies to humans whereby energy consumed must be equally expended, or the excess will be stored as body fats (Rowland, 1990). Sedentary life makes the consumed food to remain in the body unutilized for various metabolic activities. Thus, most of it is being stored as body fats. Extra deposition of fats in the body leads to overweight and obesity, which have adverse consequences in social, health and academic outcomes of the children as presented in Figure 2.1.

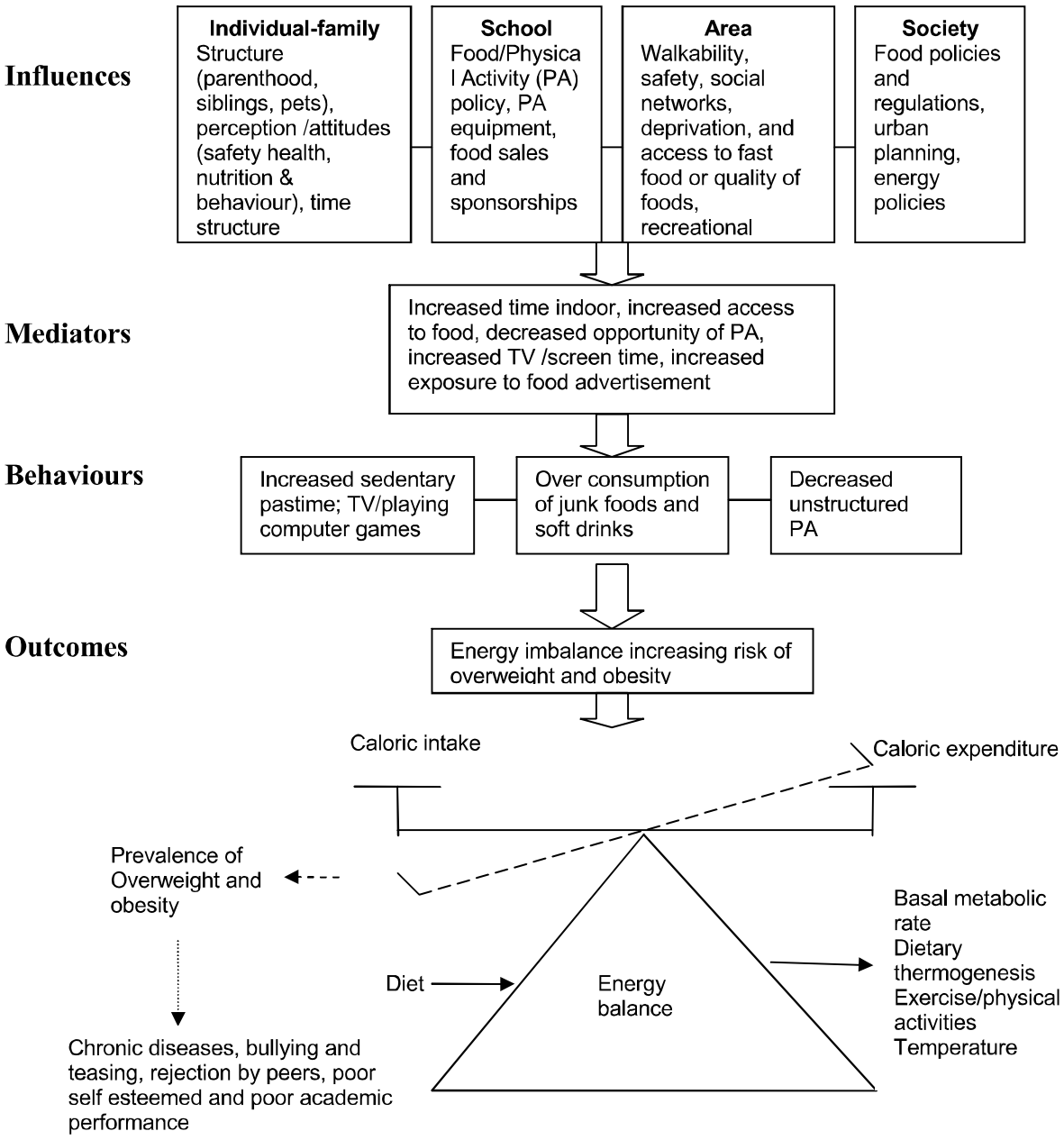


Figure 2.1: A Model showing the Contributory Factors and Implications of Overweight and Obesity

Source: Adapted from Maziak *et al.,* (2007) and Rowland (1990)

2.5.1 Elaboration of the Model

From the model, (Figure 2.1) it is observed that main determinant of overweight and obesity is an imbalance between the amount of energy intake and that of energy expenditure. This can be influenced by an individual family economic status which influences family nutrition and physical activities' policy. Children from families with good economy are less exposed to physical activities as many of them are got done by machines or house workers while exposed to overfeeding (Gavin, 2005). This makes them expend less energy than they consume, thus the excess being stored as body fats.

The area where children live (rural or urban) may also be a determinant of adiposity level that may take place. In rural areas children are more exposed to physical activities than in urban, this makes rural children to be less vulnerable to obesity than urban children. The other influencing factor is the society that surrounds the children. The society which considers overweight and obesity a good health condition will have a poor policy for children's food consumption and participation in physical activities.

Influences of overweight and obesity such as individual family, school, area and society as shown in Figure 2.1, are mediated by increased time indoor, increased access to food, decreased opportunity to physical activities, increased Television (TV) time, and increased exposure to food advertisements. They are further cemented by behaviours such as increased sedentary life; children spending most of their free time in front of a TV or play computer games instead of participating in sports and physical activities Also there are decreased unstructured physical activities especially in urban

areas where the space would have been used by children for unstructured physical activities are utilized for various economic and domestic activities.

Overweight and obesity may have significant effect on health (heart problems, hypertension), social problems (rejection by peers, bullying and teasing) and poor academic performance (last stage of Figure 2.1) which is mostly resulting from the reduced attention of the children in the classroom and lack of social bond with other children (Swan, 2002).

2.6 Knowledge Gap

Prevalence of overweight and obesity among primary school children is not yet established in Tanzania. As such, there is no mechanism put forward either to establish risk factors associated with overweight and obesity or the impacts that overweight and obesity have on the children health and learning behaviours and outcomes. Also little is known on causes of overweight as well as obesity among primary school children in both rural and urban settings in Tanzania.

There are also contradicting ideas on who is more vulnerable to obesity between children from well to do families and those from poor ones. Wang (2004) contends that children from poor families are more vulnerable to obesity than those from rich families, while O'dea (2003) argues the opposite. Again, there is little emphasis on the impact that overweight and obesity have on children's learning behaviours and outcomes.

2.7 Justification for the Study

A study on overweight and obesity was chosen because there were very limited studies in Tanzania that have addressed the problem of overweight and obesity among primary school children. This meant that overweight and obesity among primary school children was not yet identified as a problem in Tanzania. Also the researcher's previous experience from the study of overweight and obesity at Mlimani primary school in Dar es Salaam acted as a motivation for other study that covers more schools.

Little has been done to address the problem of overweight and obesity in schools. For this reason there are no established data on prevalence of overweight and obesity among primary school children, no establish reason for prevalence of overweight and obesity among primary school children, no established information on the health and social consequences of overweight and obesity as well as academic consequences of overweight and obesity among primary school children, thus a need for this study.

CHAPTER THREE

RESEARCH METHODOLOGY

The previous chapter presented the literature review and conceptual framework. This chapter delineates the research methodology. It comprises of research design, study area and target population. Also there are sampling techniques, data collection methods, validation of instruments and data analysis procedures.

3.1 Research Design

A research design is a plan that specifies and states clearly the population studied, method and procedure(s) used for processing information obtained from the field (Kothari, 2004). This study used a causal-comparative design to investigate the possible cause-and-effect relationship of overweight and obesity by observing existing consequences and searching back through data for plausible causal factors. Causal-comparative design makes the study descriptive thus, employing quantitative as well as qualitative research approaches (Best and Kahn, 2006; Kothari, 2004).

The study used mainly a quantitative research approach, but there were some elements of qualitative approaches that were mainly intending at authenticating quantitative data. Causal-comparative design was chosen to investigate prevalence, causes and implications of overweight and obesity for children's health, social, learning behaviours and outcomes by assessing the relationship between causal-effect factors and environment (rural and urban).

3.2 Study Area

The study was conducted in Kinondoni and Njombe districts in Dar es Salaam and Iringa regions, respectively. The two districts were chosen for the study because they were sought to have good representation of urban and rural settings. A large area of Kinondoni is urban, thus having a great likelihood of representing all urban areas of Tanzania, while most of Njombe is rural, providing a good representation of rural settings in Tanzania. See the map of Kinondoni and Njombe districts in **Appendix G**.

3.3 Target Population

The target population for this study included the primary school children and primary school teachers from both rural and urban settings in Njombe and Kinondoni districts respectively. It comprised of Uwemba, Ibumila, Kichiwa and Mhaji Primary Schools in Njombe district as well as Umoja primary school, Mabibo Primary School, Kwanza International School and Sahara English Medium School in Kinondoni district.

3.4 Sample size

The sample for this study was categorized into three. First, were primary schools, which consisted four schools in each district (Kinondoni and Njombe). The second category comprised 200 pupils not older than 14 years and the third category involved primary school teachers, one from each school. The sample size was considered realistic for quantitative and qualitative research approaches as the study employed both.

3.4.1 The Primary Schools

Four primary schools from each district were involved in this study. Schools were considered ideal for representation of all schools in each district. Schools were classified according to area they originated either urban or rural. Urban schools presented by (US) and rural schools (RS). Number such as 1, 2, 3 and 4 both for rural and urban areas presented each school. The same procedure and naming were maintained for teachers and pupils as shown in Table 3.1.

Table 3.1: Summary of Background Information on the Schools, Teachers and Pupils Involved in the Study

School	**RS1**	**RS2**	**RS3**	**RS4**	**US1**	**US2**	**US3**	**US4**
Region	IRINGA	IRINGA	IRINGA	IRINGA	DSM	DSM	DSM	DSM
School type	Govt	Govt	Govt	Govt	Govt	Private	Govt	Private
Level	Nursery & Primary	Primary	Primary	Primary	Primary	Nursery and primary	Primary	Nursery and primary
Number of pupils	563	436	654	457	743	232	459	253
Average class	70-80	65-70	74-80	65-70	85-95	30-45	50-60	30-45
Teaching staff	9	8	11	11	23	10	25	8
Teachers	**RT1**	**RT2**	**RT3**	**RT4**	**UT1**	**UT2**	**UT3**	**UT4**
Teachers involved	1	1	1	1	1	1	1	1
Gender	Female	Female	Male	Female	Female	Male	Male	Female
Pupils	**RP1**	**RP2**	**RP3**	**RP4**	**UP1**	**UP2**	**UP3**	**UP4**
Grade	4, 5& 6	4, 5& 6	4, 5& 6	5& 6	4, 5& 6	3, 5& 6	4, 5& 6	2, 3, 4, & 6
Number of pupils involved	25	25	25	25	25	25	25	25

Source: Adapted from Mafumiko (2006)

Key: RS1–Uwemba primary school, RS2–Ibumila primary school, RS3–Mhaji primary school and RS4–Kichiwa primary school where as US1-Umoja primary school, US2-Sahara English Medium school, US3-Mabibo primary school and US4-Kwanza International School. The same naming procedure was applied for pupils and teachers.

3.4.2 The Pupils

A total of 200 primary school children (91 males and 109 females) participated in this study. Among them, 100 pupils (51 males and 49 females) were from Kinondoni district and 100 pupils (40 males and 60 females) from Njombe district. All children who participated in this study from both rural and urban settings were aged between 7 and 14 years. The age range was considered appropriate in describing a school child in Tanzanian context. Other attributes are described in Table 3.1.

3.4.3 The Teachers

One teacher from each sampled school participated in interviews with the researcher. Thus a total of 8 teachers participated in the study. In all schools, participant teachers were selected randomly irrespective of subjects of specialization and responsibilities they held at schools. Other attributes are described in Table 3.1.

3.5 Sampling Techniques

Kumar (1999) defines sampling as a process of selecting a number of individuals for a study in such a way that individuals represent the larger group from which they were selected. This study used systematic random sampling, stratified sampling and simple random sampling techniques.

3.5.1 Systematic Random Sampling

Systematic random sampling technique was used to get the sample schools for the study from each district. This sampling technique was chosen, because it reduces the

probability of making error in sampling (Krishnaswami, 2002). It involved the process of getting a sample by selecting each *nth* school in a list with finite number of schools (see also Best and Kahn, 2006). In this sampling method, the researcher listed down all schools in each district and established the n*th* term on the basis of the number of schools in the district and the number of schools needed in the study.

In Njombe district, for example, there were 243 primary schools that were randomly listed. Since only four schools were needed out of 243 schools, the 70^{th} schools after the first school were chosen. Basing on the systematic sampling procedures, the researcher chose 1^{st}, 70^{th}, 140^{th} and 210^{th} schools for the study. In Kinondoni district there were 194 primary schools and the 49^{th} schools after the first school were chosen. Therefore, the researcher chose the 1^{st}, 49^{th}, 98^{th} and 147^{th} schools.

3.5.2 Stratified Sampling

The population, from which the sample was taken, was not homogenous. In one school, there were pupils of different class levels, ages and economic backgrounds. Therefore, the population was stratified into classes to get a sample of similar characteristics in terms of ages and class level. Pupils were subdivided into smaller homogeneous groups in order of their classes (from standard/grade three to seven), so as to get a more accurate representation (see also Best and Kahn, 2006). Standard one and two were excluded in the sample because were considered too young to respond properly to questionnaires. Depending on the number of subjects in each strata/class, sample size and proportion of population in each stratum, five pupils were randomly

selected from each strata/class for the study (see also Kothari, 2004). There were five strata from each school. Therefore there were 25 pupils from each school.

3.5.3 Simple Random Sampling

Children involved in the study were selected randomly from each stratum. All individuals were chosen in such a way that each had an equal and independent chance of being selected (see also Krishnaswami, 2002). A lottery method of random sampling was used in the selection of participants from each stratum. Slips of similar pieces of paper with number equal to the total number of pupils needed for the study were made. For example, at RS1, 35 slips of papers were made for each class/stratum, and only 5 of the 35 were numbered. As stated by Best and Kahn (2006), the papers were rolled, mixed thoroughly and displayed on table where every pupil could pick one of the slips blindly. Once the piece of paper was picked it was not replaced (Kothari, 2004). Each pupil who picked a piece of paper with number was to consider himself/herself selected for participation in the study. For ensuring equal representation of males and females, pieces of papers for boys and girls were displayed separately.

3.6 Data Collection Methods

Data collection methods refer to many different methods and procedures developed to aid in the acquisition of data (Best and Kahn, 2006). In order to determine prevalence of overweight and obesity, data were collected by measuring children's weights and

heights to determine Body Mass Index (BMI) and measurement of skinfolds to determine body fat percentage. Causes and implications of overweight as well as obesity among primary school children were studied by using questionnaires and interviews (teachers and pupils' interviews).

Overall the study employed five data collection methods: (1) pupils' questionnaires, (2) teachers' interviews; (3) pupils' focus group discussions (4) measurement of BMI; and (5) measurement of skinfolds. Each research theme was studied by using more than one method (triangulation) so as to be certain with results. Table 3.2 shows research themes for each type of data collection method.

Table 3.2: Data Collection Methods for Each Research Theme

Research theme	Data collection method				
	Pupils' focus group discussion	Pupils questionnaire	Teachers' interviews	BMI measurement	Measurement of skinfolds
Prevalence				√	√
Causes		√	√		
Health and social	√	√	√		
Learning outcome	√	√	√		

Source: Adapted from Mafumiko (2006)

This study used five instruments for data collection. These included, pupils' close-ended questionnaires, teachers' semi-structured interview guides, pupils' focus group discussion guide, measurement of pupils' weight and height to determine BMI and measurement of skinfolds to determine body fat percentage. Before starting the actual data collection the researcher asked for children's consent to participate in the study.

Although there were no consent form to sign in, all ethical measures for protection of human subjects were observed. In the next section the instruments used are described.

3.6.1 Pupils' Questionnaires

Questionnaires were prepared and administered to school children after undergoing measurements of their weight and height to determine BMI. Measurement of skinfolds was meant to determine their body fat percentage. Questionnaires were thought useful in collection of information that required objective responses (see also Krishnaswami, 2002). In addition the number of respondents was too big to be handled accurately by other data collection methods. The questionnaires helped in gathering facts about respondents' historical backgrounds and lifestyles. The questions were mainly close-ended, and were considered easy for pupils to score (**Appendix A**).

3.6.2 Teachers Interview Guides

This method helped to collect information on teachers' experiences in dealing with overweight and obese children at their schools. Teachers deal with children of various abilities. Therefore they are well informed about the children's life styles, health, social relations and academic ability. The interviews reflected overall classroom learning and participation in sports including other physical activities at school. Interviews were chosen because were thought to provide in-depth information about school children's life styles. Different from questionnaire, interviews provided room for the researcher to ask questions more than those in the interview guide. Also

allowed interviewees to ask for clarifications where they did not understand. Discussions were recorded by using a digital recorder for retrieval. The interview guide is attached in **Appendix B**.

3.6.3 Focus Group Discussion with Pupils

Focus group discussion was used to provide detailed information about health, social as well as academic implications of overweight and obesity among primary school children. 10-12 children attended each focus group discussion. Focus group discussion was chosen for children because it was thought that children talk more when in group than when alone. Challenges, critics and objections were observed during the discussions especially when a child attempted to provide false information. A digital recorder was used to record the discussions. Pupil's focus group discussion schedule is attached as **Appendix C**. Figure 3.1 shows a focus group discussion with pupils.



Figure 3.1: Focus Group Discussion with Primary School Children

3.6.4 Measurement of BMI

Prevalence of overweight and obesity was studied through measurement of weight in relation to height. A mechanical weighing scale was used for measuring each pupil's weight in the study sample. A tape measure was used to measure the height of each child. Such data were later used in calculation of BMI, which was calculated as a ratio of weight in kilograms and height square in meters (see also Sharkey, 1997). Figure 3.2 shows a pupil on the weighing scale, in the measurement of body weight and Figure 3.3 shows measurement of height using a tape measure. Measurement of weight and height were necessary in the determination of children's BMI.



Figure 3.2 Measurement of Body Weight Using a Mechanical Weighing Scale



Figure 3.3: Measurement of Height Using Tape Measure

3.6.5 Measurement of Skinfolds

Measurement of children's skinfolds was also important in determination of prevalence of overweight and obesity among primary school children by calculating body fat percentages. An appropriate device for measurement of the skinfold is the "skinfold caliper". Unfortunately, the researcher did not manage to get the device. Instead, "vernier calipers" were used. The method involved measurement of biceps and triceps' skinfolds from the upper arm and measurement of scapula skinfolds. Body fat percentage was determined as a ratio of the sum of skinfold measures in millimeters, and weight in kilograms multiplied by 28 for male or 30 for female (Punshon, 2006).

3.7 Validation of Instrument

Validation of instrument was done at Majohe primary school in Ilala district and Chang'ombe demonstration primary school, in Temeke district, Dar es Salaam region. That was done 15 days before the actual data collection which started on 1st October 2007. Chang'ombe demonstration primary school was chosen because it is located in urban area. Hence it represented urban schools while Majohe primary school is located in rural area and thus represented rural school children. 39 children participated in the pilot study. They were selected randomly using lottery method. 20 pupils were from Chang'ombe demonstration primary school and 19 from Majohe primary school.

From the pilot study, some of the research instruments were abandoned due to their complexity in use and ethical issues. For example, measurement of waist-thigh circumference ratio was found to be difficult especially when taking such measurements to female pupils. So the method was abandoned for ethical reasons. Teachers' interview questions were previously prepared in English but for language clarity among primary school teachers, questions were translated from English to Kiswahili. Ambiguous questions were corrected and irrelevant questions were erased. Further refinement of data collection methods was done with supervisor.

3.8 Data Analysis Procedures

3.8.1 Pupils' Questionnaires

Data collected through questionnaires were analyzed quantitatively using a statistical package for social science (SPSS) program, Version 15.0 to test Chi-square results. Chi-square test was chosen for testing significance in this study because it tests the relationship between two independent variables (for this case, weight status and health status). Also it takes into account for variables that are both categorical (underweight, normal weight …) and numerical (percentage and frequencies). In addition, it tests for association between the row variables and column variables (Ame, 2004; Moore and McCabe, 2003). Alpha values (p-values) were set at 0.05 to determine significant associations among variables. All results were presented in graphs, charts and tables.

3.8.2 Teachers' Interviews

Data collected through interviews were qualitatively analyzed using content analysis. In this method, facts were analyzed basing on number of times a given fact was stated. Original quotes were taken to substantiate results and provide more clarification of provided information.

3.8.3 Focus Group Discussion with Pupils

Data collected through focus group discussions were analyzed by using content analysis. In due regard, number of times a certain stated fact was recorded and original quotes were presented to ensure validity of the information.

3.8.4 Analysis of measurements

Weight and height measurements were subjected to calculations of BMI so as to determine their implication to children's weight status. The following formula was used in BMI calculation: BMI = $^{\text{weight in kg}}/_{\text{height in m}^2}$. Results were used to classify weight status as "underweight, normal weight, overweight, obesity level 1, obesity level 2 or obesity level 3" as shown in Table 3.3.

Table 3.3: BMI and Body Weight Status by Implications

BMI	Implications to the weigth status
Less than 18.5	Underweight
18.5-24.9	Normal weight
25.0-29.9	Overweight
30.0-34.9	Obesity level I
34.9-39.9	Obesity level II
Greater than 40	Obesity level III

Source: Gavin (2005) and Sharkey (1997)

3.8.5 Skinfolds Analysis

Data obtained through skinfold measurement were subjected to calculations so as to determine body fat percentages. The sum of all skinfold measures were obtained and divided by weight for each pupil then multiplied by 30 for girls or by 28 for boys (Punshon, 2006). The following formulae were used in calculating percentage body fat: percentage body fat = $(^{\Sigma\text{skinfolds (mm)}}/_{\text{weight (kg)}})$* 28 for male or percentage body fat = $(^{\Sigma\text{skinfolds (mm)}}/_{\text{weight (kg)}})$* 30 for female as it was put forward by Punshon (2006). Results

were used to classify an individual as having "minimum body fats, lean, ideal, average or overweight and obesity" as presented in Table 3.4.

Table 3.4: Body Fat Percentage in Relation to Body Health Implication

Body health implication	Body fat percentage	
	women	men
Minimum amount to stay alive	10-12%	2-4%
Lean	14-20%	6-13%
Ideal	21-24%	14-17%
Average	25-31%	18-25%
Overweight and obesity	32% plus	26% plus

Source: American Council on Exercise (2003)

Final results for both BMI and skinfold measurement were presented in graphs and significance for each variable was computed using Chi-square test (χ^2).

CHAPTER FOUR

RESULTS

This chapter presents findings obtained from the field. It comprises of several sections that presents difference in prevalence of overweight and obesity between rural and urban schools. It also presents children's lifestyles that contribute to overweight and obesity among school children. Finally it covers the health and social implications of overweight and obesity among school children as well as the implication of overweight and obesity in children learning behaviour and outcomes respectively.

Results for this study are presented on the basis of research hypotheses. The study aimed at testing the following hypotheses;

- There is no significant difference in prevalence of overweight and obesity between rural and urban primary school children;
- Overweight and obesity have no significant relationship with the primary school children's lifestyles;
- Overweight and obesity have no significant implication on children's health and social wellbeing ; and
- Overweight and obesity have no significant implications for children's learning behaviours and outcomes.

4.1 Prevalence of Overweight and Obesity between Rural and Urban Primary School Children

Hypothesis 1

Findings from BMI measurement indicated a significant ($\chi^2 = 17.77$, df = 4 and sig. = 0.001) difference in prevalence of overweight as well as obesity between rural and urban primary school children. BMI results for rural primary school children were as follows: 49% underweight, 47% normal weight, and 4% overweight. No cases of obesity were found among rural school children. In urban areas there were; 33% underweight, 44% normal weight, 14% overweight, 8% obesity level 1 and 1% obesity level 2. Results are presented in Figure 4.1 and **Appendix D**.

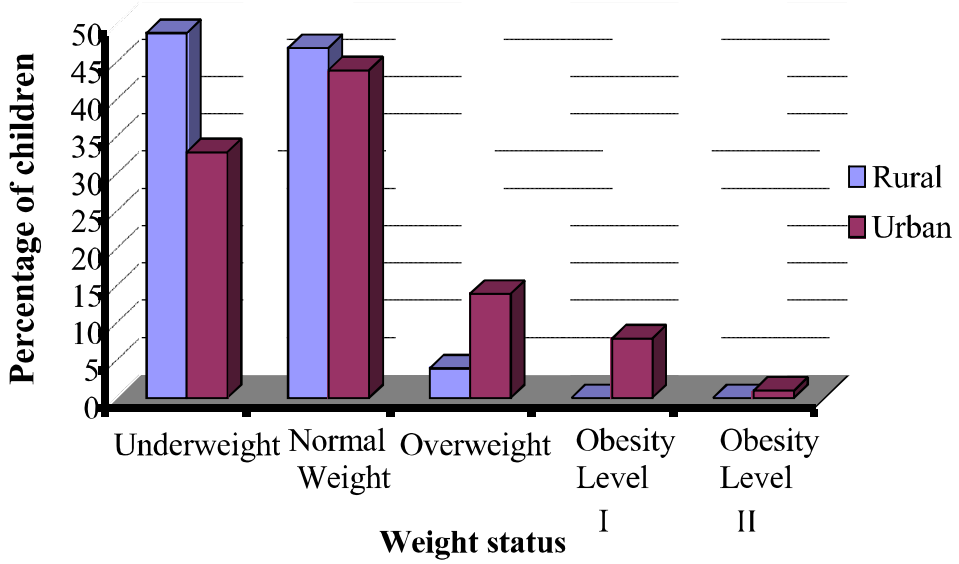


Figure 4.1: Weight Status for Rural and Urban Primary School Children

Source: Field data (2008)

Figure 4.1 shows children's overall weight status in rural and urban settings. Trends of overweight and obesity are presented in Figure 4.2.

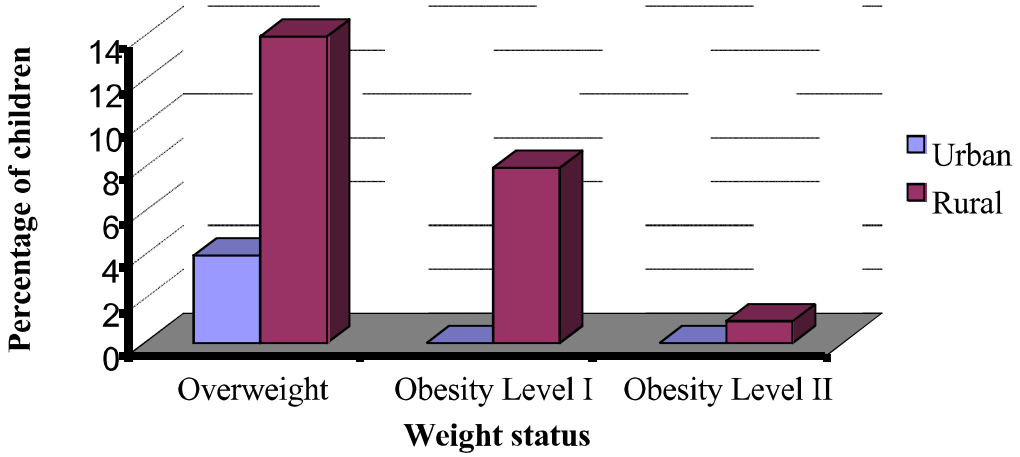


Figure 4.2: Trends of Overweight and Obesity between Rural and Urban

Source: Field Data (2008)

From Figure 4.2, it is clear that children in urban areas have higher prevalence of overweight and obesity than those in rural areas. A very small proportion of rural children were overweight while a large proportion of the urban children were overweight and obese as presented in Figure 4.2.

Computation of skinfold measurement into body fat percentage also showed a significant (χ^2 = 26.70, d.f = 4 and sig. = 0.000) difference in prevalence of overweight as well as obesity between rural and urban primary school children. Skinfold result showed that in rural schools, there were 1% children with minimum fats, 36% lean fats, 37% ideal fats, 23% average fats and 3% overweight and obesity. In urban schools, there were 0% minimum fats, 20% Lean fats, 22% Ideal fats, 32% average fats and 26% overweight and obesity. Figure 4.3 shows percentage of children in each body fat status.

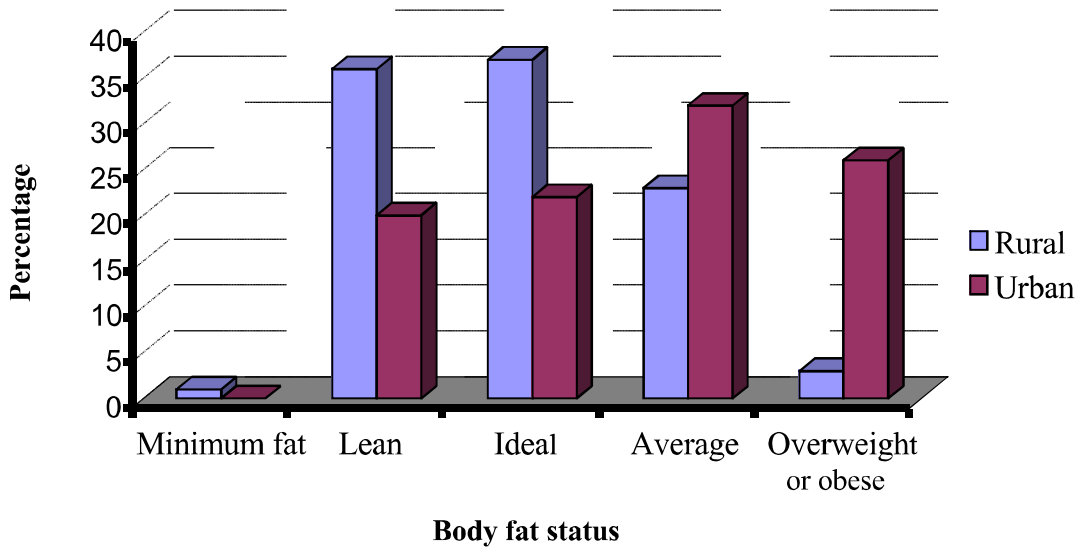


Figure 4.3: Body Fat Percentage among Primary School Children

Source: Field Data (2008)

From Figure 4.3 there were more urban children who were overweight and obese than rural children majority of whom had "lean" and "ideal" body fat percentages.

4.2 Lifestyles Contributing to the Occurrence of Overweight and Obesity among Primary School Children.

Hypothesis 2

Lifestyle habits were studied by analysing the level of participation of children in physical activities, thus determining the extend to which they practice sedentary life, the nutrition status, family economic status, household occupation, nature of transport that children were using, inheritance and parental care.

4.2.1 Children's Physical activeness

Results showed a significant (χ^2 = 21.70, d.f = 12 and sig. = 0.041) relationship between overweight and obesity and children's physical activeness. In this case, individual lifestyle habits were determined from participation levels in physical activities and the factors that were determining their level of participation in physical activities. Evaluation of individual activeness for example, was done by assessing number of times children participated in sports both at schools and homes per week. Children were classified as very active, active, moderate, and inactive. Relationship between weight status and activeness level is presented in Table 4.1 and **Appendix F**.

Table 4.1: The Percentage of Children in Each Weight Status According to the Physical Activeness levels (N=200 and p< 0.05)

Weight status	Level of physical activeness			
	Very active	Active	Moderately active	Inactive
Underweight	46	51.1	42.1	30.2
Normal weight	51.5	40.4	49.1	42.9
Overweight	3	6.4	8.8	14.9
Obesity level I	0	2.1	11.1	4
Obesity level II	0	0	0	2

Source: Field Data (2008)

From Table 4.1, there were, no "very active" children who were at obesity level I or II; very few "active" children were obese. However, there were many "inactive" children who were overweight (about 15%) and almost 6% of them being obese. Inactive life styles such as watching Television were other significant factors (χ^2 = 15.45, df = 4 and sig. = 0.004) and (χ^2 =18.28, df = 4 and sig. = 0.001) respectively, for occurrence of overweight and obesity among primary school children.

4.2.2 Family's Economic Status

There was a significant (χ^2 = 24.29, d.f = 8 and sig. = 0.002) relationship between children's weight status and family's economic status. Family's economic status was determined from individual home appliances. 63% of overweight and obese children were from well off families and 37% from moderate and poor family's economic status. Figure 4.4 shows the relationship between weight and family economic status.

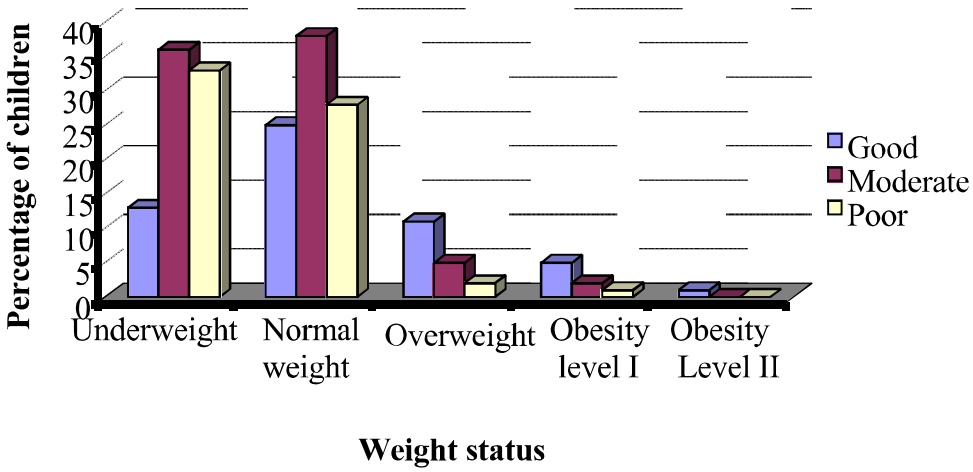


Figure 4.4: Relationship between Weight Status and Family Economic Status

Source: Field Data (2008)

Figure 4.4, shows that majority of children from poor and moderate family economic status was "underweight". Comparatively, very few children from good family economic status were underweight. More children from good family economic status were overweight and obese rather than those from poor economic status.

4.2.3. Nutrition

Results showed a significant (χ^2 = 14.86, d.f = 4 and sig. = 0.005) relationship between children's weight status and nutrition. 93% of all overweight and obese children were receiving high quality diet including canned and packed foods. Only 7% of overweight and obese children were receiving poor diets. The quality of diet was assessed on the basis of content of the food that children were taking at home. For example, canned and flied foods with other food additives were classified as "good" and the rest classified as "poor". Data related to nutrition and their implications to weight status are presented in Figure 4.5 and **Appendix F.**

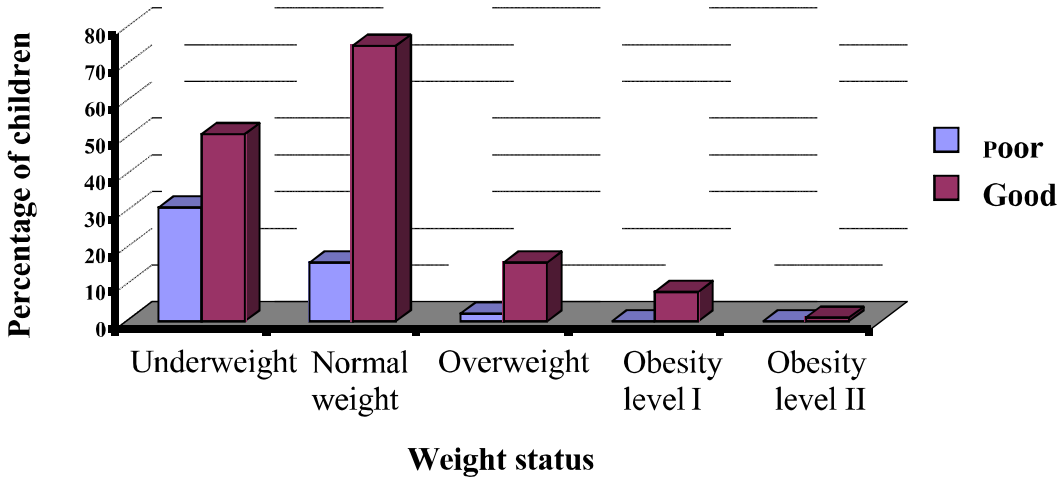


Figure 4.5: Relationship between Weight Status and Nutrition

Source: Field Data (2008)

Figure 4.5 reveals that despite the fact that there were some underweight and normal weight children who were taking a good diet, yet many of them were overweight and obese. But children receiving poor diet were either underweight or normal weight.

Further investigations on the impact of nutrition on overweight and obesity among school children were done by assessing contribution from each food type on weight status. Results are presented in Table 4.2.

Table 4.2: Responses on Food types Taken by Primary School Children and Significance of their Effect on Weight Status (N = 200 and p<0.05).

Type of food	Frequency	Percentages	% of Obese	Chi-square	Sign	df
Fruits	83	41.5	19.28%	5.34	0.2540	4
Blueband	70	35.0	20.00%	30.28	0.0000	4
Bread	152	76.0	17.76%	18.51	0.0010	4
Leftover	64	32.0	9.38%	2.93	0.5704	4
Cassava	107	53.5	14.02%	1.41	0.8431	4
Milk	111	55.5	18.02%	6.26	0.1803	4
Groundnuts	50	25.0	14.00%	0.46	0.9776	4
Fliedchicken	95	47.5	15.79%	6.96	0.1379	4
Fliedbeaf	89	44.5	14.61%	4.92	0.2958	4
Fish	143	71.5	15.38%	2.59	0.6290	4
Cannedfoods	23	11.5	30.43%	8.38	0.0787	4
Choculates	43	21.5	25.58%	11.94	0.0178	4
Icecream	55	27.5	12.73%	1.29	0.8629	4
Bites	114	57.0	9.65%	8.25	0.0829	4
Chewgums	91	45.5	8.79%	4.26	0.3717	4
Lunchatschool	79	39.5	16.46%	2.26	0.6868	4

Note: There were multiple responses

Source: Field Data (2008)

Table 4.2, shows that (30.4%) of overweight and obese children were eating canned foods, followed by chocolates (25.6%) and blue band (20%) which are all canned and packed food contents. However, blueband, choculates and breads were found to be the only significant food that causes overweight and obesity among children.

4.2.4 Nature of Transport

Findings showed a significant (χ^2 = 33.27, d f= 4 and sig. = 0.000) relationship between school children's nature of transport and weight status. Nature of transport was assessed basing on four categories of means of transport as used in Tanzania. They included family cars, school buses, public transports and on foot. Family cars and school buses were classified as good quality of transport while walking and public transport, poor quality. 84% of overweight and obese children were using family cars and school buses while 16% of overweight and obese children were using public transport and walked. Relationships between nature of transport and weight status are shown in Table 4.3.

Table 4.3: Children's Weight Status versus Transport (N=200 and p<0.05)

Weight Status	Nature of transport	
	Poor means of transport	Good means of transport
Underweight	46.8	19.0
Normal Weight	46.2	42.9
Overweight	5.7	21.4
Obesity Level I	1.3	14.3
Obesity Level II	0.0	2.4

Source: Field Data (2008)

Many children using poor transport such as walking on foot and public transports were underweight and normal weight (Table 4.3). Only few were overweight (Table 4.3). On the other hand few children using high quality transport such as family cars and school buses were underweight (Table 4.3). Majority were overweight and obese.

4.2.5 Parents and Guardian's occupation

A study on parents and guardians' occupation showed a significant (χ^2 = 24.88, d.f = 12 and sig. = 0.015) effect on overweight and obesity among school children. Results on impact of household occupation on children's weight status are shown in Table 4.4.

Table 4.4: Percentage of Children and their Weight Status in Each Parents and Guardians' Occupation (N=200 and p<0.05)

Weight status	Parents and guardians' occupation			
	Peasant	Businessperson	Employed	No occupation
Underweight	50.6	26.7	35	53.8
Normal weight	45.5	53.3	42.5	46.2
Overweight	3.9	13.3	13.5	0
Obesity level I	0	3.3	8.8	0
Obesity level II	0	3.3	0	0

Source: Field Data (2008)

From Table 4.4 it is shown that there was no child from household without occupation who was either overweight or obese (Table 4.4). Also only few children (about 4%) whose parents were peasants were overweight. They were mainly from rural areas. Many overweight and obese children were from either employed, or businesspersons.

4.2.6 Inheritance

Investigation on the genetic contribution to overweight and obesity involved the study of mother and father's body morphologies in relation to children's weight status. Results showed insignificant (χ^2 = 10.54, d.f = 12 and sig. = 0.569) and (χ^2 = 7.99, d.f = 12 and sig. = 0.785) relationships respectively between father and mother's bodies and children weight status (See **Appendix F**).

4.2.7 Teachers' Views on Factors Contributing to Overweight and Obesity

Findings from interviews with teachers indicated that factors contributing to overweight and obesity among school children were inheritance, nutrition, inactivity (sedentary activities, for example TV watching and playing computer games) and family's economic status. Also lack of close supervision on children's activities by parents and teachers as well as presence of other health problems related to overweight and obesity. Figure 4.6 shows a summary of teachers' responses on contributing factors to children's overweight and obesity.

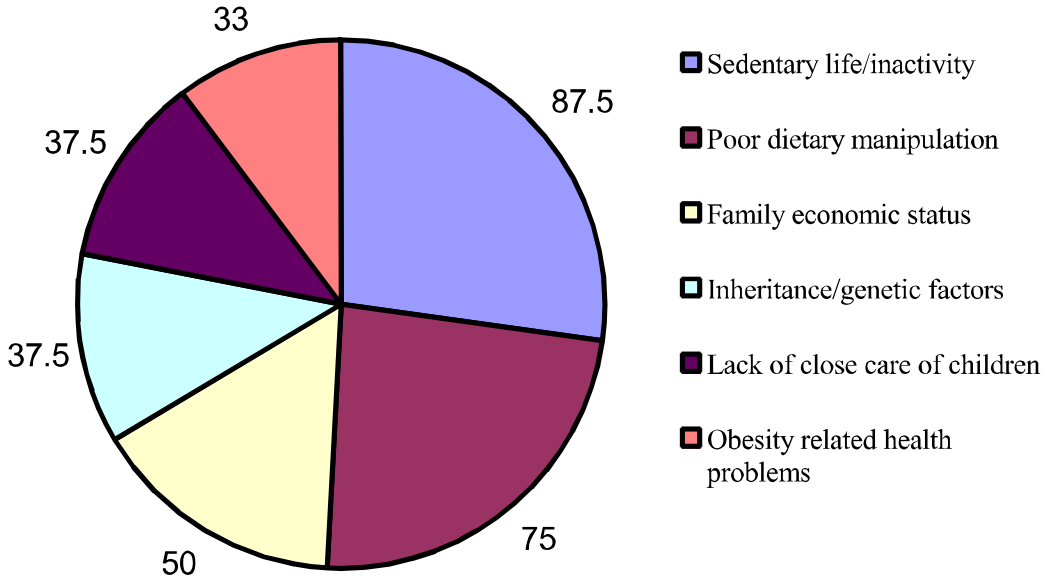


Figure 4.6: Teachers Responses in Percentage about Contributing Factors to primary school children's Overweight and Obesity

Source: Field Data (2008)

Teachers' responses on causes of overweight and obesity revealed that, 87.5% were due to sedentary life and 75% caused by poor diet manipulation (Figure 4.6). Between 30% and 50% were due to family economic status, genetic factors, lack of close parental care to children and presence of obesity related health problems such as mongolism. For example UT1, said;

> "….the first cause is malnutrition, the second is inheritance, and the third I think is lack of physical activities. Today's children get good meals, but never involve in working, they just stay at home watching TV..."

UT1 and RT1 further reported other health problems such as mongolism that might be might acquired by a child during birth and can contribute to overweight and obesity. UT3, RT2, RT3 and RT4 recommended that eating a lot of carbohydrates, which at the end change into fat glycogen plays a great role in occurrence of overweight and obesity among primary school children. It was argued by the UT4 in her response that;

> "…I think obesity results from taking too much carbohydrate than other food components. Scientifically, end results in digestion of glucose turns into fat …"

4.3 Social and Health Implication of Overweight and Obesity to School Children

Hypothesis 3

Investigation on the social and health implication of overweight and obesity among primary school children were insignificant for; recurrent fevers ($\chi^2 = 1.59$, d.f = 4 and sig. = 0.81), sleeping in the classroom ($\chi^2 = 2.68$, d.f = 4 and sig. = 0.61), truancy ($\chi^2 = 5.31$, d.f = 4 and sig. = 0.25), can't participate in sports ($\chi^2 = 1.75$, d.f = 4 and sig. =

0.78) no problems (χ^2 = 3.53, d.f = 4 and sig. = 0.47). However the findings were significant (χ^2 = 25.24, d.f = 4 and sig. = 0.00) for teasing and bullying.

Frequency study showed an average percentages of 85.2% of all overweight and obese children experiencing teasing and bullying from their peers, 81.9% were unable to participate in sports and other physical activities, 25.9% were sleeping in the classroom, 19.4% were experiencing recurrent fever and body weaknesses, 9.7% were truant and only 6% were not experiencing any problem as shown in the Table 4.5.

Table 4.5: Problems which were Experienced by Overweight and Obese Children (N=200 and p<0.05).

Social problem	Weight status	Frequency	Percentages	Sign.
Recurrent fever	Overweight	6	33.33	0.81
	Obesity level I	2	25.00	
	Obesity level II	0	0.00	
Sleep in class	Overweight	5	27.78	0.61
	Obesity level I	4	50.00	
	Obesity level II	0	0.00	
Truancy	Overweight	3	16.67	0.25
	Obesity level I	1	12.50	
	Obesity level II	0	0.00	
Can't partcipate in sports	Overweight	15	83.33	0.78
	Obesity level I	5	62.50	
	Obesity level II	1	100.00	
Teasing and bullying	Overweight	10	55.60	0.01
	Obesity level I	8	100.00	
	Obesity level II	1	100.00	
Noproblems	Overweight	1	5.56	0.47
	Obesity level I	1	12.50	
	Obesity level II	0	0.00	

Note: Results are presented on multiple responses bases.

Source: Field Data (2008)

From Table 4.5, there were a negligible amount of overweight and obese children who were not experiencing any problem. Majority were experiencing teasing and bullying as well as missing an opportunity to participate in sports and other physical activities. It was also revealed that children were experiencing heart problems and hypertension. Others were experiencing excessive sweating and some were facing problems in breathing, as it was reported by UT3 that, "…I realize that these children's sweating levels is abnormal and sometimes they face difficulties even in breathing…"

Overall the following were mentioned as common health and social problems that overweight and obese children were experiencing: being inactive (laziness), recurrent fevers, sleeping in the class while the lesson is on, breathing difficulties, too much sweating, being teased and being bullied. Others included being uneasy, failure to attend school at right time and sometimes truancy, appearing tired most of the time and self inferiority. UT1 for example, responded that "…they are very lazy in performing various physical activities"

When overweight and obese children were interviewed, they said they were not free to participate in sports and other physical activities. They faced problems in walking quickly and hence were reporting to school late. 30% overweight children said they were experiencing recurrent fevers such as headaches, colds and recurrent body weaknesses. Cases of heart diseases and high blood pressure were said to rarely exist among primary school children but four cases were reported by teachers from US1, US2 and US3.

4.4 Implications of Overweight and Obesity for Children's Learning Behaviours and Outcomes

Hypothesis 4

Results showed a significant (χ^2 = 64.26, d.f = 16 and sig. = 0.000) implications of overweight and obesity for children's learning behaviours and outcomes. Majority were having poor or average academic performances. Interviews with teachers and children showed that overweight and obese children were more academic underperformers than normal weight and underweight children. UT1, said that overweight children were slow in responding to questions in classrooms and were lazy in doing homeworks. UT3 said since he started teaching, he has never ever seen an obese child performing better in academic. He said majority of them were poor or average. His response was as follows;

> "…they range from average to low performers. *I have never ever seen an overweight child getting higher passes in academic.* They are not active, cannot stand up and attempt some questions in front of the class like others …"

This argument was supported by UT4 who insisted that the performance of overweight and obese children in academic was either average or below average. She added that there were some overweight and obese children who were doing things quite contrary to their age level.

> "…their performance is average, and there are some who are doing things contrary to their ages, they are too childish, different from the way peers of the same age are behaving, most of the time they appear tired and inactive…"

UT1 and UT2 said laziness, inactiveness and weakness that are experienced by overweight and obese children, were factors for their poor performance in academics.

Their responses were as follows;

> UT1 said that "…these children are very lazy, not sharp … in the classroom they are inactive. They do not involve in practical work. They do not like to participate in solving questions… Sometimes it is tiring when teaching obese children because they take a long time to understand…"

> UT2 reported that "…overweight children take a long time to understand because they might be sleeping in the class or are not in good mood to respond to questions. They get tired to listen to teacher …"

Further information on the relationship between weight status and children's learning behaviours and outcomes (academic performances) in grades is presented in Figure 4.7 and **Appendix E**

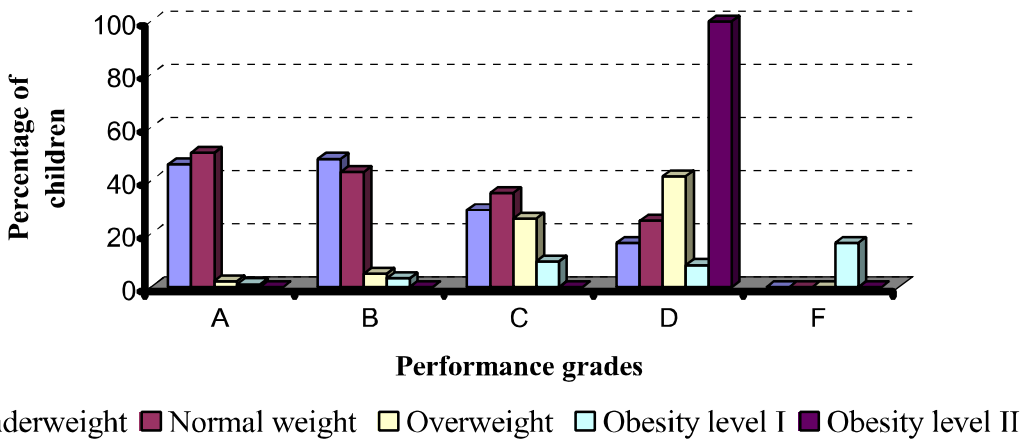


Figure 4.7: Children's Weight Status and their Academic Performance

Source: Field Data (2008)

Figure 4.7, shows that very fewer overweight and obese children were scoring "A" and "B" grade, than underweight and normal weight children. Many overweight and obese children fell on the "C" grade; others fell on "D" and "F" grades.

CHAPTER FIVE

DISCUSSION

This chapter presents the interpretation and discussion of the main findings of the study. It comprises of a sections that provide prevalence as well as causes of overweight and obesity among primary school children. Also it presents the health, social and academic implications of overweight and obesity.

5.1. Summary of the Findings

This study was intended to investigate the extent to which overweight and obesity is a challenge among primary school children in Tanzania in terms of prevalence between rural and urban settings, causes, health and social implications, and the implications that overweight and obesity have in children learning behaviours and outcomes.

Findings on prevalence revealed a significant difference in prevalence of overweight and obesity between rural (4%) and urban (23%) settings. Family economic status, nutrition, sedentary life, household occupation and nature of transport were the significant factors for prevalence of overweight and obesity. Overweight and obese children were also experiencing heart problems, hypertensions, and shortness of breath. Social problems encountered by these children were such as bullying, teasing and rejections by peers. They were also reported to be sleeping in the classroom, experiencing recurrent fevers and some were truancy.

5.1. Prevalence of Overweight and Obesity between Rural and Urban Primary School Children

Investigation on BMI and skinfolds showed a higher prevalence of overweight and obesity among urban than rural primary school children. This finding was similar to those of Sobngwi *et al.* (2002) and Nyaruhucha *et al.* (2004) who reported for high prevalence of overweight and obesity in urban than it in rural areas. The prevalence of overweight and obesity was five times higher among urban children than rural children.

Many studies (Sobngwi *et al.*, 2002; Nyaruhucha *et al.,* 2004) have reported for the differences in overweight and obesity that exist between rural and urban settings of Tanzania, but there are no descriptions on why these differences exist. This study revealed that the difference that exists was highly attributed to the differences in the level of physical activities, nature of transport, household occupation and dietary manipulations between the rural and urban settings. This study has further revealed that over 65% of urban children were joining in private studies, watching television programmes and playing computer games after school hours, while majority of rural children were joining in various physical activities such as farming, playing and having a distance walk to collect water and firewood; which are considered significant in cutting down the excess weight in the children's body (Kai-Ming, 1998).

Children from RS4, for example, said in morning they run the whole way from home to school to time the roll call. Likewise in the evening they run from school to home so as to time for other home responsibilities such as feeding livestock and fetching water. Despite the physical activities they were engaged in, more than 20% of the rural school children reported to stay the whole day without anything to eat. They said, their residences were located far from school. Thus they faced difficulties to go home for lunch. They used to get only dinner or leftovers in the morning if they happened to be available. These hardships were hardly experienced by urban children, and none of the urban child mentioned these as problems.

Final results on prevalence of overweight and obesity among primary school children revealed that overweight and obesity were far more prevalent in urban settings by 19% than in rural settings. Chi-square tests revealed a significant difference in overweight and obesity between urban and rural settings. Therefore the researcher rejected the null hypothesis, which stated "…There is no significance difference in prevalence of overweight and obesity between rural and urban primary school children…" Instead accepted the alternative hypothesis; "…there is significance difference in overweight and obesity between rural and urban primary school children..."

5.2 Causes of Overweight and Obesity among Primary School Children

Statistical results showed that sedentary life, nutrition, household occupation, nature of transport and family's economic status, were significant lifestyles with considerable

relationship with the occurrence of overweight and obesity among primary school children. However inheritance and parental care were insignificant causes.

5.2.1 Sedentary Life

Sedentary life was a significant factor for prevalence of overweight and obesity among primary school children. In the analysis of children's level of activeness, it was revealed that, majority of inactive children were overweight and obese. Very few children who were very active were overweight, and none of them was obese. Majority of overweight and obese children were moderately active or inactive. Sedentary life was previously mentioned by Johnson (2002) and Gavin (2005) as a factor for prevalence of overweight and obesity among school children. Children with limited time for physical activities such as sports and farming activities were more vulnerable to overweight and obesity than children who were engaging in various physical activities.

Participation in physical activities is very important in balance of energy in the body (Council for Physical Education for Children, 1998). A human body, as it is for a machine, which uses fuel to generate energy, needs food to maintain body warmth and carry out voluntary as well as involuntary activities for perpetuation of life. Experience shows that human being eats by following the routine (breakfast, lunch, dinner and other extraneous meals) regardless of how much he/she expends the already consumed energy. Following the Principle developed by Pavlov about the

conditioned stimulus (Smith & Soper, 1986), human being has been conditioned to feel hungry every eating hour even if he/she was not involved in any activity. Since humans do not expend all the consumed energy, an extra amount of energy that is unutilized in metabolic activities is stored as fat (Rowland, 1990; Sharkey, 1997). The excess amount of fat storage is what leads to overweight and obesity among children. For example excess glucose is stored as fat in form of glycogen.

Pangrazi (1995), Kai-ming (1998) as well as Mazengo *et al.* (1997) argued that advancing technology in the world has replaced the active physical activities that children were previously engaging in, instead they engage in computer based activities which make them expend minimal amount of energy while energy consumption level has increased (Gavin, 2005). Interviews with teachers revealed that, majority of urban school children were having more time to spend in front of screens watching video or playing computer games than participating actively in physical games at playgrounds.

From this study, it was found that over 76% children from urban schools were not participating in physical activities both at their homes and school. Activities such as school cleanliness and domestic works at home were being done by employed workers. This was never observed in rural areas where children were exposed to the long way travel to fetch water or collect firewood and participating in the farming activities. The present nature of life that exists between the two settings, urban being

more sedentary than rural, subjects urban children to overweight and obesity than rural children.

In most urban schools, children have no place to cultivate and play games, all open spaces have been utilized for other infrastructures such as house quarters and so on. They do not walk; for just a short distance travel, a child requires a bus fare to go. Most children in urban areas have limited opportunity to carry out physical activities at home at the same time, sports and physical activities like farming at schools are forbidden. All physical activities that were performed at schools before the government banned sports competitions in 2001; do not exist at schools (Bulemile, 2002). Currently there is no national service training, no competitive sports at schools and homes, no farming, and no "mchakamchaka" (jogging), thus higher risk of overweight and obese among urban children than rural children.

5.2.2 Nutrition

The quality of nutritious food consumed by children at their homes was found to be another important determinant of overweight and obesity among school children. It was found out that some children in rural areas were getting one or two meals per day; and majority were underweight and or had normal weight. Their counterparts in urban areas were getting three or four meals per day. In addition to number of meals they were getting, urban children were getting meals with plenty of fats or oils such as fried meat, canned foods and other junk foods. Many children who were feeding on

modern foods including canned and packed foods were more vulnerable to overweight and obesity than those who were receiving poor diets (Pangrazi, 1995).

On the other hand rural children were receiving low quality food contents. Mostly they eat stiff porridge (ugali), potatoes and "makande" with green vegetables and beans. It was further revealed that about 96% of urban school children were having something to eat at school out of the normal eating routine. For example, urban children were buying ice-cream, chew gums, chocolates and fruits at school a pattern that was not observed among rural children. Urban children were eating food with a lot of oils added in, blueband, and other fatty components for increasing flavour. Many advanced families were seldom eating food prepared in a kitchen; instead they were eating artificial foods not cooked by water and fire.

Findings revealed that over 20% of urban children were eating canned foods. Among them, 30.4% were overweight and obese. These findings confirm those of Gavin (2005) who argued that, today's busy families have fewer free moments to prepare nutritious cooked meals. Instead they depend on canned foods which have considerable contribution to weight gains. Most of canned foods have a lot of additives of which are thought to have significant contribution to weight gains. Gavin (2005) adds that one contributing factor in the onset of these complications of overweight and obesity is taking in a diet lacking fibres and antioxidants, but rich in processed foods loaded with added fats and sugars.

5.2.3 Parents and Guardians' Occupation

Parents and guardians' occupations were found to have an impact on children's health status in terms of weight. Children from households with good occupations such as employee in governmental, and finance sectors and businesspersons were more vulnerable to overweight and obesity than those from households with poor occupations such as peasants and unemployed people. These findings were in line with those of O'dea (2003), who argued that children from families with good income were subjected to obesity risk factors. Good household occupation may mean good income at home. Thus children from these families have a lot of fringe benefits resulting from their parents or guardian's occupational positions.

According to Sharkey (1997), restrain from underlying emotional and psychological satisfactions advance chances of becoming overweight and obese. Children whose parents have something to earn monthly are assured for availability of all needs including school and home needs. They are certain of getting good meals, good shelters, and good places to sleep (O'dea, 2003). Such children have no or little possibility of getting tenderness or other discomforts resulting from poverty related problems. Thus become less risky of kwashiorkor rather in high risk of overweight and obesity in case of poor diet management.

Good occupation also implies availability of services such as television, computers and other electronic devices at home. Hence, children have more time to spend on that equipment than engaging in other physical activities. All these were possible

incentives that urban children were likely to get while rural school children were missing and some of them were even uncertain of what to eat or what to put on.

The nature of the household occupations can also act as a determining factor of number of hours a parent can spend with children and help in managing their diets. Depending on their occupation, many parents use to leave the mixture of food contents to their house workers to feed their children without any regulations on appropriate food amount to be taken (Kafyulilo, 2006). Parents' social closeness to the children would have something to do with the children's psychic and mental balances enabling them to develop with good mental and body fitness.

5.2.4 Nature of Transport

Children who were using private transport such as family cars and school buses were more vulnerable to overweight and obesity than children using public transport or walked on foot. The observation is in line with that of Ka-iming (1998) who asserted that, instead of using a machine in every action, it is good to perform physical activities such as walking, cooking, and washing, which have significant effect in cutting down excess fats in the body. This means that involvement in simple exercises such as walking are of great need for better body health.

It was further revealed that rural school children were walking a distance of five to six Kilometres everyday on their way to schools. For example, children from RS2 said they were waking up as early as 05.00 am to be on time for roll call at school, which

was located at a considerable distance from where they were residing. Maybe this is why many rural school children were having lower body fat percentages than their counterparts in urban schools (see also Kai-Ming, 1998).

The risk of being overweight and obese was greatly imposed on those who were using family cars where their parents were taking them to school in the morning and back home in the evening. In private schools, especially International schools where even cleaning of the school compounds is done by employed workers, and there is no space for physical exercise and sports activities, the problem was found to be serious.

5.2.5 Family's Economic Status

Family's economic status was determined on the basis of family home appliances.It was ranked as good, moderate and poor. As it was for the household occupation, family economic status was also a determinant of the quality of diet the children were taking, nature of transport were using, home services and presence of sophisticated home appliances which make little use of child's body energy. Findings revealed that children from families with sophisticated home appliances were more vulnerable to overweight and obesity than those from families with simple home appliances.

Homes of high economic status were having modernized machines for simplifying various home activities including electric cookers, washing machines and computers. All together make children busy while seated instead of involving actively in physical activities as other children from families that do not have those equipment (poor

family). In due regards, findings from this study were contrary to those of Wang (2004) who contended that children from households with poor economic status were more vulnerable to overweight and obesity than those from wealth families.

Many children from well off families got home from school virtually, all their free time before dinner and getting to bed spent in front of a screen. Gavin (2005) argues that screen time have a great impact on children's weight status. Accordingly, children who watch televisions more than four hours a day are more likely to be overweight than children who watch two hours or less. Gavin (2005) further reported that screen time have stronger evidence of increasing the risk of obesity than any other factor.

Nowadays, many advanced families have home workers such as house girls and house boys who are responsible for all activities carried at house (Kafyulilo, 2006). UT1 for example, said the growing tendency of rich people to put a strong fence around their houses and restricting their children from getting out of their homes, and all activities at home being done by machines and house workers, has made majority of children from such families to be lazy, inactive and obese. These findings are in compliance with those of Newbold (2004) who argued that even domestic activities, which were previously carried out by the family members are now left to house girls and house boys or else they are done by a machine. Simple works like cooking, washing, fetching firewood, water and grazing are now done by modern tools, thus subjecting children to a great risk of becoming overweight and obese.

5.3 Implication of Overweight and Obesity among Primary School Children

Findings from interviews with teachers and children revealed that overweight and obesity were sources of health, social and psychological problems to school children. However statistical tests revealed that overweight and obesity had insignificant implication on health and social wellbeing of the primary school children. This does not mean that the problems did not exist; rather it means that the extent of the problem did not reach the level of significance ($p< 0.05$).

5.3.1 Health Implication of Overweight and Obesity

Study on the impacts that overweight and obesity were having on the children health was done by using interview with teachers and children and significant testing. Statistical findings revealed insignificant health implications of overweight and obesity among primary school children. However, findings from interview revealed that overweight and obese children were experiencing health problems, such as hypertensions, heart problems, excessive sweating and shortness of breath.

These findings were in line with those of Johnson (2002) who said excessive weight especially with muscular exertion puts a great workload on the heart and circulatory systems causing a more profuse sweating and difficultness in breathing. Fat under skin prevents heat from escaping through the skin by sweating (Pangrazi, 1995). Grisogono (1991) argued that obese children are handicapped by their excessive weight. So they require high oxygen uptake to do a given task.

Respiratory and breathing disorders frequently occur to overweight and obese children, due to difficultness of blood circulations caused by fat deposits around blood vessels (Pangrazi, 1995). WHO (2005) asserts that blood pressure increases with BMI. For every 10 kilogramme increase in weight, blood pressure rises by 2-3 mmHg. Conversely, weight loss induces a fall in blood pressure and typically, for each 1% reduction in body weight, blood pressure falls by 1-2 mmHg (WHO, 2005). Breathing difficultness may be resulting from high blood pressure, which induces high pressure in lungs, making it difficult for them to take air in and out smoothly.

Childhood obesity has a tendency of perpetuating to adulthood. For this reason, if childhood obesity will not be worked out there will be a high possibility of having a large number of people who will be suffering from cardiovascular problems, including heart problems, hypertensions, diabetes mellitus, joint problems and other body complications that results from overweight and obesity. This increases health care costs to the government and families with members who are overweight and obese.

5.3.2 Social Implication of Overweight and Obesity

Overweight and obese children were victims of discrimination and segregation from peers in various academic and social cultural activities. Overweight and obese children were reported to be the last to be chosen for any group work conducted in classroom or in other physical activities including sports. These findings were in compliance with those of Gavin (2005) and Swan (2002) who said that overweight and obese children have to bear the burden of discrimination from peers.

This study revealed that cases of grief between obese and non-obese children existed in some schools as a result of teasing and bullying tendencies. In some schools, overweight and obese children were to comply with the teasing situation and adapt the names they were called, although were thought awful. A name like "Bonge Nyanya" "Mabofya", "Vitambi", "futufutu", "kipipa", "kiriba tumbo" and "chura" were common to overweight and obese children. For example this was evidenced by an obese child from US3 who said, "…They just tease me; they call me "bonge", and tell me that I should not be eating so much. Maybe they want me to stop eating blueband…"

Some children were not acclimatized to those names and thus were getting angry and consequently abandoned school. More than 9% of overweight and obese children were not attending school because of the fear of being teased, bullied and the loneliness they experienced as a result of rejection from peers. Swan, (2002) observed that, when children were repeatedly bullied or teased, they started hating school.

Other weight related problems such as failure to arrive at school on time and failure to follow properly the teacher in classroom were further contributing to children truancies. Repeated punishments due to poor performance in various fields make overweight and obese children to put off school. However, not all overweight and obese children hated school; there were some who managed to cope with the situation thus maintaining their schooling programme.

Bullying and teasing by peers together with teachers' negative attitudes towards overweight as well as obese children were pressing social and psychological problems which in turn affected their dynamism at school. This study further revealed that obese children were quite unhappy with bullying and teasing tendencies. Yet more than 85% of overweight and obese children reported to have been bullied and teased.

Apart from school drop-outs which were caused by overweight and obesity, over 80% of overweight and obese children were not participating in sports activities. This was imperative in hindering them to have social interactions with peers as well as limiting opportunities to express interest and talents they had in sports including other physical education programs. For example, about 75% of teachers and 68% of children contended that overweight and obesity were drawing away personal confidence as well as strength, thus limiting their participation in sports and physical activities. Teachers said obese children were feeling inferior and uneasy most of time. They were afraid to carry out simple activities in and outside classroom for fear of being bullied or teased.

In summary the findings through interview with teachers and children show that there were social and health implication of overweight and obesity among primary school children. Such problems were recurrent fevers, breathing difficultness, hypertensions, and heart problems also bullying and teasing, rejection from peers and inability to participate in gratifying activities such as sports. But statistical data showed that overweight and obesity had no significant health and social implication to primary

school children. Out of the six attributes tested for significance, only one (teasing and bullying) was significant and the rest were insignificant. Therefore the null hypothesis which stated that; "Overweight and obesity have no significant implication on health and social wellbeing of the primary school children" was accepted but bullying and teasing was taken into account during the analysis. Accepting the null hypothesis does not mean that there were completely no health and social implications of overweight and obesity, rather the extent of the problem was below 95% confidence level.

5.4 Implication of Overweight and Obesity in Children Leaning behaviour and outcomes

Overweight and obese children were achieving low in almost every activity they engaged in. Overweight and obese children were inactive in sport, social life and in academics. Over 67% of all overweight and obese children were having the least performance grades such as "D" and "F" (poor and failures respectively). Only few were getting the higher performance grades such as A, B and C.

Many studies (Datar *et al.*, 2004; Swan, 2002; Jansen *et al.,* 2006) mentioned overweight and obesity as a hindrance to the children academic achievements. None of these studies articulated the way overweight and obesity affect the prosperity of the children learning behaviours and outcomes. This study revealed a number of reasons for overweight and obese children to have lower academic achievements than others. One was the lack of attention in the classroom due to poor body fitness thus laziness.

The other was the tendency of overweight and obese children appearing tired and sleeping in the classroom. It was also caused by poor health make up that was making them uncomfortable with the studies when in the classroom. The consortium of those problems was subjecting the overweight and obese children into poor learning behaviours and finally affecting their learning outcomes.

Findings revealed that overweight and obese children rarely participated in discussion with peers and were slow in responding to questions. They were also lazy and inactive when in the classroom. They arrived at school late getting to the classroom while others have already started studies. Some were experiencing excessive sweating especially in Dar es Salaam, thus failing to concentrate to the lesson when in the classroom.

On the other hand, over 90% of teachers said overweight and obese children were within the average and below average passes in academic subjects, results which comply with those of Datar *et al.* (2004) and Jansen *et al.* (2006) who argued that overweight and obese children achieves less in education. Less than 10% of teachers said these children were performing well even better than normal weight children. The way these few teachers were arguing, it was reflecting that, they were very proud to have overweight and obese children in their school. This further implied that some teachers and guardians perceived overweight and obesity as a good health thus promoting it. But overweight and obese children themselves mention the situation as a hindrance to their better performance in academic.

About 34% of overweight and obese children agreed to be performing less in academics because of inability to seat for sometime reading or doing rehearsal works. For example it was revealed by this study that, overweight and obese children liked sleeping and watching television soon as they arrived at home from school, as illustrated in the following response;

> "…I become weak in the class… even if I don't sleep in the class, but I sleep a lot at home… when I wake up, I don't feel well, I feel like going on sleeping…"

Overweight and obesity was observed to be a burden even in managing the school time table where overweight and obese children were arriving at school later than the other children. In hand with late arrival to school overweight was the slowness in learning and inactiveness in responding to questions. This was witnessed by the researcher during the interview with overweight and obese children that it was taking long for a question to be answered when an obese child was appointed to answer it.

In view of these findings, the researcher rejected the null hypothesis which stated that "overweight and obesity have no significance implications on children learning behaviours and outcomes" instead accepted the alternative hypothesis which stated that "overweight and obesity have significance implication on the children learning behaviours and outcomes".

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Chapter five presented the discussion and interpretation of the results. This chapter provides the summary of the study in section 6.1, conclusion in section 6.2, general recommendation in section 6.3, recommendation for policies in section 6.4 and recommendation for further researches in section 6.5.

6.1 Summary

This study intended to investigate the extent to which overweight and obesity was a challenge among primary school children by assessing the difference in prevalence between urban and rural, in this case; Kinondoni and Njombe districts respectively. It was further intended to identify the causes and health, social and academic implications of overweight and obesity among primary school children in Kinondoni and Njombe.

The study used basically the quantitative research approach though some qualitative elements were employed to substantiate the quantitative data. Findings from this study revealed a significant difference in overweight and obesity between rural and urban school children. 23% of urban primary school children (Kinondoni) were overweight and obese, while 4% of rural primary school children (Njombe) were overweight but

not obese. An average of 13.5% of all children under study was found to be overweight and obese.

It was revealed that overweight and obesity was resulting from sedentary life and improper nutrition. Children from good family economic status, good household occupation and good type of transport were more vulnerable to overweight and obesity. Interview with teachers revealed that overweight and obese children were experiencing heart problems, hypertensions, difficultness in breathing and excessive sweating. Social problems were named to be bullying and teasing, rejection by peers, inability to participate in sports, sleeping in the classroom and self inferiority.

More than social and health consequences, overweight and obesity had impacts on the children learning behaviours and outcomes. Findings showed a significant implication of overweight and obesity on children learning behaviour and outcomes. Overweight and obese children were reported to be achieving less than others in academic, physical and social activities. About 70% of overweight and obese children were getting grade which were below average pass such as "D and F".

6.2 Conclusion

The purpose of this study was to investigate the difference in prevalence of overweight and obesity among primary school children between rural and urban settings. It was also intended to identify the causes of overweight and obesity by assessing lifestyle behaviours that subjects children to overweight and obesity. It was

further sought to investigate the health and social implications of overweight and obesity among primary school children as well as investigating the impacts that overweight and obesity had on the children's learning behaviours and outcomes.

The findings of this study showed a significant difference in prevalence of overweight and obesity among rural (4%) and urban (23%) children. It also revealed that physical inactivity (sedentary life), family economic status, household occupations, nature of transport and nutrition have significant effects to overweight and obesity among primary school children.

Findings show that overweight and obesity have impacts not only on health but also on social and academic affairs, thus a concern for educators and stakeholders in other sectors such as health and sport. In fact, weight control is a rational task, and yet not an easy for everyone. Therefore, motivation and sufficient information are keys to successful weight control through physical activities and diet manipulations. Design and introduction of education programs that will address issues related to overweight and obesity is paramount for building a generation with a health body and health mind. This may include educating parents and other stakeholders in education, sports and health through Media, such as Radios, Newspapers, Television and internet programmes.

6.3 Recommendations

6.3.1 General Recommendations

In view of the findings from this study, it is hereby recommended that; stakeholders in education, sports and health should put a mechanism that will guide all children at schools to participate in physical activities. Such activities may include sports and other domesticated activities that in turn will act as an outlet for excessive body fat deposits. This will help in improving body health conditions and academic performance.

The common goal of children's wellness and fitness should help physical education become an integral part of total education curricula. Schools should be equipped with relevant facilities and equipment necessary for improving movement skills as well as fitness among school children. Parents, teachers, guardians and other stakeholders in education, sports and health should make efforts to ensure that physical education programs are not only part of the curricula but also a compulsory component of education programmes.

Education should be given to all people at all levels on the essence and impacts of overweight and obesity to the children and adults. That can be done by using various Medias such as newspapers, radios, and televisions broadcasts. The measure will help in raising awareness to every parent, guardian and teacher at his/her field, and will discourage the prevalence of condition in their families and work places.

There is also a need to raise community awareness on the type of foods they provide to their children and frequencies of feeding them. That does not mean that children should be provided with little or non-nutritious foods, but there should be control of calories given to children in relation to activities they engage in.

6.3.2 Recommendations for Policies

Policies on sports and physical education should be corrected or restated so that they incorporate criteria for all children of all ages in sports and health related activities. The policy statement should provide an open room for parents, guardians and stakeholders in education to debate on how to develop children's interests towards physical activities, sports and development of good sportsmanship.

Education policies should also put sports and leisure activities as a compulsory component of education, since they have an important attribute in development of the whole human body. Leisure activities and exercises are very important component in development of the child's physical, mental and intellectual characteristics (Rowland, 1990). Therefore, policies on education should view physical education and sports as a foundation stone towards children with good body health and minds, together with well developed intellectual and physical capabilities.

Policies on health and human welfare should focus on development of the generation that is free from cardiovascular diseases and other chronic diseases, which are by-

products of overweight and obesity. Since childhood obesity persists to adulthood, policies should focus on elimination of the problem at the childhood age. Treatment of diseases resulting from overweight and obesity is reported to be expensive. Thus effort should be done to control the problem among school children.

6.3.3 Recommendations for Further Research

A more advanced method to study the impact of overweight and obesity on children's learning behaviours and outcomes need to be explored. Such method may include conducting a longitudinal study that will help to get systematic progress of overweight and obese children.

Another study can be done to investigate the mechanism that makes overweight and obese children to underperform in academics. This can involve serological or neurological analysis to determine the impacts that overweight and obesity press on overall child's body make-up.

A study to identify the type of exercises that can effectively work out overweight and obesity among school children within a limited range of time is needed. For this case, an experimental study with effective diet management between the experimental group and control group is suggested.

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Appendix A

Pupils' Questionnaires

This study is intended to investigate the extent to which overweight and obesity is a challenge among primary school children in Kinondoni and Njombe districts. Data provided in this questionnaire will be used for reference only and remain confidential. So feel free to disclose all the information you have concerning overweight and obesity at your home and school.

I. PERSONAL INFORMATION

1. Name of school ..... District, ... Village/street.....
2. Gender..... (ma/fe), weight…….....height……....skinfold (biceps)……..... (triceps)……. (Scapula)…… Age……...

3. Put a tick on what you possess at home (√)
   a. Car, ( )
   b. TV, ( )
   c. Computer, ( )
   d. Washing machine, ( )
   e. Exercises equipment, ( )
   f. Electric cooker, ( )
   g. Others (mention) .....……

4. What mean of transport do you use to school?……...choose the correct letter.
(a) Family car
(b) On foot
(c) Public transport
(d) School bus

II. INFORMATION ABOUT PARENTS

Please choose the correct answer from brackets to fill in the blanks;

1. Who do you live with…….. (father, mother, father and mother, uncle, aunt, sister, brother, grandfather, or grand mother)
2. How is your father's body morphology?……(fat, medium or lean)
3. How is your mother's body morphology?…… (fat, medium or lean)
4. Is there anybody in your clan who is fat? ……(yes/no)
5. What is your father's occupation? ……. What is your mother's occupation? …

III. INFORMATION ABOUT FOOD

1. What comprises your meal? **(put a tick (√) for each food component you get).**
   a. **Breakfast:**
      i. Fruits ( )
      ii. Blueband ( )
      iii. Loams of bread ( )
      iv. Food leftovers ( )
      v. Cassava/potatoes ( )
      vi. Milk ( )
      vii. Groundnuts ( )
      viii. Never gets breakfast ( )

b. **Dinner:**
   i. Green vegetables ( )
   ii. Beans ( )
   iii. Fried chicken ( )
   iv. Fried beef ( )
   v. Fish ( )
   vi. Canned foods ( )

2. What do you eat when at school? **(put a tick (√) against anything you eat at school)**
   a. chocolates ( )
   b. Ice creams ( )
   c. Breads ( )
   d. Groundnuts ( )
   e. Chew gums ( )
   f. I get lunch ( )
   g. I eat nothing ( )
3. How many meals do you get per day? …… (**choose the correct latter**)
   a. One
   b. Two
   c. Three
   d. Four

IV. HOME RESPONSIBILITIES

1. Are you a sportsperson…? (if the answer is **no** skip question 2, 3&4)
2. What kind of sports do you like most? (put a tick (√) against a bracket for each sport you like)
   a. Rope jump ( )
   b. Athletics ( )
   c. Ball games ( )
   d. Gymnastics ( )
   e. Swimming ( )
   f. Throws ( )
   g. Tag of war ( )
3. Where do you get a chance to play...? (school, home, both school and home)
4. Does your school give you an opportunity to participate in sports...? (Yes/No)
5. In what activities do you engage in after school hours? **Put a tick in brackets (√) against the activity you engage in.**
   a. Fetching firewood ( )
   b. Tuition ( )
   c. Self studies ( )
   d. Sports ( )
   e. Fetching water ( )
   f. Gardening or farming ( )
   g. Watch video/TV ( )
   h. Play computer games ( )
   i. Visiting friends ( )

6. Do your parents like sports...? (Yes/No)
7. Do you get permission from parents to participate in sports……(Yes/No)

V. ACADEMIC INFORMATION

1. What subjects do you like most? (**underline all subjects you like**)
    a. Science
    b. Sports and vocational skills
    c. Arts
    d. Culture
    e. Others, (mention) ……..
2. What position do you hold in your class, in academic subjects? What is your average pass marks (A, B, C, D, F). Tick against the correct grade you get.
3. Is overweight and obesity among children a good health condition?.....(Yes/No).
4. What problems do overweight and obese children experience at your school? (**underline the correct answer**)
    a. Recurrent fevers
    b. Sleeping in classroom
    c. Truancy
    d. Can't participate in sports
    e. Bullied and teased
    f. There are no problems

Thank you for your participation![a]

[a] Kafyulilo, A. C, University of Dar es salaam

Appendix B

Pupils' Focus Group Discussion Guide

This study is intended to investigate the extent to which overweight and obesity is a challenge among primary school children in Kinondoni and Njombe districts. Data collected during this discussion will be used for reference only and remain confidential. So feel free to disclose all the information you have concerning overweight and obesity among children.

1. Have you ever seen children who are overweight?
    - Are these children present at your school?
    - Do you like to be overweight? Why?
2. What are advantages of overweight and obesity among kids?
    - Are there any disadvantages?
    - Mention them.
3. Is there a tendency of children teasing or bullying overweight and obese children?
    - What are characteristics of bullying behaviour that exist in your school? (For example, do you call bad names, abuse them…)
    - How do you cooperate with overweight and obese children in extracurricular activities and in the classroom?
4. What do you consider to be causes of overweight and obesity among children?

(For the approved overweight and obese children)

5. Is there any problem that you experience on being overweight?
    - Can you mention some of the problem that you experience?
6. Is there any bullying and teasing behaviour against overweight and obese children at your school?
    - If yes, how is it done?
7. How do you feel when they call you names like "Bonge", "kipipa" …?
    - Do you think that those names and other bullying behaviour that prevail at your school affect your learning behaviour and outcomes?
    - What performance grades do you get in examination?
    - Do you think you deserve grades you get?
8. What problems do you face when you are in the classroom that you think are caused by your being overweight and obese?
    - Do you think that your weight status is a barrier to you in anyway?
9. How your participation in extracurricular activities is (for example sports)?
    - What supports do you get from your friends while in sports and other physical activities?

Thank you for your participation in this study[b]

[b] Kafyulilo A.C., University of Dar es salaam

Appendix C

Teachers' Interviews

This study is intended to investigate the extent to which overweight and obesity is a challenge among primary school children in Kinondoni and Njombe districts. Data collected during our discussion will be used for reference only and remain confidential. So feel free to disclose all the information you have concerning overweight and obesity at your home and school.

1. Does your school have children who are overweight and obese?
    a. How many are they? Please give me an estimate ……
    b. Which sex has more children than the other?
    c. Which age is the most affected?

2. Do overweight and obese children face any problem?
    a. If yes, why and if no, how?
    b. How is attendance of overweight and obese children in the classroom?

3. Do you think that being overweight and obese can affect children learning behaviours and outcomes in the classrooms?
    a. Can overweight and obese children stay in the classroom from the beginning of the period to the end?
    b. What can you say about these children's academic ability?
    c. Can you give the estimate of grades that overweight and obese children get in the examinations?

4. As a teacher, how can you describe performance for the children who are overweight and obese?
    a. If they perform well, explain how well?
    b. If they perform poorly, explain why?
    c. Are there problems that you experience from having overweight and obese children in your school?

5. Does your school have a policy for physical education, and sports for children?
    a. How many days per week do your children attend in sports and physical activities?
    b. How can you tell about participation of overweight and obese children in sports and physical activities?
    c. How can you describe availability of sports equipment and facilities in your school?
6. In your own opinion, what do you think are reasons for many of today's children being overweight and obese?
7. What should be done to overcome overweight and obesity at childhood level?

Thank you very much for accepting to participate in this study [c]

Kafyulilo A.C., University of Dar es salaam

Appendix D

Number of Children and their Weight Status in both Rural and Urban Settings (BMI Results)

Weight status	Location	
	Rural	Urban
Underweight	49(59.76%)	33(40.24%)
Normal weight	47(51.65%)	44(48.35%)
Overweight	4(22.22%)	14(77.78%)
Obesity level 1	0(0.00%)	8(100%)
Obesity level 2	0(0.00%)	1(100%)

Source: Field Data (2008)

Appendix E

Percentage of Children According to their Weight Status and Performance Grades in the Classroom

Weight status	Percentage of children in each grade score				
	A	B	C	D	F
Underweight	42(46.15%)	29(48.33%)	9(29.03%)	2(16.667%)	0(0.00%)
Normal weigh	46(50.54%)	26(43.33%)	11(35.48%)	1(25.00%)	0(0.00%)
Overweight	2(2.20%)	3(5.00%)	8(25.80%)	5(41.67%)	0(0.00%)
Obesity level	1(1.09%)	2(3.33%)	3(9.68%)	1(8.33%)	1(16.67%)
Obesity level	0(0.00%)	0(0.00%)	0(0.00%)	1(100.00%)	0(0.00%)

Source: Field Data (2008)

Appendix F

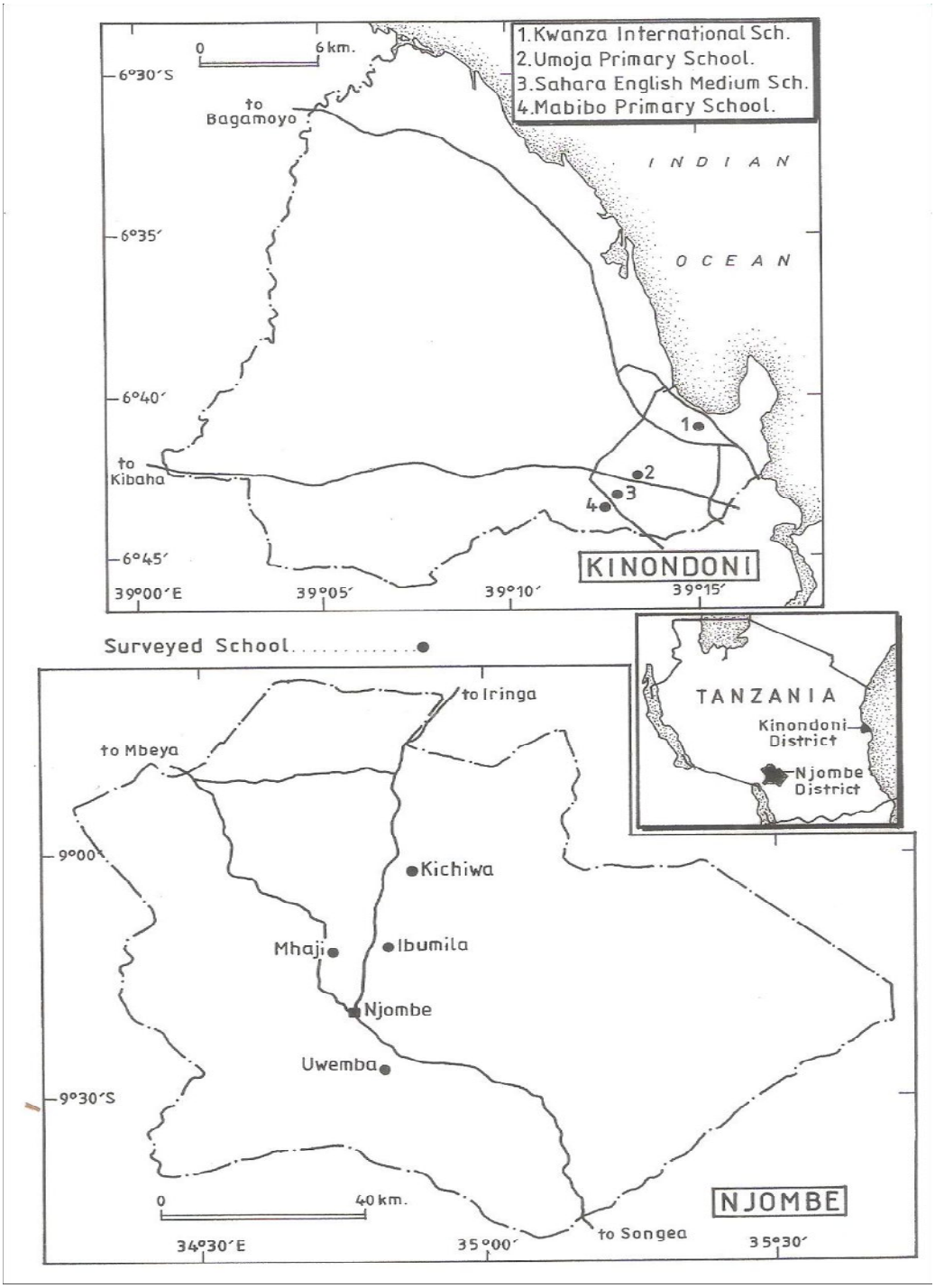
Factors Causing Overweight and Obesity among School Children and their Level of Significance

Factor	Weight status	Good	Moderate	Poor		Chi-Square sig.
Economic status	Underweight	8(9.76%)	17(20.73%)	57(69.51%)		
	Normal weight	19(20.88%)	16(17.58%)	56(61.53%)		
	Overweight	8(44.44%)	5(27.78%)	5(27.78%)		0.007
	Obesity level 1	2(25.00%)	3(37.50%)	3(37.50%)		
	0besity level 2	0(0.00%)	1(100.00%)	0(0.00%)		
		Poor	**Good**			
Quality of transport	Underweight	76(92.68%)	6(7.31%)			
	Normal weight	76(85.39%)	13(14.60%)			
	Overweight	9(52.94%)	8(47.06%)			0.000
	Obesity level 1	3(37.5%)	5(62.5%)			
	0besity level 2	0(0.00)	1(100%)			
		Fat	**Normal**	**Lean**		
Father's body	Underweight	11(13.41%)	48(58.53%)	16(19.51%)		
	Normal weight	17(18.68%)	56(61.53%)	13(14.28%)		
	Overweight	6(33.33%	9(50.00%)	1(5.55%)		0.569
	Obesity level 1	1(12.50%)	7(87.50%)	0(0.00%)		
	0besity level 2	0(0.00%)	1(100%)	0(0.00%)		
		Fat	**Normal**	**Lean**		
Mother's body	Underweight	21(25.60%)	46(56.09)	9(10.97)		
	Normal weight	23(25.27%)	53(58.24%)	12(13.18%)		
	Overweight	4(22.22%)	10(55.55%)	4(22.22%)		0.785
	Obesity level 1	1(12.50%)	7(87.50%)	0(0.00%)		
	0besity level 2	0(0.00%)	1(100%)	0(0.00%)		
		Bad	**Good**			
Household occupation level	Underweight	46(56.09%)	36(43.90%)			
	Normal weight	42(46.15%)	49(53.84%)			
	Overweight	3(16.66%)	15(83.33%)			0.002
	Obesity level 1	0(0.00%)	8(100%)			
	0besity level 2	0(0.00%)	1(100%)			
		Bad	**Good**			
Nutrition	Underweight	30(36.58%)	52(63.41%)			
	Normal weight	22(24.17%)	69(75.82%)			
	Overweight	2(11.11%)	16(88.88%)			0.043
	Obesity level 1	0(0.00%)	8(100%)			
	0besity level 2	0(0.00%)	1(100%)			
		Very active	**Active**	**Moderately active**	**Inactive**	
Physical activeness	Underweight	46%	51.10%	42.10%	30.20%	
	Normal weight	51.50%	40.40%	49.10%	42.90%	
	Overweight	3.00%	6.40%	8.80%	14.90%	0.005
	Obesity level I	0	2.10%	11.10%	4.00%	
	Obesity level II	0	0	0	2.00%	
		Bad	**Good**			
Parent care	Underweight	11(13.41%)	71(86.58%)			
	Normal weight	14(15.38%)	77(84.61%)			
	Overweight	2(11.11%)	16(88.89%)			0.778
	Obesity level 1	0(0.00%)	8(100%)			
	0besity level 2	0(0.00%)	1(100%)			

Source: Field Data (2008)

Appendix G:

A Map of Kinondoni and Njombe Showing the Surveyed Schools



Source: Cartographic Unit, Department of Geography (2008)