COMPARISON OF THE PREVALENCE AND LEVEL OF AWARENESS OF UNDERWEIGHT, OVERWEIGHT AND OBESITY AND ASSOCIATED FACTORS AMONG ADULTS IN MOROGORO

BY

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ABSTRACT

The study was carried out to compare the prevalences and level of awareness of underweight, overweight, and obesity and their associated factors among adults. The study was carried out in Morogoro Region (Morogoro Urban and Morogoro Rural districts). A cross- sectional survey design was used and data were collected using a structured questionnaire for information regarding awareness, life style, and eating habits of respondents and a bathroom scale and stadiometer for measuring BMI. The sample population of 240 adults of which 120 males and 120 females were selected from each district. The data collected were analysed using Statistical Package for Social Sciences (SPSS) computer program. The overall results showed a significant ($P \leq 0.01$) difference between mean BMI of respondents in Urban 28.27 ± 8.23 and 25.50 ± 4.80 in Rural districts. Prevalence for underweight was 0.8% for Urban and 6.7% for the Rural district. The prevalence of morbidly obese was 11% in Urban district and none in the Rural district. The difference was significant ($P \leq 0.01$) between the two places. Also the results showed that 8.3% males and 10% females were morbidly obese in Urban district whereas no respondent was observed to be morbidly obese in the Rural district. The results showed that both in Urban and in Rural districts people who were married tended to have significantly ($P \leq 0.01$) higher BMI than those who were unmarried. Level of awareness of obesity and its effects on health amongst people within Morogoro Urban was significantly ($P \leq 0.01$) higher than in Morogoro Rural district. The study established a clear association between overweight, obesity and diseases such as heart attack and hypertension among adults in the Urban district. Furthermore, it was observed that BMI was significantly ($P \leq 0.01$) related to income in both districts. The study suggested that there is a need for public awareness on effects of underweight, overweight and obesity throughout the country.

DECLARATION

I, CAROLYNE C. RUHEMBE, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and has never been submitted nor concurrently being submitted for a higher degree award in any other university.

29/10/2008

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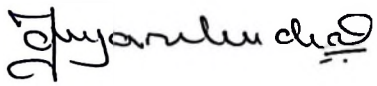
Date

The above declaration is confirmed.



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Date

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DEDICATION

This work is dedicated to my beloved mother Ruth Faith Ruhembe and my beloved father Mr. Charles Ruhembe without whom I would not have been where I am now. May God bless them.

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LIST OF ABBREVIATIONS

AED	Acute Energy Deficiency
BMI	Body Mass Index
CDCP	Centre for Diseases Control and Prevention
CSPD	Child Survival Protection and Development
DHES	Department of Home Economics Studies
df	Degrees of freedom
HDL	High Density Lipoprotein
Kcal/day	Kilocalories per day
Kg	Kilogram
LDL	Low Density Lipoprotein
M^2	Meter squared
PEM	Protein Energy Malnutrition
P-value	Pearson correlation value
SPSS	Statistical Package for Social Science
TEF	Thermic Effect of Food
TFNC	Tanzania Food and Nutrition Centre
URT	United Republic of Tanzania
USA	United States of America
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Underweight or Acute Energy Deficiency (AED) is regarded as a state of negative energy balance i.e. energy intake is less than energy expenditure so that despite changes in metabolic efficiency or physical activities patterns there is a progressive loss of body weight and body energy stores (Shetty and James, 1994).

Overweight and obesity are conditions of abnormal or excessive fat accumulation in adipose tissues, to the extent that health may be impaired (WHO, 2000). They occur when a person takes in more calories than the body uses and the extra calories are stored as fat cells (adipose cells). The underlying causes of overweight and obese are the undesirable positive energy balance and weight gain (Willett, 1995).

The common characteristic among obese people is that usually, they consume excess foods and do minimal physical exercises, while for underweight individuals they appear to consume less calories than the activities performed and hence appear to be expending much energy and hence decrease energy stores. The prolonged positive energy balance causes fat accumulation in the body. However, the amount of excess fat, its distribution within the body, and the associated health consequences vary considerably between obese individuals (Popkin, 1994).

Overweight and obesity are common problems among people in the developed countries but nowadays there is emerging epidemic of non-communicable diseases associated with obesity which are adding to the burden of malnutrition in developing countries (Hawkes *et*

al., 2000). A trend in the national status for developing countries that are undergoing rapid economic growth indicates a decrease in Protein Energy Malnutrition (PEM) with an associated rise in overweight and obesity prevalence (Berrios, 1997). The advent of urbanization in developing countries including Tanzania has led to changing of diet and activity patterns resulting to increasing incidences of overweight and obesity in urban areas (Schmidhuber and Shetty, 2004) and diet related chronic diseases, the treatment of which are costly but prevention possible (TFNC, 1993). Women generally have higher rates of obesity than men, although men may have higher rates of overweight (Ball, 1993).

Several factors have been identified as the causative agents of overweight and obesity. These include hormones, high adipose cells counts, heredity, defective metabolic mechanism, large fat cells, brown fat, lack of physical exercise and overeating. But the most common and main cause is the consumption of calories in excess of the normal body requirement (Antia, 1989).

Underweight, overweight and obesity can be detrimental to good health and well being of an individual. The complications such as cardiovascular diseases, stroke, high blood pressure, metabolic disorders, physical disabilities, respiratory problems, psychological problems, and low life expectancy have been associated with overweight and obesity. Also underweight can lead to poor work performance and compromised immune system (Shills *et al.*, 1994). It was reported that cardiovascular diseases account for more than three quarters of the total number of deaths that occur due to non-communicable diseases in low and middle-income countries (Charlottesville, 2000).

1.2 Problem statement and justification

Underweight, overweight and obesity are growing to be social, health and economic problems. Once established most of the conditions are not easily reversible and their

management is costly. Thus the diseases associated with those three constitute an immense and growing health problem and imposing additional economic and health burden in developing countries especially in sub-Saharan countries, Tanzania inclusive. It has been reported that in many developing countries overweight and obesity co-exist with under nutrition. Therefore efforts to combat both obesity and under nutrition should go together. Moreover, due to lack of detailed risk data for the various health problems associated with overweight and obesity in this country as problems of under nutrition there is a need to address these problems and their causes (WHO, 2000).

Furthermore, deaths caused by diseases associated with underweight, overweight and obesity are high. In Tanzania a study which was done by Kavishe *et al.* (1985) showed that 29.5% of women in the rural had a BMI of <20 showing underweight and the reasons being excessive workload, lack of enough foods to eat, walking long distances and poor traditional farming tools which are very laborious and energy consuming.

In Tanzania few studies have reported the prevalence of obesity and its causal factors. However, results from studies done in selected population indicated that prevalence of obesity is increasing and high among people with high and low socioeconomic status respectively. For instance, the prevalence of obesity in Tanzania in the year 2000 was 7% among men and 20% among women as stated by Jacobsen (2000). Also it has been reported that, non communicable diseases associated with obesity account for about 59% of premature deaths due to heart diseases, stroke, cancer, diabetes and other diseases. Worldwide, obesity account for about 40% of all deaths in developing countries (Schmidhuber and Shetty, 2004).

A survey which was conducted by Mosha (2001), using the current lower cut- off points (Body mass index ≤ 25) classification methods revealed prevalence of obesity in women of Morogoro Rural and Urban to be 49% also using a cut-off points (Body Mass Index $\geq$ 19.5) classification methods revealed prevalence of underweight to be 4% in the rural district . Moreover, the study conducted by Nyaruhucha *et al.* (2003) found the prevalence of 25% of obesity among different age groups in four different institutions in the Morogoro municipality. The main risk factors were overeating, sedentary life style and lack of physical exercises. The study found that overweight and obesity's prevalence rates and level of awareness are still confined to few people and thus majorities are still ignorant of their associated problems.

In view of the above background information about the prevalence and causes of underweight, overweight and obesity, of which their information in Tanzania are so much limited, the objective of this study was to determine and compare the prevalence and level of awareness of underweight, overweight and obesity and their associated factors among adults in Morogoro Rural and Urban districts. The results will be useful in identifying adult groups at high risks of underweight, overweight and obese. It will also assist in stimulating awareness among people about underweight, overweight and obesity. It will also assist in planning of Preventive Health Care and Nutritional Education programs aimed at promoting health and nutritional status in Morogoro Region.

1.3 Objectives

1.3.1 Main objective

To determine and compare the prevalence and level of awareness of underweight, overweight and obesity and their associated factors among adults in Morogoro Urban and Rural districts.

1.3.2 Specific objectives

i. To assess current nutritional status of men and women in Morogoro Urban and Rural districts.

ii. To determine the prevalence of underweight, overweight and obesity.

iii. To determine the prevalence of diseases associated with underweight, overweight and obesity.

iv. To determine the socio-economic and cultural factors that influence underweight overweight and obesity.

v. To assess awareness of subjects on underweight, overweight and obesity and their effects on health.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definitions of underweight, overweight and obesity

Underweight or Acute Energy Deficiency (AED) is regarded as a state of negative energy balance i.e. energy intake is less than energy expenditure so that despite changes in metabolic efficiency or physical activities patterns there is a progressive loss of body weight and body energy stores (Shetty and James,1994).

Garrow (1988) defined obesity as a condition of abnormal or excessive fat accumulation in adipose tissues to the extent that health may be impaired, while overweight means that a person is too heavy for weight. Obesity in man is the result of an imbalance between energy intake and expenditure, in which excess energy is accumulated as excess fat in the body (Swinburg, 1996).

2.2 Acute energy deficiency, overweight and obesity as risk factors

Negative energy imbalance causes health and body function to be impaired over a period of time which eventually can lead to death. Low Body Mass Index (BMI) has shown to imply proneness to illness with for example a compromised immune system and this has serious implications on health. Also underweight is associated with lowered work capacity. A low BMI has been found to be associated with poor lactation performance and poorer growth in infants (Kusin *et al.*, 1994).

An estimated 300,000 deaths per year may be attributable to obesity in USA and the risk of death rises with increasing weight. Even moderate weight excess (4.536 or 9.0720 kilograms) for a person of average height increases the risk of death, particularly among

adults aged 30 to 64 years. Individuals who are obese (BMI > 30) have a 50 to 100% increased risk of premature death from all causes compared to individuals with a healthy weight (Van Noord, 1990). The incidence of heart disease (heart attack, congestive heart failure, sudden cardiac death, angina pain, and abnormal heart rhythm) is increased in persons who are overweight or obese (BMI >25) as reported by Jousilahti (1996). High blood pressure is twice as common in adults who are obese than in those who are at a healthy weight. Obesity is associated with elevated triglycerides (blood fat) and decreased High Density Lipoprotein (HDL) cholesterol which is called good cholesterol (Pi Sunyer, 1993).

2.3 BMI distribution in adults population

BMI is a measure of weight proportionate to height and is calculated as weight in kilograms per height in meters squared (Kg/m^2). BMI is considered a useful measurement of the amount of body fat. Occasionally, some very muscular people may have a BMI in the overweight range. However, these people are not considered overweight because muscle tissue weighs more than fat tissue. Generally, BMI can be considered an effective way to evaluate whether a person is underweight, overweight or obese (Gordon, 2003).

2.3.1 Criteria for BMI measurement

The classification of weight normality is based on two principal measurements: height without shoes and weight with minimal clothing. The weight / height^2 called the BMI, is then calculated, with weight expressed in kilograms and height in meters. The population whether male or female can be divided for degree of underweight, normal, overweight or obese (Gordon, 2003).

Low BMI's have shown to imply proneness to illness with for example a compromised immune system and this has serious implications on health. The BMI range of 20 to 24.5 classified as normal coincides with normal mortality ratio. The mortality ratio begins to increase at BMI levels above 25, and it is here that health professionals and nutritionist should be concerned. Although the mortality in overweight 25 to 29.9 is not great, it is of importance because it is transitional to grades I (obese) and II (morbid obesity), which truly create health risks for the individuals (Xavier, 1988).

2.3.1.1 How obesity is diagnosed

Measuring body fats and not just body weight determines obesity. In this regard, two key measures are used to determine if a person is either overweight or obese. BMI is currently the best measure of body fat. It is a standard 'tool" used to judge body weight and the amount of body fat a person has. BMI calculates a weight- to- height ratio and assigns a value to the result. The higher the BMI value, above the normal range, the greater the degree of obesity. Guidelines define overweight as a BMI between 25 and 29 kg/m^2 and obesity as a BMI greater or equal to $30kg/m^2$ (Beaton *et al.*, 1990).

2.3.1.2 Fat distribution

There is a relationship between obesity and specific diseases such as adult-onset diabetes and hypertension. This is contributed much by location of fat in relation to the amount of adipose tissues in the body. The location of body fat has been used to delineate three body types: Gynoid (pear shape), intermediate, and android (apple shape). Clinical studies have shown that adipocyte size, location and metabolism are related to fat distribution. An excess of large fat cells in the upper body explains the increase risk of diabetes.The distribution of fat in body central part (excess subcutaneous fat in the abdominal area) and

abdominal fat distribution (excess intra abdominal fat) can be shown to have positive associations with the cardiovascular diseases (heart diseases, stroke, diabetes, and the related risk factors such as LDL (Low Density Lipoprotein), cholesterol and insulin resistance. Positive association is also seen with some females cancers, gallstones and some psychosocial diseases. Negative associations are rare and have only been suggested so far for varicose veins and diseases of the weight bearing joints (DHES,1996).

Men tend to have more central or abdominal fat distribution profile than women and this is associated with predisposition to several of the metabolic diseases. Other factors influencing the fat distribution pattern of men and women are age, race, degree of fatness, parity and social factors. Genetic factors play a greater role in determining fat distribution than they do in determining total fatness.The amount of fat around the belly of an individual is an important indicator in assessing one's disease risk. A waist measurement of more than 40 inches in men and more than 35 inches in women is indicative of greater risk and these corresponds to a BMI value of between 25 and 34.9 Kg/m^2 (Karen, 2000).

2.4 Etiology of underweight, overweight and obesity

2.4.1 Energy

Acute energy deficiency or underweight is a state of negative energy balance i.e. energy intake is less than energy expenditure which causes lowered metabolic efficiency and physical activities patterns, and there is a progressive loss of body weight and body energy stores. As the energy imbalances continue, health and body function will be impaired over a period of time leading to death (Wardlaw and Kessel, 2001). Energy needs are met by food intake, represented by a number of kilocalories eaten each day. Obesity is a condition of abnormal or excessive fat accumulation in adipose tissues to the extent that health may be impaired, so is a consequence of an energy imbalance that means energy

2.4.2.1 Basal metabolism

This represents the minimum energy expended in a fasting state (12hrs to keep a resting, awake body and alive in a warm quite environment). And this requires about 60-70% of total energy use by the body (Gordon and Margaret, 2001). The process involved includes maintaining a heartbeat, respiration, temperature and other functions. It does not include energy used for physical activity or food digestion. The amount of energy used for basal metabolism depends primarily on lean body mass; hence basal metabolism is generally higher in people with greater amount of lean body mass than in those with large proportions of fat mass. The participating tissues such as muscle, liver, brain, and kidney-show high metabolic activity at rest and have high energy needs (CDCP, 2005).

Other influences that determine basal metabolism include the following: the amount of body surface (the greater the surface area the greater the heat loss); gender (males average higher energy use because of greater lean body mass); body temperature (fever increases body metabolism); thyroid hormones increases basal metabolism; aspects of nervous system activity; such as epinephrine release (increase basal metabolism). Others are age (basal metabolism rate falls as we age through adulthood, it declines about 2% each decade past age 30 as activity -metabolizing cells slowly and steady decrease); Pregnancy (increases basal metabolism); Caffeine and tobacco use (increase basal metabolism), nutritional state (eating less slows basal metabolism rate in short term, a low energy intake decreases it by about 10 to 20% or about 150 to 300 kcal/day (Shills *et al.*, 1994).

2.4.2.2 Energy for physical activity

Physical activity increases energy expenditure above and beyond basal energy needs by as much as 25 to 40 times. In choosing to be active or inactive, we determine much of our total energy expenditure for a day. Unlike basal metabolism energy expenditure from

physical activities varies widely among people. Climbing stairs rather than riding the elevator ,walking rather than driving, and standing in a bus rather than sitting increases physical activities and hence energy use (Wardlaw and Kessel, 2001).

2.4.2.3 Thermic effect of food

The energy that the body uses to digest, absorb and further process food nutrients is Thermic Effect of Food (TEF). The total amount of thermic effect of food varies among individuals. The thermic effect value for carbohydrate - rich or a protein - rich meal is higher than for a fat rich meal. This is because it takes less energy to transfer absorbed fat into adipose stores than to convert glucose into glycogen or to metabolize excess amino acids into fats (Gordon and Margaret, 2001).

In addition, large meals show higher values for TEF than the same amount of food eaten over many hours. Some possible mechanisms for this phenomenon include changes in central nervous system activity, greater production and release of hormones (such as insulin) and enzymes, and the rate of absorption and storage of macro nutrients (Gordon and Margaret, 2001).

2.4.2.4 Non exercise activity thermogenesis

Non exercise activity thermogenesis represents the increase in non-voluntary physical activities triggered by overeating. This activity includes fidgeting, maintenance of muscle tone, and maintenance of body posture when not lying down. The increase in food intake may lead to an increase in sympathetic nervous system activity, which in turn increases fidgeting. Overall, a sedentary person uses 70 to 80% of energy for a combination of basal metabolism and the thermic effect of food. The remainder is used for physical activity and non exercise activity thermogenesis. The extra energy which is not used by all energy

expenditures is the one which is converted to fat and being stored as adipose tissues (WHO, 2000).

2.5 Factors which influence overweight

Factors which may influence the occurrence of overweight and obesity include, but not limited to, the following:

2.5.1 Genetics

Changes in both dietary habits and physical activity create an environment in which a person predisposed to weight gain may become obese. Such predispositions include either a genetic factor, as seen in the Pima Indians in Arizona (United States), or under nutrition early in life. The Pima Indians living in the United States are morbidly obese and suffer from high rates of diabetes and hypertension. This is in sharp contrast with their genetic counterparts living in Mexico where body weight and chronic disease prevalence are normal. It has been suggested that the Pima Indians possess a "thrifty gene" that predisposes them to weight gain when environmental conditions such as sufficient food supply, high-fat diets or decreased physical activity are favorable (Saw and Rajan, 1997).

In addition, recent work has shown a correlation between nutritional stunting (growth retardation) attributed to under-nutrition during childhood) and later obesity in developing countries. Studies have shown that a predisposition toward obesity can be inherited. The chance of being overweight increases by 25 percent if one or both parents are obese. Where a person carries weight - the hips or around the middle - is also strongly influenced by heredity. If one or both parents are obese, the chances of being overweight are greater. Genes may affect the amount of body fat store and where that fat is distributed. But, genetics doesn't guarantee that one should be obese (Popkin *et al.*, 1996; Schroeder *et al.*, 1999).

2.5.2 Metabolic factors

How a particular person expends energy is different from how someone else's body uses energy. Both metabolic and hormonal factors are not the same for everyone, but these factors play a role in determining weight gain. Two drives influence our desire to eat and thus take in food energy these are hunger and appetite. Hunger is our primarily physical drive to eat and is controlled by internally body mechanism (Ohlin and Roossner, 1990).

Organs such as the liver and brain interact with hormones like neuroendocrine factors, the nervous system and other aspects of body physiology to influence feeding behavior. Appetite, our primarily psychological drive to eat, is affected by external food choice mechanisms such as seeing a tempting food. Fulfilling either or both drives by eating sufficient food normally brings a state of satiety temporarily halting our desire to continue eating. Recent studies show that levels of leptin, a peptide hormone known to regulate appetite, and other peptides in the stomach, play a role in triggering hunger and producing a feeling of fullness, in a scarce or absence of the hormone may lead to overeating. It appears that some obese people do not respond to the leptin signal and so eat more (Mac. Keigue, 1996).

2.5.3 Medical problems

Uncommonly, obesity can be traced to a medical cause, such as low thyroid function, excess production of hormones by the adrenal glands (Cushing's syndrome) or other hormonal imbalances, such as polycystic ovary syndrome. A low metabolic rate is rarely a cause of obesity. A medical problem, such as arthritis, can also lead to decreased activity, which can result in weight gain corticosteroids and tricyclic antidepressants in particular, can lead to weight gain as some high blood pressure and antipsychotic medications (James *et al.*, 2004).

2.5.4 Physical activity

People living in lower socio-economic situations that have recently moved to large cities tend to find work primarily as day laborers or factory workers. They leave behind continuous, physical labor and adopt sedentary and sporadic work. While some people are able to carry out work that may actually increase their daily physical activity, this is generally not the case. A low level of physical activity has been indirectly associated with weight gain and obesity in several developed countries. It is thought that physical activity, the one controllable component of total energy expenditure, accounts for 15-30 percent of daily energy expenditure (Popkin, 1998).

Thus, a person experiencing a change in labor practices may see a decline of as much as 1 000 calories per day, which translates into more than a 50 percent reduction in physical activity. This decline in total energy expenditure, if not accompanied by a reduction in energy intake, may result in weight gain and potential obesity. Sedentary people are more likely to gain weight because they don't burn calories through physical activities (Antia, 1989).

2.5.5 Psychological factors

Some people overeat to cope with problems or deal with emotions, such as stress or boredom (Armstrong, 2003).

2.5.6 Early life

Nutritional stunting has been associated with obesity later in life in several transitional countries. Schroeder *et al.* (1999) published a report suggesting that adolescents who were stunted early in life were more likely to be overweight compared with their peers who were not stunted. Physiological reasons for these observations vary from improper muscle

development that affects substrate oxidation and physical activity to poor development of food intake and satiety controls during critical periods. Finally, stunting has been found to be associated with both metabolic and psychological risk factors for obesity (Popkin *et al.*, 1996).

2.5.7 Age

As one gets older, one tends to be less active. In addition, the amount of muscle in the body tends to decrease with age. This lowered muscle mass leads to a decrease in metabolism. These changes also reduce calorie needs. If someone doesn't decrease caloric intake as one ages, she/he is likely to gain weight (Burke *et al.*, 1990). Antia (1989) also reported that obesity tends to increase with age and is mostly likely to occur after the age of 35.

2.5.8 Pregnancy

During pregnancy a woman's weight necessarily increases. Some women find this weight difficult to lose after the baby is born. This weight gain may contribute to the development of obesity in women (Gordon and Margaret, 2001).

2.5.9 Lifestyle choices

2.5.9.1 Diet

Overeating, along with a sedentary lifestyle, contributes to overweight and obesity. These are lifestyle choices that can be affected by behavior change. Eating a diet in which a high percentage of calories come from sugary, high-fat, and refined foods promote weight gain. Lack of regular exercise contributes to overweight and obesity in adults and makes it difficult to maintain weight loss. In children, inactivity, such as watching television or sitting at a computer for a longer time contributes to obesity (James *et al.*, 2004).

Dietary changes associated with urbanization are related to the fact that rural dwellers tend to be more self-reliant in obtaining food and also tend to eat traditional diets that are high in grains, fruit and vegetables, and low in fat. Once they arrive in urban areas, these same people tend to rely more on external forces for sustenance, resulting in a shift from production of their own food to the purchase of processed foods (Popkin, 1993).

Together with these changes it has been reported that groups moving from rural to urban areas experience an increased intake of energy, sugar, refined grains and fat (Monteiro *et al.*, 1992). This dietary profile, referred to as a "western" diet, such as fast foods, contributes to weight gain and it has been reported to be associated with excessive caloric intake and obesity. High-fat foods, soft drinks, candy and desserts are dense in calories also promotes weight gain. All those foods and beverages are high in sugar and calories which can lead to diabetes, heart disease and other non communicable diseases (Popkin *et al.*, 1995; Drewnowski and Popkin, 1997; WHO, 1998).

2.5.9.2 Alcohol

Drinking alcohol adds calories to the diet; just one regular beer is about 150 calories, adding just one beer daily could cause a weight gain of more than one pound a month. Additionally, excessive drinking can stimulate appetite and makes one less likely to control portion of food (Gordon and Margaret, 2001).

2.5.9.3 Cigarette smoking

Smokers tend to gain weight after quitting. This weight gain may be partially due to nicotine's ability to raise the rate at which the body burns calories (metabolic rate). When smokers stop, they burn fewer calories. Smoking also affects taste; quitting smoking makes food taste and smells better. Former smokers often gain weight because they eat

more after they quit. However, cigarette smoking is still considered a greater threat to health (Gordon and Margaret, 2001).

2.6 Diseases associated with overweight and obesity

Overweight and obesity are major contributors to many preventable causes of death. Obesity is associated with many chronic diseases, such as diabetes, heart disease, hypertension and some forms of cancer. On average, higher body weights are associated with higher death rates (Shetty, 2000). Overweight and obesity substantially raise the risk of illness from high blood pressure, high cholesterol, type 2 diabetes mellitus, heart diseases and stroke, gallbladder disease, arthritis, sleeping disturbances, problems of breathing, and certain types of cancers. Obese individuals also may suffer from social stigmatization, discrimination, and lowered self-esteem (WHO, 1998).

2.6.1.1 Diabetes

Non insulin-dependent diabetes (type 2 diabetes) is the most common type of diabetes in the developed countries. Type 2 diabetes reduces body's ability to control blood sugar. It is a major cause of early death, heart disease, kidney disease, stroke, and blindness. Overweight people are twice as likely to develop type 2 diabetes as people who are not overweight (Shetty, 2000).

2.6.1.2 Cancer

Several types of cancer are associated with being overweight. In women, these include cancer of the uterus, gallbladder, cervix, ovary, breast, and colon. The increased incidence of these cancers is greater in those individuals with excess abdominal fat and is thought to be a direct consequence of hormonal changes. Overweight men are at greater risk for developing cancer of the colon, rectum, and prostate. For some types of cancer, such as

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colon or breast, it is not clear whether the increased risk is due to the extra weight or to a high-fat and high-calorie diet (Le Machand *et al.*, 1992).

2.6.1.3 Sleeping apnea

Sleeping apnea is a serious condition that is closely associated with being overweight. Sleeping apnea can cause a person to stop breathing for short periods during sleep and to snore heavily. Sleeping apnea may cause daytime sleepiness and even heart failure. The risk for sleeping apnea increases with higher body weights. Weight loss usually improves sleep apnea (Armstrong, 2003).

2.6.1.4 Osteoarthritis and gout

Osteoarthritis is common joints disorders that most often affects knees, hips, and lower back. Extra weight appears to increase the risk of osteoarthritis by placing extra pressure on these joints and wearing away the cartilage (tissue that cushions the joints) that normally protects them. Weight loss can decrease stress on the knees, hips, and lower back and may improve the symptoms of osteoarthritis. Possible factors underlying the relationship between obesity and osteoarthritis include mechanical stresses related to the increased load carried by the obese individuals, metabolic changes associated with increased fatness, dietary elements related to the development of obesity (Davis, 1990). Gout is a joint disease caused by high levels of uric acid in the blood. Uric acid sometimes forms into solid stone or crystal masses that become deposited in the joints. Gout is more common in overweight people and the risk of developing the disorder increases with higher body weights (Burton, 1985).

2.6.1.5 Gallbladder disease

Gallbladder disease is the most common form of digestive diseases among the obese. The risk for gallstones and cholecystectomy increases with increasing body weight. The increased cholesterol levels excreted in the bile as obesity develops appear to be linked to the development of gallstones. Gallstones occur three or four times more often in the obese than in the general population (Stampfer *et al.*, 1992).

2.7 Treatments of obesity

A wide variety of treatments of obesity are available, including dietary management, physical activity, behavior modification, pharmacological treatment and surgery. However, there is a need to control the promotion and dangerous and deliberately deceptive approaches to weight loss or control such as weight loss aids equipment, "miracle cures" and certain drugs and treatment often offered through unlicensed weight-loss (WHO, 2000).

2.7.1 Dietary management

The education of overweight patients about food and eating habits that facilitate weight control is an essential component of all weight management strategies. Dietary intake and pattern should be assessed to identify areas requiring special attention such as nutritional adequacy, meal size, meal frequency and meal timing (Bennett, 1987).

2.7.2 Pharmacological treatment

According to Bray (1993), weight-management drugs can broadly be divided into two types:

(i) Those that act on the central nervous system to influence feeding behavior, appetite and other mechanisms, and

(i) The peripherally acting drugs such as those that target the gastro- intestinal system and inhibit absorption or enhance a feeling of fullness.

Meanwhile Karen (2000) reported that there are two main classes of drugs used to treat obesity, one class decreases appetite while the other prevents dietary fat from being absorbed. These drugs are orlistat and phentermine respectively. But all these drugs should only be used under the care of a doctor.

2.7.3 Gastric surgery

Surgery is now considered to be the most effective way of reducing weight, and mainly for weight loss, in severely obese (BMI > 35) and very severely obese (BMI> 40) subjects Kral (1995). During a 4-year period of observation estimated that, on the basis of weight/kg of weight lost, surgical treatment is comparatively less expensive than any other treatment. This treatment should be a last resort and for people who are severely obese and have been unable to lose weight after many attempts with dieting, exercising and/or behavioral change and do have medical problems that are likely to be facilitated by the weight loss (Antia, 1989).

2.7.4 Reduced daily calorie intake

Antia (1989) suggested that the aim of reducing calorie intake is to produce a calorie deficiency, which then results in the utilization of fat stored in the adipose tissues to meet body calorie needs. Reducing diet should normally provide only about half the daily calorie requirement. Astrup (1997) found that a reduction of 10% in fat energy could produce an average of 5kg weight loss in obese subjects.

2.7.5 Physical activity and exercise

The combination of exercise and dieting is more effective than either method alone in promoting fat loss (Skender, 1996). While exercise limits the promotion of lean tissue lost in stemming regimens and limits weight regain, physical activity may favorably affect body fat distribution. Antia (1989) recommended that moderate exercise could help to expend more energy and bring about a decrease in body weight in obese persons consuming a reducing diet. For example, walking 3 miles a day will require 300 kcal of energy.

2.7.6 Behaviour modification

The primary goal of behavioral treatment is the improvement of eating habits in terms of what to eat, where to eat, when to eat and how to eat. The level of physical activity is also an important facet in this treatment. Behavioral treatment is considered to be an essential component of any adequate obesity-treatment programme (Wilson, 1994).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the study area

3.1.1 Geographic location and size

The study was conducted in Morogoro region (Morogoro municipality and Morogoro rural district). Morogoro region is among the coast regions and is situated two hundreds kilometers from Indian Ocean. The region lies between 5° 58" and 10° 0" latitudes south of equator and between the longitudes 35° 25"and 35° 30"east of Greenwich. The Municipal lies between 5 ° 00" and 7° 40' longitudes and 37° 10' and 38° 33' east of Greenwich meridian. The Municipal occupies a total area of 260 sq. km with no large water bodies. Morogoro Rural district is located 38°30" and 38° 00" south of equator and latitude 4°30 " and 6° 00 east of Greenwich. It occupies a total of 19.036 km^2 and 20 km^2 water bodies (Morogoro Region, 2000).

3.1.2 Climatic condition

The region's mean relative humidity is about 66 percent and it drops down as far as 37 percent. The total average annual rainfall ranges from 821mm to 1050mm. Long rains occur between February and April. Morogoro Region has the average annual temperature which varies between 18^{0}C on mountains to 30^{0}C in river valleys. In most part of the region, the average temperatures are almost uniform at 25^{0}C. In general the hot season runs from July to September.

3.1.3 Population, economy and health facilities

Morogoro Municipality has 19 wards and total populations of 228, 863 where by 113, 639 are men and 115, 224 are females. Morogoro Rural district has 25 wards and populations

of 263, 920 inhabitants of whom 129,285 are males and 134,635 are females. Average individual annual income per capita in Morogoro Region was about 214 US $ which is 171, 530 Tsh in the year 2000. Moreover, about 62% of the population in the region depends on agriculture and main crops produced are maize, paddy, cassava and sorghums as food crops. The main cash crops produced are sugarcane, cotton and oil seed (URT, 2003).

The districts have a total of six hospitals of which three are on each part, twelve health centers of which seven are in rural whereas five are in urban. Moreover, there are one hundred and sixteen dispensaries, thirty four are in urban and eighty four are in rural. Nutritional status of children is improving due to the efforts of CSPD programmes in the region. The proportion of households which are served by clean water sources is 95% in Urban and 69% in the Rural district. The proportion of people living in good houses (for the purpose of this study good houses are made up of fire bricks or concrete and covered with iron sheets) is 82% and poor living houses (made up with only mud and covered with grasses) is 17.30% in the Urban district. In the Rural district 58.62% had good living houses and 41.38% poor living houses. The proportion of households with toilets is 99% in Urban district and 95.21% in Rural district. The major diseases affecting Morogoro Rural and Urban districts include malaria, pneumonia, diarrhea, worms and upper respiratory infections (URT, 2003).

3.1.4 Research design

Cross - sectional survey, which consisted of asking questions to representative sample of population at a single point in time and taking measurements, was done. According to Babbie (1990), the design is useful for description purpose as well as for the determination of relationship between variables at the time of study.

3.1.4.1 Sampling procedures

The target populations for the study were men and women aged 18 to 80 years from Morogoro Urban and Morogoro Rural districts who represented Urban and Rural characteristics respectively. Systematic random sampling technique was employed starting from the district to the household level. From each district three wards were selected and these included Saba Saba, Kilakala and Kihonda for municipality as well as Tawa, Mvuha, and Lundi. Furthermore, from each ward one village was randomly selected. The procedure gave the number of the households to be studied.

3.1.4.2 The sample size

The sample formula for the sample size used in the study was according to Berenson and Levine (1999).

$$N = \frac{Z^2P^{(1-P)}}{E^2}$$

Where,

N = Desired sample

Z= Standard normal deviate at required confidence level

P= Target population estimated to have characteristics being measured

E= Level of statistical significance set

Therefore the sample size of the study was 240 adults where 120 respondents were from Urban and 120 from Rural district comprised 60 males and 60 females. One village/street from each of the six wards was selected, whereby 40 subjects were further selected from each village.

3.1.4.3 Data collection

The primary data were collected from the sample population; the instruments used were stadiometer and a bathroom scale for measuring height, and weight, and a structured questionnaire. The questionnaire was structured to have both open and close ended questions, and captured information regarding the awareness of underweight, overweight and obesity, general life style and eating habits of respondents. The questionnaires were pre-tested on 10 adult's respondents of whom 5 were males and 5 females who were not included in the study.

3.1.4.4 Assessment of nutritional status

The anthropometric variables used in the study were weight and height. Standard techniques and equipment were used to measure weight and height; height was measured by using a stadiometer to the nearest 0.1 cm while the subject was standing barefoot with feet together and with head, shoulder, buttocks and heels touching the walls. The subject was closely observed to ensure that the heels remained on the plate and the head was in the upright position during measurements. The head piece was then brought down on the subjects head and the reading taken. Age was recorded and the weight was measured by using a bathroom scale to the nearest 0.25 kg while the subject was in minimal clothing. Body mass index was calculated for each subject as the ratio of body weight (in kg) and squared height in (meters). Subjects were judged to be underweight, normal, overweight and obese using the BMI criteria (cut- off points) whereby the BMI >18.50 was regarded as underweight, BMI >18.5-24.99 regarded as normal, BMI 25-29.9 regarded as overweight, BMI >30-34.99 regarded as obese and BMI >35morbid obese (WHO 2000).

3.1.4.5 Data analysis

Data collected from the primary sources were cleaned, edited, coded and analyzed using SPSS Computer program. In this statistical package, both descriptive and inferential statistics such as frequencies, percentages, cross tabulations and Chi-square were employed to determine their descriptive distribution and relationships between variables.

CHAPTER FOUR

4.0 RESULTS

This chapter presents the results of the study conducted to compare the prevalence and level of awareness of underweight, overweight and obesity and associated factors among adults in Morogoro Rural and Urban districts.

4.1 The comparison of prevalence of underweight, overweight and obesity between Morogoro Urban and Rural districts

The overall results showed a significant difference between mean BMI of respondents in urban and rural districts with mean BMI of 28.27 ± 8.24 and 25.50 ± 4.80 respectively ($p<0.05$) (Table 1).

Table 1: Comparison of mean respondent's BMI between Urban and Rural districts

	District	Mean	t	p- value
BMI	Urban	28.27 ± 8.24	3.19	0.00*
	Rural	25.50 ± 4.80		

*Means significant at $p< 0.05$

Furthermore, the results showed a significant difference between the classification of BMI and location of respondents ($p<0.01$). Also there was a significant difference ($p<0.01$) in prevalence of morbid obesity among the respondents living in Urban and Rural districts. However, it showed non- significant difference in prevalence rate of obese, overweight and underweight among respondents living in Urban but for the Rural underweight was higher though the difference was not significant (Table 2).

Table 2: Classification and comparison of respondents BMI between Urban and Rural Districts (N=240)

	District of Respondent			
Nutritional status	**Urban**	**Rural**	**t**	**p-value**
	%	**%**		
Underweight	0.80	3.30	-1.26	0.21
Normal	40.00	45.80	-0.81	0.42
Overweight	32.50	33.30	-0.01	0.99
Obese	17.50	17.50	-0.32	0.75
Morbidly obese	9.20	0.00	3.43	0.00*
Total	**100.00**	**100.00**		

* Means Significant at $P < 0.05$
($\chi^2 = 13.288$, p-value= 0.00, df =4)

4.2 Comparison of nutritional status basing on BMI of men and women for Urban and Rural districts

One man from the urban was underweight whereas 6.70% males from Rural district were underweight. No females in both districts were observed to be underweight. Also 8.30% of males and 10.00% of females were morbidly obese in Urban area whereas no respondent was observed to be morbid obese in Rural district (Table 3).

Table 3: Classification of nutritional status according to sex of respondents in Urban and Rural districts

	Classification of Nutritional status (%)					
District	Underweight	Normal	Overweight	Obese	Morbidly Obese	Total N=240
Urban						
Males	0.8	41.70	30.00	18.30	8.30	100.00
Females	0.00	38.30	35.00	16.70	10.00	100.00
Total	**0.80**	**80.00**	**65.00**	**35.00**	**18.30**	**100.00**
Rural						
Males	6.70	46.70	33.30	13.30	0.00	100.00
Females	0.00	45.00	33.30	21.70	0.00	100.00
Total	**6.70**	**91.70**	**66.60**	**34.00**	**0.00**	**100.00**

4.3 Comparison of nutritional status between men and women of Urban and men and women of the Rural district

The comparison of nutritional status between men and women of urban shows that one man was underweight and no woman was observed to be underweight and there was a significant different ($p \leq 0.01$) between those two sexes. In the Rural district 4 men were underweight while no woman was underweight and there was a significant difference at ($p \leq 0.01$) between those two sexes (Table 4).

Table 4: Comparison of nutritional status between men and women of urban and men and women of the rural district (N=240)

Nutritional status	Men	Women			
	n	n	Total	X^2	p-value
Urban					
Underweight	1.00	0.00	1.00	0.00	0.00
Overweight	18.00	21.00	39.00	0.23	0.63
Obese	11.00	10.00	21.00	0.05	0.83
Morbid obese	5.00	6.00	11.00	0.09	0.76
Total	**35.00**	**37.00**	**72.00**		
Rural					
Underweight	4.00	0.00	4.00	0.00	0.00
Overweight	20.00	20.00	40.00	-	-
Obese	8.00	13.00	21.00	1.19	0.26
Morbid obese	-	-	-	-	-
Total	**32.00**	**33.00**	**65.00**		

4.4 The prevalence of diseases associated with underweight, overweight and obesity

The prevalence of High Blood Pressure was 12.50% for Urban and 9.16% for people living in Rural district. The prevalence of Diabetes Mellitus was 25.00% for Urban and 1.60% for rural districts. And those who didn't suffer any of those diseases in their families were 56.60% and 83.30% for Urban and Rural districts respectively. There was a significant difference ($p \leq 0.01$) between the prevalence of diseases and districts of respondents (Table 5).

Table 5: Types of diseases present in the families

District	Diseases (%)							Total
	High BP*	DM**	Cancer	Asthma	High BP and DM	Hernia	Non-Suffer	N=240
Urban	12.50	25.00	5.00	0.00	0.83	0.00	56.60	100.00
Rural	9.16	1.60	0.00	2.50	0.00	3.30	83.03	100.00

*High Blood Pressure** Diabetes Mellitus

χ^2=45.211; p-value ≤0.01; df=6

4.5 Distribution of subjects in various categories of nutritional status according to their socio-economic status

4.5.1 Nutritional status with age of respondents in Urban district

In Urban district it is shown that as people were increasing in age the BMI was also increasing until age 45 when the BMI started to decrease. Table 6 shows nutritional status of respondents according to their age groups in Urban district. Only one respondent was undernourished and was between 18-25 years old. Out of obese, 7.10% were between 18-25 years, 19.60% between 26-35 years, and 20.70% between 36-45 years. Furthermore, 25.00% who were morbidly obese were 45 and above years old.

Table 6: Nutritional status with age of respondents in Urban district

Age	Normal %	Overweight %	Obese %	Morbidly obese %	Total % N=120
18-25 Yrs	15.00	5.00	7.10	3.60	100.00
26-35 Yrs	15.83	15.83	19.60	3.90	100.00
36-45 Yrs	5.83	8.33	20.70	20.70	100.00
46-52 Yrs	1.67	3.34	14.30	0.00	100.00
53-60 Yrs	0.83	0.00	00.00	25.00	100.00
61-80 Yrs	0.00	0.00	0.00	100.00	100.00

χ^2= 36.548; df=20; p-value ≤ 0.01

4.5.2 Nutritional status with age in Rural district

The BMI was observed to decrease with increasing age of respondents as from age 53-60 only 20% of the respondents in the group were found to be overweight and no individual was obese. Moreover, it is shown that in the age group of 46-52, 23.10% were normal

46.20% were overweight and 23.10% were found to be obese. In the Rural district the respondents who were undernourished were mostly observed from the age 18-35 years which account for 4.30%. Most of the respondents who were normally nourished were in the age group of 26-35 years and accounted for about 41.30% of the age group. Also the same age group contained 37.00% of the overweight individuals and 17.40% obese. There was no association between age and BMI (Table 7).

Table 7: Nutritional status with age in Rural district

Age	Underweight %	Normal %	Overweight %	Obese %	Total % N=120
18-25 Yrs	0.00	55.60	29.60	14.80	100.00
26-35 Yrs	4.30	41.30	37.00	17.40	100.00
36-45 Yrs	4.30	47.80	21.70	26.10	100.00
46-52 Yrs	7.70	23.10	46.20	23.10	100.00
53-60 Yrs	0.00	80.00	20.00	0.00	100.00
61-80 Yrs	0.00	50.00	50.00	0.00	100.00

χ^2=11.633; df=20; p-value = 0.821

4.5.3 Nutritional status with marital status of respondents in Urban district

In Urban district people who were married tended to have significantly higher BMI than unmarried ($p \leq 0.01$). Table 8 shows that in the Urban district 28.40% of the married people were normal, 34.30% were overweight and 37.30% were obese. It is shown that one person who was underweight was single. Among the married people none was undernourished in the urban district.

Table 8: Nutritional status with marital status of respondents in Urban district

Marital status	Underweight %	Normal %	Overweight %	Obese %	Morbid obese %	Total % N=120
Single	0.80	54.00	30.20	7.50	5.70	100.00
Married	0.00	28.00	34.30	25.40	11.90	100.00

χ^2= 13.207; df=4; p-value$\leq$ 0.01

4.5.4 Nutritional status with marital status of respondents in Rural district

The study found that married subjects had significantly higher BMI's ($p \leq 0.01$) than unmarried subjects (Table 9). Among the married respondents 4.10% were undernourished while 34.20% were normal, 38.40% overweight and 23.30% were obese.

Table 9: Nutritional status with marital status of respondents in Rural district

Marital status	Underweight %	Normal %	Overweight %	Obese %	Total % N=120
Single	2.10	63.80	25.50	8.50	100.00
Married	4.10	34.20	38.40	23.30	100.00

$\chi^2=10.775$; df =4; p-value ≤ 0.01

4.5.5 Nutritional status with level of education in Urban district

Respondents who had secondary level of education comprised a big percent of well nourished people and this accounted for 52.60%. These were followed by 24.60% who were overweight and 21.10% who were obese within the same group. Among the people with college level of education 29.70% were well nourished, followed by 45.90% who were overweight and 23.30% who were obese and morbid obese within the same group. There was no association between BMI and the level of education (Table 10).

Table 10: Nutritional status with level of education in Urban district

Level of education	Underweight %	Normal %	Overweight %	Obese %	Morbid obese %	Total % N=120
Informal	0.00	28.60	42.90	14.50	14.50	100.00
Primary	0.00	26.30	26.30	42.10	5.30	100.00
Secondary	0.80	52.60	24.60	8.80	12.30	100.00
College	0.00	29.70	45.90	18.90	5.40	100.00

$\chi^2=19.919$; df=12; p-value=0.455

4.5.6 Nutritional status with level of education in Rural district

Primary level of education was observed to have 32.20% respondents who were overweight while 46.00% had normal BMI. There was no association between BMI and

the level of education as the BMI was not dependent to level of education in the Rural district (Table 11).

Table 11: Nutritional status with level of education in Rural district

Level of education	Underweight %	Normal %	Overweight %	Obese %	Total % N=120
Informal	0.00	50.0	33.30	16.70	100.00
Primary	4.60	46.00	50.00	17.20	100.00
Secondary	0.00	16.70	3.30	33.30	100.00
College	0.00	6.70	0.00	0.00	100.00

χ^2=4.938; df=12; p-value=0.877

4.5.7 Nutritional status with work categories in Urban district

Table 12, shows that underweight was highest among students 11%, compared to other work category. Also the rate of overweight was highest among the students 55.60% while obesity was higher 31% among the business oriented in the Urban district even though there was no association between BMI and work category in the Urban district.

Table 12: Nutritional status with work categories in Urban district

Work category	Normal %	Overweight %	Obese %	Morbid obese %	Total % N=120
Employed	44.40	35.60	13.30	6.70	100.00
Students	22.20	55.60	11.10	0.00	100.00
Business	44.80	20.70	31.00	3.40	100.00
Farmer	27.30	36.40	0.00	36.40	100.00
unemployed	38.50	30.80	19.20	11.50	100.00

χ^2=33.680; p-value=0.159; df=16

4.5.8 Nutritional status with work categories in Rural district

In the Rural district the BMI was shown to depend on the occupation since most farmers in the Rural were normally nourished and mostly employed people in the Rural were overweight and obese. There was a significant association ($p \leq 0.01$) between nutritional status and occupation. Table 13 Shows that among the employed subjects 72.70% were obese and among farmers 36.20% were overweight. Among the students only 11.10% were underweight.

Table 13: Nutritional status with work categories in Rural district

Work Category	Underweight %	Normal %	Overweight %	Obese %	Total % N=120
Employed	0.00	18.20	9.10	72.70	100.00
Student	0.00	0.00	0.00	0.00	100.00
Business	0.00	33.30	33.30	33.30	100.00
Farmer	0.00	49.50	36.20	10.50	100.00
Not employed	2.20	0.00	0.00	0.00	100.00

χ^2 =32.260; df=16; p-value≤0.01

4.5.9 Nutritional status with income in Urban district

It was observed that the BMI was significantly (p≤0.01) related to income in Urban district. Table 14 shows that 33.30% of the respondents whose income was below 10,000 per month were overweight and 23.80% obese. From the income, which ranges 50-100,000, 30.30% were overweight and 33.30% were obese. Also from the income range of more than 100,000, 28.30% were overweight, and 28.20% were obese.

Table 14: Nutritional status with income in Urban district

Income	Underweight %	Normal %	Overweight %	Obese %	Morbid obese %	Total % N=120
Under 10.000	0.00	33.30	42.90	14.30	9.50	100.00
10,000-50,000	0.00	50.00	33.30	5.60	11.10	100.00
50,100-100,00	0.00	36.40	30.30	21.20	12.10	100.00
>100,000	2.20	41.30	28.30	21.70	6.50	100.00
No earning	0.00	50.00	50.00	0.00	0.00	100.00

χ^2 = 19.199; df= 16; p-value≤0.01

4.5.10 Nutritional status with income in Rural district

There was a significant difference (p≤0.01) between Urban and Rural in terms of income this indicates that Urban subjects earn more than Rural people and this also correlates to higher BMI of the Urban respondents (Table 15). It is shown that from income under 10,000 per month 42.90% were overweight. From income range of 50,100-100,000 per month 30.30% respondents were overweight and in the same range 21.20% were obese.

Table 15: Nutritional status with income in Rural district

Income	Underweight %	Normal %	Overweight %	Obese %	Morbid obese %	Total % N=120
Under10,000	0.00	33.30	42.90	14.30	9.50	100.00
10,000-50,000	0.00	50.00	33.30	5.60	11.10	100.00
50,100-100,00	0.00	36.40	30.30	21.20	12.10	100.00
>100,000	2.20	41.30	28.30	21.70	6.50	100.00
>100,000	2.20	41.30	28.30	21.70	6.50	100.00
No earning	0.00	50.00	50.00	0.00	0.00	100.00

$\chi 2=38.45$; p-value ≤ 0.01; df=16

4.6 Demographic information's in relation to nutritional status between Urban and Rural districts

It is shown that in males, underweight and morbid obese were significantly different in the two districts while in females only morbid obese show the difference. In Marital status 6 morbid obese individuals were single in the Urban while none was in the Rural district. Also in Married respondents 5 morbid obese were in the Urban while none was observed in the rural district. In the attribute of occupation all categories of work showed significant difference in all nutritional status in the two districts. Furthermore in the attribute of education level, informal education showed difference, 3 respondents were underweight in Rural district and none was underweight in the Urban district, normal respondents were 12 in Rural 2 in the Urban district, Obese were 7 in Rural while none in Urban district. In both primary and secondary level of education underweight and morbid obese showed significant ($p \leq 0.05$) difference between the two districts. While in the college only morbid obesity showed the difference between the two districts.

Table 16: Demographic information's in relation to nutritional status between Urban and Rural districts

Attributes		Nutritional status	Urban n	Rural n
sex	Male	Underweight	1[a]	4[b]
		Morbid obese	5[a]	0[b]
	Female	Morbid obese	6[a]	0[b]
Education Level	Informal	Underweight	0[a]	3[b]
		Normal	2[a]	12[b]
		Obese	0[a]	7[b]
	Primary	Underweight	0[a]	1[b]
		Morbid Obese	3[a]	0[b]
	Secondary	Underweight	1[a]	0[b]
		Morbid obese	6[a]	0[b]
	College	Morbid obese	2[a]	0[b]
Marital Status	Single	Underweight	1[a]	0[b]
		Morbid obese	6[a]	0[b]
	Married	Underweight	0[a]	2[b]
		Morbid obese	5[a]	0[b]
Occupation	Business	Normal	17[a]	2[b]
		overweight	7[a]	1[b]
		obese	4[a]	0[b]
		Morbid obese	1[a]	0[b]
	Employed	Underweight	1[a]	0[b]
		Normal	21[a]	9[b]
		obese	8[a]	0[b]
		Morbid obese	5[a]	0[b]
	Farmer	Underweight	0[a]	4[b]
		Normal	0[a]	43[b]
		overweight	1[a]	37[b]
		obese	8[a]	21[b]
		Morbid obese	2[a]	0[b]
Family size	1-4 people	Underweight	0[a]	1[b]
		Morbid obese	2[a]	0[b]
	5-8 people	Morbid obese	8[a]	0[b]
	9-12 people	Underweight	1[a]	0[b]

Different letters in the same row indicates significant difference ($p \leq 0.05$)

4.7 Behavioral characteristics of respondents in relation to awareness of nutritional status between urban and rural districts

Eleven variables of characteristics of the respondents were tested using Chi-square statistics to compare behavior characteristics of respondents between Rural and Urban

district. Results are presented below.

4.7.1 Choice of respondents on reducing or increasing body weight

Table 17 show the results of the perception of respondents on increasing or decreasing weight. There was a significant difference ($p \leq 0.01$) between Urban and Rural as most subject in the urban 42.75% preferred to reduce their weight and 20.83% preferred to remain at their own weight while in the Rural about 78.00% preferred to increase weight.

Table 17: Choice of respondents on reducing or increasing body weight

Variable tested	Urban %	Rural %	$\chi 2$	P-value
Reducing	42.75	5.83	68.81	0.00
Increase	27.33	78.30		
I don't want either of those	20.83	15.83		

4.7.2 Subjects response on type of foods eaten

The results on types of foods eaten between Rural and Urban showed that in urban people who preferred to eat mixed types of foods were about 86.66%, and in Rural 57.50% while 42.50% preferred to eat boiled foods in the Rural. There was a significant difference ($p \leq 0.01$) between urban and Rural (Table 18).

Table 18: Type of foods eaten

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Fried foods	1.66	0.00	5.24	0.00
Boiled foods	10.83	42.50		
Mixture	86.66	57.50		
Steamed foods	1.66	0.00		
Smoked foods	0.83	0.00		

4.7.3 Perception of subjects on thin person

Perception of subjects on a thin person also showed the difference between Urban and

Rural districts. In Urban district about 66% of respondents perceived a thin person as having good health while in the rural district about 97% perceived a thin person as having bad health. The difference was significant ($p \leq 0.01$) between the two districts (Table 19).

Table 19: Perception of subject on thin person

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Has good health	66.67	2.50	109.19	0.00
Has bad health	33.33	97.50		

4.7.4 Subjects response on eating out

Response of subjects on eating out showed that in the urban district about 54.16% eat out of their homes and the rest 45.83% do not eat out. In the Rural district 82.50% do not eat out. There was a significant difference ($p \leq 0.01$) between urban and Rural districts in relation to eating out (Table 20).

Table 20: Response on eating out

Variable tested	Urban %	Rural %	$\chi 2$	p-value
They eat out	54.16	18.83	35.08	0.00
They don't	45.83	82.50		

4.7.5 Subjects response on eating snacks in between meals

The comparison of people who eat snacks in between meals showed that 64.16% of Urban subjects eat snacks and 68.33% in Rural eat snacks in between meals. There was no significant difference between rural and urban district Table 21).

Table 21: Subjects response on eating snacks in between meals

Variable tested	Urban %	Rural %	$\chi 2$	p-value
They eat snacks	64.16	68.33	0.46	0.29
They don't	35.83	31.66		

4.7.6 Amount of teaspoonful taken

There was a significant difference ($p \leq 0.01$) between Urban and Rural district in relation to amount of sugar taken by subjects in the two districts (Table 22).Results showed that in the urban 47.88% took about two spoonful of sugar while in the Rural district they were 45.00%. The subjects who took about three spoonful of sugar in the Urban district were 35.83% while the amount taken in the Rural ditrict was decreasing as only 15.83% took three spoonfuls.

Table 22: Amount of teaspoonful taken

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Nothing	2.50	20.83		
One	12.49	18.33	42.33	0.00
Two	47.88	45.00		
Three	35.83	15.83		
Four	0.83	0.00		

4.7.7 Response of subjects on drinking alcohol

Response of subjects on drinking alcohol shows that 39.16% in Urban and only 13.33% in the Rural were taking alcohol while others did not drink. The results showed that there was a significant difference ($p \leq 0.01$), between those two places and this means that in the urban people drink more as compared to rural people (Table 23).

Table 23: Response of subjects on drinking alcohol

Variable tested	Urban %	Rural %	$\chi 2$	p-value
They drink	39.16	13.33	20.68	0.00
They don't drink	60.83	86.66		

4.7.8 Types of foods eaten by subjects

Types of foods eaten by the subjects were not very different between Urban and Rural as most of the subjects in urban 60% and in rural 80.83% eat ugali, rice, beans and

vegetables. Only 16.66% eat meat and potatoes chips in urban while in Rural only 0.83% eat those foods. There was a significant difference between Urban and Rural district ($p \leq 0.01$) in relation to the types of food eaten (Table 24).

Table 24: Types of foods eaten by subjects

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Ugali, rice, beans, vegetables	60.00	80.83		
Vegetables, rice, ugali	13.33	18.33	33.84	0.00
Meat, potato chips, ugali, rice	16.66	0.83		
All of the above	10.00	0.00		

4.7.9 Presence of any belief which assists in increasing weight

Most of the subjects in rural 76.66% and urban 79.16% suggested that there was no any belief which assists one to increase weight. The results showed that there was no significant difference between Urban and Rural district in relation to any belief (Table 25).

Table 25: Presence of any belief which assists in increasing weight

Variable tested	Urban %	Rural %	$\chi 2$	p-value
No any belief	79.16	76.66	9.26	0.02
They don't know	7.50	0.83		

4.7.10 Preference of subject on the appearance of spouses

Response of subjects on the appearance of spouses shows that in urban 42.50% wanted them to appear normal while 30% wanted them to be slim, and 27.50% to be overweight, while in the rural district 57.50% wanted their spouses to appear plump. There was no significant difference between Urban and Rural district in relation to the appearance of spouses (Table 26).

Table 26: Preference of subject on the appearance of spouses

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Normal	42.50	37.50		
Overweight	27.50	57.50	34.51	0.03
Slim/thin	30.00	5.00		

4.8 Awareness of underweight, overweight and obesity in Urban and Rural districts

Awareness test according to response of the respondents on the knowledge of underweight showed that most of the respondents 80.00% in Urban and 75.00% in Rural were aware that underweight can cause health problems. There was no significance difference between Urban and Rural district in relation to awareness.

Test of the knowledge about overweight causing factors showed that 90% of the respondents in Urban and 78.33% in Rural knew the factors which cause overweight. Only 10% in Urban and 21.60% in the Rural district didn't know. It is shown that there was no significant difference between the two places in relation to knowledge of overweight causing factors. This implies that the knowledge about the causes of overweight does not depend in location since both respondents from Urban and Rural were aware of the factors that cause overweight.

Knowledge about the effects of overweight on health showed that 95.00% of the respondents in the Urban district and 85.83% in the Rural were aware of the effects of overweight on health. It is shown that the knowledge of the effects of overweight was dependent to respondent's location since ($p \leq 0.01$), this means that in Urban district people were more aware of the effects of overweight than in Rural district.

Moreover, 66.66% of the respondents in Urban knew the effect of excess salt in foods while in the Rural only 49.16% were aware of that knowledge. The difference was

significant ($p \leq 0.01$) between the two districts. Also it was observed that most people in the Urban 95.00% were aware of the effects of excess sugar eaten in food, while in the Rural about 77.00% were aware of that effect. There was a significant difference ($p \leq 0.01$) between those two locations (Table 27).

Table 27: Awareness of underweight, overweight and obesity in Urban and Rural districts

Variable tested	Urban %	Rural %	$\chi 2$	p-value
Knowledge that underweight can cause problems				
Know	80.00	75.00	0.86	0.36
Do not know	20.00	25.00		
Knowledge about overweight causing factors:				
Knows	90.00	78.33	6.13	0.01
Do not know	10.00	21.66		
Knowledge about the effects of overweight on health				
Know	95.00	85.83	83.30	0.00
Do not know	5.00	14.16		
Knowledge that excess salt can cause problems on health				
Know	66.66	49.16)	7.54	0.00
Do not know	33.33	50.83		
Knowledge that excess sugar can cause problems				
Know	95.00	77.50	15.49	0.00
Do not know	5.00	22.50		

CHAPTER FIVE

5.0 DISCUSSION

5.1 Nutritional status basing on BMI of men and women for urban and rural districts

From the results it is shown clearly that in the Urban district people had higher BMI as compared to Rural district. The transition from a Rural to Urban lifestyle is associated with increased levels of obesity, which is linked with dramatic changes of lifestyle (e.g. increased consumption of high energy dense foods and decreased physical activities). This result is consistent with the findings of Sobngwi *et al.* (2002) who found that Urban residents and higher income people were associated with higher energy intake, higher fat intake and lower physical activities as compared to Rural residents and lower income categories. Also the study found that women were having higher BMI in both districts.

5.2 The prevalence of underweight, overweight and obesity

The prevalence of underweight among the respondents using BMI as an indicator showed that in Urban district the prevalence of underweight was slightly lower compared with that of the Rural district and this can be supported by the fact that the Rural dwellers perform different kind of activities such as farming, keeping animals, preparation of charcoal, fetching firewood and walking long distances which have higher energy expenditure as compared to urban people who mostly are sedentary and use cars for transportation. The prevalence of overweight in those two locations was not very much different but the prevalence of morbid obesity was higher in the urban district than it was in the Rural district. The findings were related to other studies conducted elsewhere by Saw and Rajan (1997) and Vioque *et al.* (2000) which suggested low levels of physical activities, high calorie intake and long hours of watching television as the contributing factors to the rising trend of overweight and obesity in developing countries.

5.3 The prevalence of diseases associated with underweight, overweight and obesity

The prevalence rate of diseases related to underweight, overweight and obesity across the study is explained by the results which showed the significant difference between Urban and Rural and the results showed that Urban people mostly suffer from many chronic diseases as compared to Rural district. The prevalence of diseases in the study showed that in the Urban district there were more people who suffered from many diseases associated with overweight and obesity as compared to the Rural counterparts. These findings are comparable to those of Mishra (2004) who suggested that overweight and obesity were the first gateway to chronic diseases such as hypertension, type 2 diabetes, gall bladder diseases, asthma, cholesterolemia and many others. Most of the Rural people suffer diseases which associate themselves with a lot of physical activities and mostly suffer from hernia and a compromised immune system which eventually lead to low work performance and sometimes can lead to death. The major reasons are poor eating habits and high physical activities.

5.4 Distribution of subjects in various categories of nutritional status according to their socio-economic status in urban district

5.4.1 Nutritional status with age of respondents

The results showed that as people were increasing in age the BMI was also increasing until age 50 when the BMI started to decrease. The study confirms the findings of Antia (1989) which suggested that obesity tends to increase with age and is most likely to occur after the age of 35. This is because high percentage of obesity was found to be higher in age group between 35-45 years. As one gets older, one tends to be less active. In addition, the amount of muscle in the body tends to decrease with age. This lowered muscle mass leads to a decrease in metabolism. These changes also reduce calorie needs. If someone doesn't decrease caloric intake as one ages, one is likely to gain weight (Burke *et al.*, 1990).

5.4.2 Nutritional status with marital status of respondents

The study found the correlation between marital status and the BMI in both Urban and Rural districts where the proportion of married people who were obese was higher than single persons. The difference of these groups between single and the married can be explained by a number of factors but mainly that married couples have the children who have to eat, and hence these people are less likely to miss food in their houses. The results are comparable to that of Nyaruhucha *et al.* (2003), which suggested that married men mostly rely on their wives to do all the cooking, washing and household chores, hence they are likely to end up drinking or staying without doing any domestic activities because they have no work at home and the consumption of beer tends to favor higher BMI.

5.4.3 Nutritional status with level of education

The BMI tended to be higher in people with higher levels of education. In Urban district there was a relationship between BMI and level of education. Education has a big influence on lifestyle characteristics; individuals with higher education are likely to be aware of the effect of obesity. From the results it was observed that educated people had higher BMI than other groups. This findings related to that of Brown and Konner (1987) who reported that the higher prevalence of obesity in individuals of higher socioeconomic status appears to be related to their social influence and hence the ability to obtain adequate food supply. In the Rural district the difference within the groups was not significant and this can be explained by the fact that in the Rural areas most respondents attained primary level of education.

5.4.4 Nutritional status with work category

In the Urban district there was no correlation between occupation and BMI. In the Rural district the BMI was found to be related to occupation since most farmers in the Rural district had normal nutritional status and the employed ones were overweight and obese. This showed that in the Rural areas farmers do much of physical activities that burn a lot of fats from adipose tissue that leads to low BMI than those who are employed. Also the Rural people eat natural foods with low fats and sugar so they tended to maintain their BMI (Ledikuwe *et al.*, 2005).

5.4.5 Nutritional status with income

It was observed that the BMI was related to income. It is clear that as income was increasing the BMI was also increasing. There was a significant difference between Urban and Rural districts. The Urban respondents earn more than the Rural respondents and this correlates also with higher BMI. Income is a major factor influencing food habits and nutrition, with a significant increase in income, more expensive foods are purchased and eaten (Den Hortog and Van Staren, 1983).

5.5.1 Demographic information's in relation to nutritional status between Urban and Rural districts

Demographic information's in relation to nutritional status showed that sex attribute was significantly different between Urban and Rural; males in the rural were more underweight than in the urban. This can be supported by the fact that people living in the rural do much of physical activities that burn a lot of fats from adipose tissue that leads to low BMI. Futhermore in marital status married respondents were morbid obese in the Urban while none was observed in the Rural district. This is related to the findings of Nyaruhucha *et al.* (2003),who suggested that married couples have the children who have

to eat, and hence these people are less likely to miss food in their houses and also people who live in town do minimal levels of physical activities, eat high calorie diets and stay for long hours watching television. Furthermore in the attribute of education level, college level show difference in nutritional status, morbid obesity was high in the Urban district. These shows that people who were educated were mostly employed and were having high income which also favors high BMI. Work category also showed difference between Urban and Rural.

5.5.2 Nutritional status in relation to family size

Family size was shown to be significantly related to BMI as it was observed that in small families the BMI was higher as compared to the bigger families this was observed in rural as well as in urban district. This can be explained by the fact that the portion of food distributed to each individual is bigger in smaller houses as they may be having enough source of income which can support the family. The results correlate to the findings of Heskith and Tomkins (2003) which suggested that in bigger families' income may not be enough to support all the family members' hence small portion of foods and hence low BMI.

5.5.3 Nutritional status in relation to marital status

The BMI was related to marital status as it was observed that married respondents were more overweight and obese than single ones. This finding is similar to the finding of Hanson *et al.* (2005) suggested that married men mostly rely on their wives to do all household chores, and this tended to favor higher BMI. Women also are having higher BMI because of their body make up and parity. .Most of fat is being deposited in their lower side compared to men. Also women who gave birth appear to have higher BMI because before they gave birth the mother eats a lot and fat is being deposited for

preparation of milk if this is not properly used the mother becomes fat.

5.5.4 Nutritional status in relation to occupation

The occupation of people in the rural district was found to be related to BMI as it was observed that most of the farmers had a normal nutritional status while the employed ones were mostly overweight and obese. This showed that in the Rural areas farmers do much of physical activities that burn a lot of fats from adipose tissue that leads to low BMI's than those who are employed. Also the Rural people eat natural foods with low fats and sugar so they tended to maintain their BMI (Ledikuwe *et al.*, 2005).

5.6 Characteristics of respondents in relation to BMI

5.6.1 Choice of respondents on reducing or increasing weight

The choice between increasing or decreasing weight showed that there was a significant difference as most subjects in the Urban preferred to reduce their weight while fewer preferred to remain at their own present weight. In the Rural district most of them preferred to increase weight and there was a significant difference between Urban and Rural which means the choice on reducing or increasing weight was dependent to location as many rural subjects preferred to increase their weight. In the Rural district people still have the notion that when a person is overweight this shows a good standard of living so most of them desired to have higher body weight. Also many men prefer their wives to appear plump more and these results coincide with the findings of Brown and Konner (1987) who reported that most traditional cultures view plumpness especially in married ladies as an ideal of feminine beauty hence the prevalence of obesity in many developing societies increases.

5.6.2 Perception of subjects on a thin person

Perception of subjects on a thin person also showed the difference between urban and

Rural districts such that in Urban district most respondents perceived a thin person to have good health while in the Rural district most of them perceived a thin person to have bad health. Both in urban and rural people have different perceptions on appearance of their spouses. Most of the Rural respondents wanted their spouses to look fat but there was no significant difference between urban and rural district. The Rural people wanted their spouses to look plump, the results which are similar to the literatures that suggested that in African culture a woman should look plump as symbol of beauty and also this shows that her husband is taking good care of her on top of that it is a symbol of wealth on husbands sides as reported by Wong *et al.* (2002) in the study carried out in south Africa.

5.6.3 Types of foods eaten by respondents

The comparison of types of foods eaten between Rural and Urban districts showed that Urban people preferred to eat mixed types of foods than in the Rural. Results showed the significant difference between urban and rural. This showed that Rural people mostly eat boiled foods than in the town. This is similar to what was observed in the literature that people appear to change dietary habits as they move from Rural to Urban (Popkin, 1993). Rural dwellers tended to be more self-reliant in obtaining food and also tended to eat traditional diets that are high in grains, fruit and vegetables, and low in fat. Once they arrive in urban areas, these same people tend to rely more on external forces for sustenance, resulting in a shift from production of their own food to the purchase of processed foods.

5.6.4 Response of subjects on eating out

Response of the subjects on eating out showed that most respondents in the Urban district were eating out. This was because most were working far from their homes. The majority of the Rural respondents were not eating out. Urban people preferred eating out and this

has great influence on their health because the types of foods eaten out are most likely to be fried with a lot of fats, salts or sugar. This greatly increases BMI and hence chronic diseases. The results confirm the findings of WHO (2003) which suggested that in developing countries, with increasing urbanization, mechanization of jobs and transportation, availability of processed and fast foods and dependence on television for leisure, people are fast adopting less active lifestyles and consuming more energy dense nutrients poor diets.

5.6.5 Eating snacks in between meals

The comparison of people who eat snacks in between meals showed that majority of the respondents in Urban and Rural ate snacks in the morning and in between meals. Also it was observed that the snacks eaten between those two locations were different as most Rural people ate boiled potatoes, maize or cassava while in the Urban people ate chapattis, samosas and many others cooked with fat and this may also have influence over their health on becoming overweight than the Rural people. Eating a lot of different foods is one of the causes of obesity in adults.

5.6.6 Amount of sugar taken

The Urban respondents took more amount of sugar compared to the rural respondents. The accessibility of sugar in Rural areas for the normal farmers is difficult, so taking much sugar would be expensive. For the Urban people the accessibility of sugar is easy so respondents prefer to eat more sugar without considering the effect of that sugar on their health even if they are aware of the problems associated with it. These findings were related to the findings of Adriene *et al.* (2006) on the study conducted in Boston which suggested that urban dwellers eat a lot of sugar compared to their rural counterparts.

5.6.7 Intake of alcohol

It was observed that in the Urban people drank alcohol more than Rural people. It was also observed that Urban people drank alcohol with roasted meat and pork and these have great impact on their health. People who eat a lot of meat were found to weigh more than those who don't and this tends to increase body fat and also increase chances for most of the non communicable diseases. Intake of excessive alcohol tends to increase more fat in the body due to empty calorie which is used instead of the energy which is present in the body so this energy tended to accumulate in form of fat and causes higher BMI (Megan, 2007).

5.6.8 Types of foods eaten

The type of foods eaten influences the BMI of an individual. The study revealed that in urban people consumed foods prepared in different methods i.e. frying, boiling, steaming and grilling their foods, and most of them use fat during preparation of those foods. Rural respondents eat boiled foods. The findings were comparable to the study of Pereira and Ludwig (2000) which was conducted in Canada which found that most urban dwellers eat fatty foods when compared to the rural dwellers

5.6.9 Presence of any belief which assists one to increase or reduce weight

Most of the subjects in rural and in Urban district suggested that there was no any belief which assists one to increase weight. The results showed that there was no significant difference between the two districts.

5.7 Awareness of respondents on underweight, overweight and obesity in Urban and Rural districts

Awareness tests according to response of the respondents on the knowledge of underweight showed that most of the respondents both in Urban and Rural were aware that

underweight can cause health problems. There was no significant difference between urban and rural district.

Test of the knowledge about overweight causing factors showed that both respondents in Urban and Rural know the factors which cause overweight. It was shown that there was no significant difference between the two districts. This implies that the knowledge about the causes of overweight does not depend on location since both respondents from urban and rural are aware of the factors that cause overweight.

The knowledge of the effects of overweight is dependent on respondent's location. Most Urban respondents were more aware of the effect of excess salts in foods when compared to Rural respondents. The results showed that there was a significant difference between Urban and Rural districts on awareness of the effects of salts in health. Most of the Urban dwellers have been affected mostly with mixed culture and hence dietary habits. Regardless of that awareness, urban respondents are the ones who mostly suffer from chronic diseases associated with salt intake. For instance people prefer eating out and mostly salt is added on the table, this tends to have effects on health.

Also it was observed that majority of the respondents in the Urban were aware of the effects of excess sugar eaten in food, compared to the Rural counterparts. The results showed the significant difference between those two districts. But despite that knowledge people in urban were observed to take more sugar than the rural people. Therefore the awareness only does not mean a person regulates his/her habit in relation to amount of sugar consumed.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study provides comparison of the prevalence and level of awareness of underweight, overweight and obesity among adults in Morogoro Rural and Urban district. The overall results show a significant difference between mean BMI of respondents in Urban and Rural districts.

Prevalence rate for underweight in the Rural district was 6.7% and negligible (0.8) for the Urban district. No female in both districts was observed to be underweight. The prevalence rate of morbidly obese was 11% in the urban district and none in the rural district and the difference was significant ($p \leq 0.01$) between the two places. Also the results showed that 8.3% males and 10% females were morbidly obese in urban area whereas no respondent was observed to be morbidly obese in Rural district. And overall results showed that women were having higher BMI compared to men in all districts. Also the results showed that married respondents were more overweight and obese than unmarried respondents in both Rural and Urban districts. Moreover it is shown that as people were increasing in age the BMI was also increasing until age 50 when the BMI started to decrease.

Furthermore it was observed that the BMI was related to income. It is clear that as income was increasing the BMI was also increasing in both Urban and Rural districts. Family size was shown to be significantly ($p \leq 0.01$) related to BMI as it was observed that in small families the BMI was higher as compared to the bigger families both in Urban and Rural districts. In the Urban district there was no correlation between occupation and BMI while

in the Rural district the BMI was found to be related to occupation as it was observed that farmers were normally nourished while employed respondents were overweight and obese.

The study established a clear association between overweight, obesity and diseases such as heart attack, hypertension and breathing problems existed among adults groups in Urban district. Diseases which associated to underweight were observed in the Rural district. It was observed that Rural people were doing more physical activities as compared to Urban people and are mostly suffer hernia and compromised immunity. In Urban district, respondents were aware of the effects of overweight, overweight causing factors and effects of excess salt in human health as compared to Rural district.

Lastly, underweight overweight and obesity are becoming community or public problems so they have to be handled in a public way. That means these problems are multisectorial and to eradicate them a multisectorial approach should be conducted. Everyone should participate being a public or private organization and must address the awareness and effects of those three in the community.

6.2 Recommendations

From this study, the following recommendations can be made:

1) The need for public awareness on the effects of underweight, overweight and obesity on people's health is warranted. People need to be educated about foods that are nutritious and consumption of the same in the right quantities and in accordance with body requirements. This is necessary if these problems are to be mitigated.

2) There is a need for setting up a core team of specialists by relevant authorities, such as the Ministry of Health, Ministry of Agriculture and Non- Governmental Organizations whose role will be to sensitize people on underweight, overweight and obesity and associated problems in adults and plan on how to establish a system of eradicating those problems in the society.

3) Since this study dealt with comparison and level of awareness of underweight overweight and obesity and associated factors in urban and rural district it is recommended that further studies on external factors such as culture, and social status in relation to nutritional status be undertaken

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APPENDICES

Appendix 1: Table 28: BMI Classification

BMI	Nutritional status
<18.5	Underweight
18.5 - 24.9	Normal
25 -29.9	Overweight
30 -34.9	Obese
35 -39.9	Morbid obese
40+	Grossly obese

Source: WHO (2000).

Appendix 1: Questionnaire on comparison of prevalence and level of awareness of overweight, obesity, underweight and their associated factors among adults in Morogoro Rural and Urban districts.

Section A: Demographic Information

1. No. of Respondent ..... (2). Village.....

3. Wards name .....

4. Age..... (Years)

5. Sex: (1) Male (2) Female

6. Education level

(1) Informal education (2) Primary education
(3) Secondary education (4) Advanced secondary education
(5) College/University Education

7. Marital status:

(1) Single (2) Married
(3) Divorced (4) Widowed

8. Family size (No of people in the household) .....

9. No. of children .....

10. Intervals between pregnancies 1) (mention)..... 2) not applicable (for men)

Section B: Body measurement:

(1) Height ..... (m)
(2) Weight..... (Kg)

Section C: Level of awareness of Overweight, Obesity, underweight and their associated problems.

1. Do you know that excessive weight can results to problems in the body?

(1) Yes (2) No

1b.If yes, choose below some of the problems (at least three)

1) Malaria 2) laziness 3) diabetes 4) high blood pressure 5) cancer

2. What do you think are the causes of overweight and obesity? (Tick if you think are correct

1) Overeating 2) inactive 3) exercising and eat small amount 4) lack of thoughts 5) others

3. Do you know that underweight can results to problems in the body?
(1)Yes (2) No

3b. I f yes can you please mention the effects
1) Weak 2) active 3) unable to learn 4) sharp

4. Are you aware of the effects of the following on chronic diseases
1) Sugar (yes/no) 2) fats/ oils (yes/no) 3) salts (yes/no)

5. What is the effect of sugar on health
1) Increases weight 2) decreases weight 3) causes diabetes

6. What is the effect of fat on health?
1) Increases weight 2) decreases weight 3) causes high blood pressure

7. What is the effect of salt on health?
1) Causes high blood pressure 2) increase health 3)decreases weight

8. Is there anybody in your family suffering from any of the diseases below?(tick)
(1) High blood pressure (2) Diabetes Mellitus
(3) Cancer (4) Other non communicable diseases (Mention)...

9. What is the relationship between obesity and chronic diseases?
1) Obesity causes chronic diseases 2) chronic diseases causes obesity
3) Obesity doesn't cause chronic diseases.

10. What do you think are the ways of reducing overweight....., ..., ...

11. Do you care about your weight?
(1)Yes (2) No

12. What do you think of your body image?
(1) Normal (2) Underweight (3) Overweight (4) Tall (5)Thin

13. Would you wish to reduce/ or increase your weight?
(1) Reduce (2) Increase

14. How do you perceive a fat person?
(1) Healthy (2) Unhealthy

15. How do you perceive a thin person?
(1) Healthy (2) Unhealthy

16. Are you aware of the things which cause obesity
1) Yes 2) No

16b.If yes can you please mention them.....,.....,.....

17. Are you aware of the things which cause underweight?
(1) Yes (2) No

18. If yes can you please mention them?
....

Section D: Life style characteristics

1. What kind of activities do you normally do?
   (1). No activity (2). Farming
   (3). House wife (4). Working in the office
   (5). Mechanics (6). Business
   (7).Teacher (8). Working in the field
   (9).Housewife/ husband

If you're farmer

1. If you're a farmer what kind of farming technology are you using?
   1) Hand hoe 2) Plough 3) tractor 4) others (mention).....

2. Are your farm places far from your residential areas?
   1.) Yes 2) No

3. How far from your residential areas?
   1) 1 km 2) 2-3 km 3) More than 3 km.

4. What kind of transport you usually use when going to the farm
   (1) On foot (2) By Bicycle
   (3) By car (4) Both on foot and by car
   (5) Not applicable

5. During harvesting period what kind of transport do you use to transfer your crops to the households?
   1) Head 2) car truck 3) tractor 4) others..... .....

6. Do you all in this household participate in processing and storing the crops at? the household?
   1) Yes 2) No

7. If no who is responsible for processing and storing the crops
   1) Women 2) Men 3) Others mention

8. What kind of activities do you normally do after coming back from the farm?
   (1) No one/resting (2) Cooking
   (3) Feeding animals (4) Playing with children
   (5) Not applicable (6) others (mention).....

9. Do you have a house maid to help you in the household chores?
   (1) Yes (2) No

10. Do you normally do exercise?
    (1) Yes (2) No

11. If yes how often
    (1). Once per day (2). Twice a day
    (3). More than twice a day (4). Once a week
    (5). Twice a week (6). Once a month

12. What do you do to maintain your normal body weight?
.....

13. Who is doing the household chores in your household?
.....

Teacher

1).How many periods do you have per day.....

2).Are your school far from your residential areas?
1.) Yes 2) No

3). How far is your working place from your residential areas
1) 1 km 2) 2-3 km 3) More than 3 km.

4). What kind of transport you usually use when going to work
(1) On foot (2) By Bicycle
(3) By car (4) Both on foot and by car
(5) Not applicable

5). How much time do you spend per day in your working place?
(1)2hrs (2) 4 hrs 3) More than 8 hrs

6). What kind of activities do you normally do after coming back from your working place?
(1) No one/resting (2) Cooking
(3) Feeding animals (4) Playing with children
(5) Not applicable (6) others (mention).....

7). Do you have a house maid to help you in the household chores?
(1) Yes (2) No

8). Who is doing the household chores in your household?
.....

9). Do you normally do exercise?
(1) Yes (2) No

10). If yes how often
(1) Once per' day (2) Twice a day
(3) More than twice a day (4) Once a week
(5) Twice a week (6) Once a month

13). What do you do to maintain your normal body weight?
.....

14). Who is doing the household chores in your household?
.....

Business man/woman

1).What kind of a business do you do.....

2) How much time do you spend per day in your working place?

(1)2hrs (2) 4 hrs 3) More than 8 hrs

3).Are your business places far from your residential areas?

1.) Yes 2) No

4). Are your activities for selling involve walking most of the time?

1) Yes 2) No

5).Are your activities of selling involve sitting most of the time?

1) Yes 2) No

6). How far is your working place from your residential areas?

1) 1 km 2) 2-3 km 3) More than 3 km.

7). What kind of transport do you usually use when going to work.

(1) On foot (2) By Bicycle
(3) By car (4) Both on foot and by car
(5) Not applicable

8). What kind of activities do you normally do after coming back from your working place?

(1) No one/resting (2) Cooking
(3) Feeding animals (4) Playing with children
(5) Not applicable (6) others (mention).....

9). Do you have a house maid to help you in the household chores?

(1) Yes (2) No

10). Do you normally do exercise?

(1) Yes (2) No

11). If yes how often

(1). Once per' day (2). Twice a day
(3). More than twice a day (4). Once a week
(5). Twice a week (6). Once a month

12). What do you do to maintain your normal body weight?

.....

13). Who is doing the household chores in your household?

.....

Mechanics

1).What kind of mechanics are you doing?

1b.What activities are you doing normally in your work .....

2) How much time do you spend per day in your working place?
(1)2hrs (2) 4 hrs 3) More than 8 hrs

3).Are your working places far from your residential areas?
1.) Yes 2) No

4). How far is your working place from your residential areas?
1) 1 km 2) 2-3 km 3) More than 3 km.

5). What kind of transport you usually use when going to work
(1) On foot (2) By Bicycle
(3) By car (4) Both on foot and by car
(5) Not applicable

6). What kind of activities do you normally do after coming back from your working place?
(1) No one/resting (2) Cooking
(3) Feeding animals (4) Playing with children
(5) Not applicable (6) others (mention).....

7). Do you have a house maid to help you in the household chores?
(1) Yes (2) No

8). Do you normally do exercise?
(1) Yes (2) No

9). If yes how often
(1) Once per' day (2) Twice a day
(3) More than twice a day (4) Once a week
(5) Twice a week (6) Once a month

10). What do you do to maintain your normal body weight?
.....

11). Who is doing the household chores in your household?
.....

Working in the office

1).What kind of work are you doing?.....

2).How much time do you spend in using computer/typewriter .....

3) How much time do you spend per day sitting .....
4).Are your working places far from your residential areas?
1.) Yes 2) No

5). How far is your working place from your residential areas?
1) 1 km 2) 2-3 km 3) More than 3 km.

6). What kind of transport you usually use when going to work
(1) On foot (2) By Bicycle

(3) By car (4) Both on foot and by car
(5) Not applicable

7). What kind of activities do you normally do after coming back from your working place?
(1) No one/resting (2) Cooking
(3) Feeding animals (4) Playing with children
(5) Not applicable (6) others (mention).....

8). Do you have a house maid to help you in the household chores?
(1) Yes (2) No

9). Do you normally do exercise?
(1) Yes (2) No

10). If yes how often
(1). Once per' day (2). Twice a day
(3). More than twice a day (4). Once a week
(5). Twice a week (6). Once a month

11). What do you do to maintain your normal body weight?
.....

12). Who is doing the household chores in your household?
.....

Housewife/husband

1).What kind of activities are you normally doing while at home after waking up
(1) No one/resting (2) Cooking
(3) Feeding animals (4) Playing with children
(5) Not applicable (6) others (mention).....

2). Do you have a house maid to help you in the household chores?
(1) Yes (2) No

3). Do you normally do exercise?
(1) Yes (2) No

4). If yes how often
(1). Once per' day (2). Twice a day
(3). More than twice a day (4). Once a week
(5). Twice a week (6). Once a month

5). What do you do to maintain your normal body weight?
.....

6). Are you a member in any community activities performing in your area.
1) Yes 2) No

7). Who is doing the household chores in your household?

.....

8).How much time do you spend per day sitting (watching TV, computer etc)

.....

Section E: Eating habit

1. What kind of food are you normally eating?

(1) Fried foods (2) Boiled food
(3) Mixed fried and boiled (4) Steaming foods
(5) Cured foods e.g fish (6) Soft drinks (like sodas, juices etc)

2. What are you common foods (which you normally eat)?

3. How many meals are you eating per day?

(1). One meal per day (2). Two meals per day
(3). Three meals per day (4). More than three meals per day

4. Do you normally eat out?

(1) Yes (2) No

4b. If yes, what kinds of foods are you normally eat out?

(1) Fried (2) Boiled
(3) Mixed (4) Not applicable

5. Are you using sugar in your breakfast?

1) Yes 2) No

6. If yes how much teaspoonful you take .....

7. Do you normally add sugar to tea when drinking?

1) Yes 2) No

8. Do you normally add salts in the table when eating?

1) Yes 2) No

9. Are you taking alcohol for refreshments?

(1) Yes (2) No

10. If yes, do you drink beer (any alcohol) with mishikaki/nyama choma/chips?

(1) Yes (2) No

11. What type of drinks (alcohol) do you prefer?

1) Beer 2) Local brews 3) dry drinks (konyagi, Spirits, gongo etc. 4) Others

12. What amount of beer/bottles of alcohol do you take per day.....

13. Do you drink everyday in a week? 1) Yes 2) No

14. How many times per week you drink

(1) Once (2) twice
(3) More than twice a week

15. What types of foods are you normally eating?
    (1). Foods with a lot of starch and carbohydrates
    (2). Meat and carbohydrate in small amount
    (3). Vegetables and carbohydrates in small amounts

Section F: Social-Economical-Cultural influences

1. What is your average income per Month?
    (1) Less than Tshs 10,000/= (2) Tshs 10,100- 50,000/=
    (3) Tshs 50,100-100,000/= (4) More than Tshs 100,000/=

2. What do you perceive an overweight/fat person?
    (1.) Wealth (2) Lazy
    (3) Sick (4) He/ she has to reduce weight
3. How do you perceive an underweight person?
    (1). Wealth (2). Lazy
    (3). Sick (4). He/ she has to increase weight

4. Are there any cultural/belief that influence overweight?/underweight
    (1) Yes (2) No

4b. If yes mention them and how they influence.....
.....

5. Are your parents' fat?
    (1)Yes (2)No