PREVALENCE OF HYPERTENSION AND ASSOCIATED RISK FACTORS AMONG PRIMARY SCHOOL TEACHERS IN KINONDONI MUNICIPALITY, DAR ES SALAAM

By

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A Dissertation in partial Fulfillment of the Requirements for
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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance of dissertation entitled "**Prevalence of hypertension and associated risk factors among primary school teachers in Kinondoni Municipality, Dar es Salaam"**, in fulfillment of the requirements for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.



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DEDICATION

In the first place, this work is dedicated to my beloved wife Evaline Paulo for taking care of family responsibilities during accomplishment of course work and research activities. It is also dedicated to my mother Esther Musa, my father the late Hema Mahuna, my aunt the late Moki Missanga for their devotion to my education which made my life a reality. Last but not least it is also dedicated to my late father and mother- in- law; Paulo Saiteru and Neshiye Paulo respectively.

ABSTRACT

Hypertension is a chronic health problem and if left untreated is a major risk factor for heart attacks, heart failure, renal failure, strokes and even death. In both economically developed and developing countries, hypertension affects 25% to 35% of the adult population. The global prevalence rises with age, and was approximately 30 % according to the recent community studies. In Tanzania the overall prevalence of hypertension was found to be 41.1% in 1998, for men and 38.7% for women in a survey carried out in Dar es Salaam (urban), in Temeke, over 80% of the hypertension subjects were not aware that they had high blood pressure. In Kinondoni Municipality hypertension was among the top ten diseases in the outpatient department. The objective of the study was to determine prevalence of hypertension and associated risk factors among primary school teachers in Kinondoni Municipality, with reference to age, weight, physical activity, diet pattern, salt intake, alcohol use, and smoking habits and their associations with hypertension. A cross-sectional study among 1119(females: 936, and males: 183) teachers aged 21 and 60years was done. Data were collected using structured questionnaire. The prevalence of hypertension among study participants was found in (30.8%). Age, body mass index, gardening, farming, animal keeping, weight lifting and running were statically significantly associated with hypertension. However age and body mass index remained statically significantly associated with hypertension in the final model. Interventions addressing reduction of overweight, obesity, physical inactivity, consumption of diets high in saturated fats, and high salt intake, should be implemented among teacher populations to reduce prevalence of hypertension among them. But this also applies to the society as a whole.

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LIST OF ACRONYMS /ABBREVIATIONS

SBP:	Systolic blood pressure
DBP:	Diastolic blood pressure
BMI:	Body mass index
PAL:	Physical activity level
CHO:	Carbohydrate
SNS:	Sympathetic nervous system
CVD:	Cardiovascular disease.
JNC:	Joint National committee on prevention detection, evaluation and treatment.
CCBRT:	Comprehensive community based rehabilitation
TMJ	Thomas Jaffrey

DEFINITIONS OF OPERATION TERMS

The following terms were used in this study.

Modifiable risk factors: These are life style factors, weight, physical activity, diet pattern, salt intake, alcohol consumption, and cigarette smoking.

Non- modifiable risk factor: This is non life style factor, e.g. age.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

High blood pressure is a major risk factor for heart attacks and strokes. It contributes to renal disease and blindness. It is estimated that between 10 million and 20 million people in Sub-Saharan Africa have hypertension. It has been estimated that adequate hypertension treatment of these people could prevent about 250,000 deaths (Cappuccio *et al*, 2000). However, hypertension in Sub-Saharan Africa is under diagnosed or inadequately treated, or both, with the result that extensive end-organ damage and premature death are often seen. Hypertension is the most common cardiovascular disease (CVD) risk factor worldwide, and one of the most important preventable risk factor for premature death (Mendis *et al*, 2007).

Once considered a problem only in high-income countries, the prevalence of cardiovascular (CVD) risk factors is dramatically increasing in low-and middle-income African countries, particularly in urban areas (Sobngwi *et al*, 2001, Christensen et al, 2008). For example, studies in Tanzania have reported high rates of hypertension in both urban and rural areas, particularly among the obese and the elderly (Njelekela *et al*, 2001).The definition of hypertension is based upon an arbitrary level at which people are labeled as hypertensive and treatment is initiated (Rose, 1992, WHO:, 1994). Therefore, from the epidemiological point of view there is no natural level at which an individual can be defined as "hypertensive" (Rose, 1992). However, normal blood pressure is assumed to be 120/80mmHg or $\leq$ 140/90mmHg (JNC VI, 1996, Fagard and Tipton 1994).

The global prevalence rises with age, regardless of the type of blood pressure measurement and the population used for diagnosis. In both economically developed and developing countries hypertension affects 25% to 35% of the adult population, and up to 60-70% of adults beyond their seventh decade of life (Kearney *et al*, 2005). A review of recent community based studies on the prevalence of hypertension in different regions of

the world had concluded that the true global prevalence of hypertension is approximately 30 % (Kearney *et al.* 2005) with the lowest prevalence in rural India (3.4% in men and 6.8% in women) and the highest prevalence in Poland (68.9% in men and 72.5% in women). The prevalence of hypertension is particularly high in urban settings in Sub- Saharan Africa; between 8 and 25 percent of the adult population are affected (JNC, VI 1996 and JNC, 1997). The highest prevalence in Sub-Sahara Africa had been reported in urban Zimbabwe which had rates close to those in economically developed countries.

Hypertension is classified by etiology as either primary or secondary. Primary hypertension accounts for 90 – 95% of hypertension, while the remaining 5-10% is the result of secondary hypertension. (Roger, W.C. 2000). Primary and secondary hypertensions are briefly described below.

a) Primary Hypertension

This is also known as essential hypertension has no single identifiable cause but current evidences suggest that the disease is caused by varying combination of many factors. The following factors are recognized as associated risks and probably all contribute significantly to the etiology and pathogenesis of primary hypertension.

1. Heredity

Heredity is a predisposing factor, but the exact mechanism is unclear. Children of hypertensive parents are twice as likely to develop hypertension as children from normotensive parents. There is a tendency for hypertension to run in families. The link between genetics and hypertension is quite well established e.g. greater expression of enzymes such as angiotensin converting enzyme in black people compared to Caucasians or salt sensitivity (Roger, W.C.2000).

2. Diet

Dietary factors that contribute to hypertension include high, sodium, saturated fat, and cholesterol consumption and deficiencies in certain metal ions (K, Ca2+). Sodium intake

and its effect on blood pressure is an area that remains controversial. Severe dietary sodium restriction in patient who usually have a high salt intake, does lead to a beneficial drop in blood pressure. However reducing salt intake in a patient whose consumption is not high does not have the same effect (Roger, W.C.2000). Some dietary factors are related to hypertension, including increased salt (Sodium) intake, decrease in fruit and vegetables (Potassium) and a higher intake of alcohol products.

3. Stress

Stressful environmental factors in modern society seem to affect genetically susceptible individuals, particularly those with labile blood pressure regulation.

4. Plasma rennin activity:

Plasma rennin activity is usually normal in patients with primary hypertension but is suppressed in about 25 of patients and elevated in about 15 of them.

5. Microcirculation

Deficiency of a vasodilator substance rather than excess of a vasoconstrictor either angiotensin, or epinephrine in the microcirculation may cause hypertension.

6. The mosaic theory

The mosaic theory states that multiple factors sustain elevated blood pressure even through an aberration of only one was initially responsible, e. g. the interaction between the sympathetic nervous system and the rennin-angiotensin-aldosterone system. Sympathetic innervations of the juxtaglomerular apparatus in the kidney releases rennin; angiotensin stimulates autonomic center in the brain to increase sympathetic discharge. Angiotensin also stimulates production of aldosterone, which leads to sodium retention; excessive intracellular sodium enhances the reactivity of vascular smooth muscle to sympathetic stimulation.

7. Age

Blood pressure tends to increase with increasing age. This is probably due to decreased compliance of the blood vessels, which lead to an alteration in peripheral resistance and hence an increasing in blood pressure (Roger, W.C.2000).

8. Alcohol

Patients who drink large amount of alcohol have a raised blood pressure, which will fall if alcohol consumption is reduced (Roger, W.C.2000).

9. Weight

Obese subjects have higher blood pressure than non- obese subjects and weight reduction can lead to a decrease in blood pressure.

b) **Secondary Hypertension**

Secondary hypertension refers to high blood pressure with recognizable cause. The resulting high blood pressure can often be cured or controlled by eliminating the underlying cause, some of the more common causes of secondary hypertension include:

1. Renal disease

Such as glomerulonephritis, diabetic nephrosclerosis, polycystic kidney, renal artery stenosis, chronic pylonephritis and rennin secreting tumors.

2. Drug induced hypertension

Drugs such as: corticosteroids, non- steroidal anti- inflammatory drugs, gold medicine, and birth control pills can cause temporary high blood pressure.

3. Endocrine disorder

There are several disorders of the adrenal glands which can cause high blood pressure such as: Hyperaldosteronism or Conan's and phaeochromocytoma.

1.2 Problem statement

Until relatively recently hypertension was considered to be a disease of the industrialized world. And problem only in high-income people, the prevalence of hypertension risk factors is dramatically increasing in low-and middle- income people particularly in urban areas. For example, studies in Tanzania have reported high rates of hypertension in both urban and rural areas, particularly among the obese and the elderly (Njelekela *et al*, 2001). However, several studies conducted in Tanzania have shown that hypertension is a major problem particularly amongst urban dwellers (Mtabaji, 2006). In fact for blue collar office workers epidemiological surveys had given prevalence of 30-40% in Dar – Es – Salaam (Makene, 1976). With urbanization Tanzania is increasingly being subjected to changes in lifestyle; shifts from a subsistence rural life to non farming occupations in the cities are unfortunately leading to changes in dietary habits and a reduction in physical activity that seem to increase the risk of hypertension and other cardiovascular disease (Omran, 1971).

In Tanzania studies conducted in rural areas showed the prevalence of hypertension to range between 3 – 12.8% (Swai, 1993). The overall prevalence of hypertension was found to be 41.1% in 1998, for men and 38.7% for women in a survey carried out in Dar es Salaam (urban), Handeni (rural) and Monduli (semi – nomadic area) (Edwards, *et al*,2000). A cross sectional survey by others, in Temeke, revealed that in spite of a relatively high rate of hypertension in the area over 80% of the hypertension subjects were not aware that they had high blood pressure.(Edwards, *et al*.2000).

Data from the outpatient department in Kinondoni Municipality showed that hypertension was among the top ten diseases at the outpatient clinics particularly health insurance members who more than (70 %) were primary school teachers. Also was among the important causes of admission and stroke among adults (Mtuha data collected from out patient department -2007/08). However hypertension was the fourth common cause of death among admitted patients in Kinondoni Municipality whom some were primary school teachers. Furthermore there was no study on hypertension prevalence

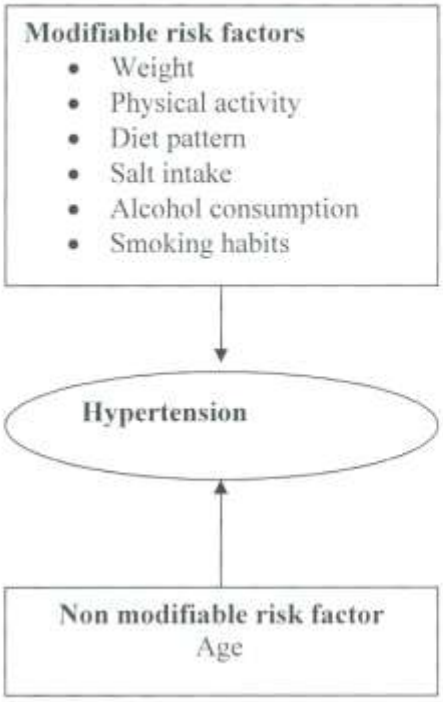
that had ever been done in Kinondoni before, therefore this study aimed to determine prevalence of hypertension and associated risk factors among primary school teachers.

1.3 Conceptual Framework

The term "risk factor" can be defined in different ways, but the simplest and commonly used definition by epidemiologist is a factor that is related to the increasing risk of suffering from the disease in the future without necessarily implying a direct causal relationship between the factor and the disease. A risk factor may be acquired one. The risk factor should be present before the disease. It should be noted, however, that the presence of a risk factor does not necessarily show a direct causal relationship to the disease (Wilhelmsen and Marmot, 1996).In most instances; a risk factor is the feature that predicts the risk of development of clinically significant disease within a society. In some instances, it may be involved in the causation of the disease; however, to validate the latter requires a proven epidemiology association that is statistically valid. The risk factor concept is very useful because it permits one to assess an importance not only of the mentioned risk factor but also of genetic trait in given individual, such as family history of hypertension. Using such information, one may ask whether modification of a given risk factor will result in modification of the risk of a particular disease (Wihelmsen and Marmot, 1996).

Different personal characteristics and environmental factors had been revealed to play causative roles in making individual more susceptible to hypertension. In this conceptual frame work, the risk factors and their relationship to hypertension had been illustrated as follows; (1)Modifiable risk factors (predominantly lifestyle-related):weight(overweight, obesity),physical activity, diet pattern, salt intake, alcohol consumption and cigarette smoking, and (2) Non-modifiable risk factor: age

.



1.4 Rationale of the study

Hypertension is the most common cardiovascular condition in Tanzania and the problem of defining a Strategy for control confronts health policy makers. Hypertension is fully treatable, but social conditions in Tanzania make the implementation of blood pressure control program difficult. Lack of a clear strategy based on evidence had undermined further these efforts.There is increasing evidence that overweight, obesity, alcohol consumption, cigarette smoking, salt intake, unhealthy diet, lack of regular physical activity are related to several adverse health outcomes such as hypertension. A common approach in dealing with hypertension up to the recent past had been through the provision of clinical services.

This approach has limited impact on improving overall population health status including primary school teachers and is very expensive even for the richest countries. As the only strategic health policy option, this approach predominantly relies upon the development and maintenance of specialized services, which due to their generally

continuously rising costs are not universally available and are unlikely to be so for the foreseeable future in many countries including Tanzania. Therefore this approach is not likely to be feasible or sustainable as the means to serve the needs of the total population for most countries of the world including Tanzania. Apart from the above the study will raise awareness on risk factors associated with hypertension and early detection of hypertension among primary school teachers.

1.5 Research questions

1. What is the prevalence of hypertension among primary school teachers in Kinondoni Municipality?
2. What is the association between hypertension and risk factors among school teachers in Kinondoni Municipality?

1.6 Broad objective

To determine prevalence of hypertension and associated risk factors among primary school teachers in Kinondoni Municipality, Dar es salaam.

1.7 Specific objectives

1. To determine prevalence of hypertension among primary school teachers in Kinondoni Municipality.
2. To determine the association between identified risk factors and hypertension among Primary school teachers in Kinondoni Municipality.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter presents description of literature review of risk factors associated with hypertension; these are age, obesity, physical activity, diet pattern, salt intake, alcohol use, and cigarette smoking.

2.1 Age in relation to blood pressure

It has been reported that there is usually a gradual rise in blood pressure, as one grows older (Bittner and Oparil, 1997). Also, in all ethnic groups, males tend to have higher blood pressure than females, and through middle age, the prevalence of high blood pressure has shown to be generally higher in males than in females (Yong *et al*, 1993, and Burt *et al*, 1995). However, it has been found that at advanced ages, prevalence of high blood pressure is higher in females than in males. At around 65 years of age, blood pressure is assumed to be 160/90mmHg (Bittner and Oparil, 1997, Kaplan, 2000). However, there are in fact communities in which blood pressure does not increase with age, among people living a traditional rural life for example Masai in the rural East Africa, when they maintain their traditional life style (Muna, 1993).

2.2 Obesity in relation to blood pressure

The world health organization (WHO) defines obesity as a condition in which excess body fat has accumulated to such an extent that health may be adversely affected. The degree of body weight is usually expressed as BMI; this is the ratio of weight in kilograms to the square of height in meters. The BMI is used to classify a person's body weight as underweight (BMI less than 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), or obese (BMI greater than 30) (WHO 2000). Obesity is defined as an excess of adipose tissue resulting from a systematic imbalance between caloric intake and energy expenditure (Atkinson and Walberg- Ranking, 1994, Alexander, 2000). Obesity has therefore been taken on the role as a marker of chronic disease such as cardiovascular disease including hypertension (Atkinson and Walberg – Ranking, 1994).

In many Sub-Saharan Africa countries, an increased level of body fat is associated with beauty, prosperity, health, and prestige, despite its negative impact on health. Thinness, in contrast, is perceived to be a sign of ill health or poverty and is something to be feared and avoided, particularly in recent years, when it has been associated with AIDS (Treloar *et al*, 1999). It is therefore unsurprising that studies have shown that black women in South Africa also do not perceive being overweight or obese as a health risk (Ndlovo and Roos, 1999).

The prevalence of obesity from Sub-Sahara Africa reported in recent literature. South Africa has the highest prevalence of obesity in black men and women reported in Africa. Its prevalence among urban black women of 36 percent in South Africa already exceeds that of black women in the United States (Puoane *et al*, 2002).The prevalence of obesity in South African and urban Tanzanian men was very similar, whereas the prevalence of obesity in South African women was almost double that of urban women in The Gambia and Tanzania.

Obesity is associated with hypertension (Alexander, 2000). The association between hypertension and obesity has been well documented in many countries in Sub-Saharan Africa. In Zimbabwe, (Mufunda *et al*, 2000) found this strong association.The prevalence of hypertension is greater in people with central, abdominal obesity, as reflect by a high waist – to – hip ratio, than in those with peripheral, gluteal fat and a low waist – to – hip ratio (Alexander, 2000). Also, hypertension in the upper body obesity is often associated with insulin resistance and high blood lipids (Alexander, 2000). Longitudinal studies have shown that obesity, which is related to hypertension, is apparent among individuals who gain weight most rapidly as they become older (Alexander, 2000).

2.3 Physical activity in relation to blood pressure

Adequate physical activity has been shown to have many health-promoting properties and has a direct, independent role in reducing cardiovascular disease mortality (Haskell, Leon, and Caspersen, 1992). However; the amounts of physical exercise have been

decreasing as a result of the high degree of urbanization that has been occurring across the continent. In urban settings, public transport replaces the traditional pattern of walking long distances, and urban employment usually entails far less physical labor than rural employment or other activities of daily living, such as chopping wood, carrying water, or tilling the fields. Few studies on the physical activity patterns of people in Sub-Saharan Africa have been published.

Many studies across Sub-Saharan Africa have revealed the impact of a sedentary lifestyle on emerging hypertension risk factors. The physical activity of the Nigerian civil servants studied by Forrest *et al*, (2001) was mostly attributed to occupational activities. Low levels of physical activity were correlated to weight, body mass index and blood pressure in men. Similarly, (Sobngwi *et al*, 2001) in Cameroon as well as (Aspray *at el*, 2000) in Tanzania concluded that physical inactivity was associated with obesity and hypertension in the people they studied in urban and rural settings in both Cameroon and Tanzania.

Physical activity lowers blood pressure. Several well –controlled studies had shown an inverse relationship between regular physical activity and blood pressure (Blair *et al*, 1983 , Hartung *et al*, 1990 , Fagard and Tipton 1994 , Kokkinos *et al*, 1995, Fagard 1999 and 2000). Numerous surveys showed a lesser incidence of hypertension in those who were physically active and fit (Blair *et al*, 1984, Fagard and Tipton 1994, Kokkinos *et al*, 1995). Most studies had recommended an endurance type of physical activity to be beneficial to individuals with hypertension and had been shown to decrease both systolic and diastolic blood pressure.

2.4 **Diet pattern in relation to blood pressure**

With continuing industrialization, daily diet changes occurred, concomitant with increasing morbidity and mortality in western as well as developing populations (Walker *et al*, 2002). The effect of increased industrialization is the globalization of food production and marketing of energy dense food. One particular feature is the production of refined food, poor in dietary fibre and several micronutrients. Daily over-consumption

of diets high in saturated fat and refined food low in fiber such as sugar and white bread would lead to obesity and hypertension in later life.

Earlier, in African countries, most populations' intake of energy and fat were relatively low, but those of fiber-containing diets were high, with a high intake of plant foods (Lubbe, 1971). These types of foods are still the main dietary features of those living a traditional lifestyle, especially rural inhabitants (Walker *et al.* 2002). However, some decades ago, diets changed with the adoption of a westernized lifestyle, with increases in energy and fat intake, but decrease in fiber intake (Bourne *et al.* 1993 and 1994). Tanzania like other African counties is also in a process of nutrition transition between the traditional foods to westernized dietary habits, particularly among urban dwellers.

Traditional diets in Sub-Saharan Africa, which are low in fat and high in unrefined carbohydrates, protect people against chronic diseases. The nutrition transition refers to large shifts in the composition and structure of diets (Popkin, 2001a). The dietary changes of the nutrition transition involve large increases in the consumption of fat (especially saturated fat) and sugar, marked increases in animal products, and a decline in unrefined cereal and, thus, in fiber intakes (Popkin 2001a, 2001b).

In the black population of Cape Town, it was found that a larger proportion of life spent in the city was associated with an increased consumption of fat and a decrease in carbohydrates. This is reflected in an increased use of dairy produce, meat, fat, and decreased intake of cereals (Bourne, Lambert, and Steyn, 2002). An examination of food balance sheets, based on the amount of food sold in South Africa indicates that per capita available fat consumption increased by 27 percent between 1993 and 1999. This increase was accompanied by a decrease in carbohydrate consumption.

An enigma in the proposed relationship of a diet high in cholesterol and fat, but with little fruit and vegetables, and raised blood cholesterol levels was reported for the pastoral Masai in Tanzania. Although their traditional diet was high in cholesterol and fat from whole milk, blood, and meat, and included little green vegetables or fruit, they

maintained low serum cholesterol levels (Gibney and Burstyn, 1980). It was suggested that this unexpected relationship could be explained by the cholesterol-lowering effect of the high levels of fermented milk consumed by the Masai and the substantial amounts of saponins and phenolic compound in the plant dietary additives used by them (Johns *et al*, 1999; St-Onge, Farnworth, and Jones, 2000). Unfortunately, these protective dietary practices have declined and new dietary changes have been observed in the pastoral Masai; consequently there has been a significant increase in their serum total cholesterol levels (McCormick and Elmore-Meegan, 1992). Not even the physically active Masai of Sub-Saharan Africa could escape the impact of the nutrition transition.

2.5 Salt intake and blood pressure

In the past few decades appreciation of the importance of determinants and risk factors in the etiology of cardiovascular disease (CVD) has grown. Most people exposed to the determinant do not inevitably develop the disease. Genetic determinants provide the foundation on which behavioral, sociocultural, economic, and educational determinants build. As an example, the popular hypothesis that African people have a genetic predisposition for salt retention may be compounded in urban African cultures in which salt intake is high, thus causing hypertension and in part explaining the documented higher incidence of hypertension in urban than rural African societies (Steyn and Fourier, 1991).

Some dietary factors are related to hypertension including increased salt (sodium) intake, decrease in fruit and vegetables (potassium). The data on the association between high salt (sodium chloride) intake and hypertension in black people from Africa had been summarized by (Seedat, 1996) and suggested that black people had a transport mechanism of high sodium retention and a low rennin activity. (Mtabaji *et al.* 1992) found salt sensitivity, measured by the blood pressure response on salt loading, in 46.2 percent of study subjects in Tanzania. A high intake of sodium is common in Sub-Saharan Africa, as it is used to preserve food or to make food tastier. For example, (Cappuccio *et al.* 2000) described the diet in Ghana as consisting mostly of unprocessed food and highly salted fish and meat. Substantial amounts of salt are added to food while

cooking and monosodium glutamate–based flavoring cubes or salts are widely used to give food taste. In addition to a high salt intake, people in Sub-Saharan Africa frequently eat little fruit and vegetables, resulting in low potassium intakes.

Few intervention studies have been conducted in Sub-Saharan Africa to show that a reduction in salt and an increase in potassium improve the blood pressure in its populations. A study done in Tanzania showed that a low-sodium diet leading to a low urinary excretion level of 52 millimoles per day reduced blood pressure in normotensive people significantly within four to five days (Mtabaji *et al*, 1990). A study in Kenya reported that supplementation with potassium in newly diagnosed patients with hypertension reduced the blood pressure to a level similar to that found in patients treated with a diuretic (Obel and Koech, 1991). The effect of dietary sodium chloride on high blood pressure is usually assumed by looking at average salt intakes in different countries (Weber *et al*, 2000). In a meta-analysis study it was estimated that the average systolic blood pressure would raise by 5-10 mmHg, for every 100mg-sodium intake, though it is dependent on age (Law *et al*, 1991).

2.6 Alcohol consumption and blood pressure

Heavy alcohol consumption increases blood pressure and death from stroke (Horan and Lenfant, 1990, Thu *et al*, 1997, Weber *et al*, 2000).The influence of alcohol consumption, particularly heavy drinking, on increasing blood pressure levels had also been described in Nigeria (Bunker *et al*, 1992). It has been reported that excessive alcohol consumption was responsible for 5 to 10% of the hypertensive males in the US (Kaplan, 2000). According to the review by (McMahon, 1987), the negative effects of alcohol seem to be evident when average daily consumption is greater than 2 drinks (equivalent of 1 ounce of ethanol). Furthermore, decrease of blood pressure has been shown when consuming not more than 2 drinks per day when compared with those who drank more (Rimm *et al*, 1993).

2.7 Cigarette smoking and blood pressure

Cigarette smoking and also use of either tobacco products have been suggested to have a detrimental effect on coronary flow by increasing vasospasm and vasoconstriction (Campisi *et al*, 1998). In particular, the acute inhalation of tobacco smoke is associated with a rise in blood pressure (Trap-Jensen, 1988). However, several epidemiological studies have shown that chronic smokers tend to have lower blood pressure than non-smokers, an effect possibly due to lower body weight (Green *et al*, 1986).

CHAPTER THREE

3.0 METHODOLOGY

This chapter presents description of study design, study area, study population, sample size estimation, sampling procedure, data collection procedures, study variables, data management and analysis, and ethical considerations.

3.1 Study design

A cross-sectional study to determine prevalence of hypertension and associated risk factors among 1119 primary school teachers with reference to age, body mass index, physical activity, users of different type of diets, salt intake, alcohol users and cigarette smoking.

3.2 Study area

The study was conducted in Kinondoni municipality. Dar es Salaam region. Kinondoni is bordered by the Indian Ocean to the North East, Ilala Municipality to the South, Bagamoyo district to the North, Kibaha district to the West and Kisarawe district to the South West. The municipality has four divisions, twenty seven wards and one hundred and twenty seven streets.

According to 2002 Census, the municipality has a total population of 1,088,867 of these there were 549,929(50.5%) males and 538,938(49.5%) females with the projected total population of 1,501,692 people by the year 2010. It was estimated that 458,149 residents of Kinondoni Municipality were employed in both private and public sectors, out of these, 435,242 (95%) were employed in the private sector while the rest 22,907 (5%) were employed in the public sector. The majority of the residents were involved in petty business, fisheries, livestock keeping and agriculture including horticulture. Food crops included maize, rice, banana, and potatoes. Only 3% of the working force engaged in subsistence agriculture in the peri-urban areas.

The health facilities in Kinondoni municipality consist of eight hospitals; Mwananyamala district hospital, Tanzania Trauma centre, Tanzania heart Institute, Mission Mikocheni, CCBRT, TMJ, Osterbay, Masama and Kinondoni. There were three health centers; Mbweni mission, Sinza and Magomeni. There were 23 dispensaries.

Kinondoni Munipality was selected on the assumption that prevalence of hypertension was presumed to be high among adults. Further more (77%) of study participants were females whom the prevalence of obesity was found to be high among women in Dar es salaam (Njelekela *et al*, 2001) and this increased the risk for hypertension among teachers. Moreover most female teachers might be married by middle, senior, exertive government officials or business men with good income and this might increase the risk for hypertension. There were many drinking places; bars, pubs and groceries each with roasted meat, meat soup and fried chicken chips and these might predispose teacher's population to risk factors for hypertension; alcohol drinking, overweight, obesity, high salt intake and physical inactivity.

3.3 Study population.

The study involved primary school teachers from both public and private schools. There were a total of 218 primary schools; of these 135(62%) were public and 83(38%) were private. Total population of teachers in all schools was 5,720; of these 4,390(77%) were females and 1,330(23%) were males. Total population of teachers in public schools was 4,667; of these 3,878 (83%) were females and 789(17%) were males. Total population of teachers in private schools was 1,053; of these 512(49%) were females and 541(51%) males.

3.4 Sample size estimation

The study used the findings from the study done by (Makene, 1976) to calculate the sample size.

The sample size N was determined by using the following formula.

$$N=\frac{Z^2P\,(100-P)}{d^2}$$

Where,

N= the minimum desired sample Size

Z= the standard normal deviate (normally set at 1.96 which corresponds to 95% Confidence level of parameter estimation.

d= the degree of accuracy desired, set at 5%

P= 40% which was the prevalence of hypertension among workers in Tanzania, (Makene, 1976).

Substituting these figures in the above formula gave the minimum required sample size of 384. Ten percent (10%) was added to carter for non respondents, making the minimum sample size 422 teachers.

However to determine the association between hypertension and risk factors, the sample size was further calculated as follows; the number 422 was multiplied by a factor of 20%, and then multiplied by 7, being risk factors under the study; = 591. To get the sample for an association, 591+422=1013. Furthermore 106 teachers were added during data collection to include more male teachers in the study; therefore the sample size was 1119 teachers.

3.5 Sampling procedure

Kinondoni municipality was randomly selected among the three municipalities in Dar es Salaam also on the assumption that prevalence of hypertension among teachers might be high compared to other municipalities. Furthermore this selection was limited by the financial constraints which necessitated the research work to be concentrated in the urban area. The teacher's population was selected on the assumption that might be a

good representative sample of the workers population. The list of primary schools was obtained from the Municipality education officer, 30% of the total number of schools (218) was used to select the required sample. Therefore 66 schools were enrolled in the study; 33 public and 33 private. The schools which were enrolled in the study were selected by random sampling. The List of teachers from the selected schools was obtained from the head teacher, and stratified random sampling was employed in getting the participating teachers in which an average of 17 teachers were selected from 63 schools and 16 teachers were selected from 3 schools thus making the required sample size of 1119 teachers. The interview was administered to the selected teachers and recruitment of the study participants was done on daily basis until the required sample size was achieved.

3.6 Data collection procedure

3.6.1 Recruitment and training of research assistants

Three fourth year medical students from MUHAS and a nurse from Muhimbili national hospital were recruited. The interviewers were medical personnel for knowing medical ethics and ability to measure and record respondents height, weight and blood pressure accurately. They were given two days training which covered the study, research tools, administering the research tools and ethics.

3.6.2 Pre-testing of the study tool

The pre-testing of research tool which included (10 %) of the required sample was done in four primary schools in Ilala municipality. Therefore 112 teachers formed the pre-testing sample. The findings from this test were used to check the logic flow of the questions and whether they were understood by target group. Pre-testing was done before conducting the actual study in order to identify gaps for correction.

3.6.3 Data collection

Data were collected using structured questionnaire with closed and open ended questions. The questionnaire was developed in English and translated into Kiswahili. The data on demographic information of the respondents, weight, height, habitual

physical activity, dietary and social habits on alcohol drinking and cigarette smoking were collected. Every stratified randomly selected respondent was invited to participate in the study. Each interview lasted for 10-20 minutes.

Anthropometric measurements, including weight, height were taken using standardized procedures, weight was measured while wearing clothes and without shoes and was measured to the nearest 0.5 kg in kg by using a scale (SECA model). Body mass index (BMI) was calculated as weight divided by height squared ($kg/m^{2)}$ and categorized as; underweight (<18.5), normal weight (18.5-24.9), overweight (25.0-<30.0), and obese (≥30.0). (WHO, 2000). Height was measured in cm with a metal tape fixed to a wall and right-angle device.

Blood pressure measurements were conducted in a quiet office, classroom or library at the study sites. Blood pressure was measured in mmhg using a standardized and validated automatic digital blood pressure measuring machine (Omron Digital HEM907, Tokyo, Japan). Two blood pressure readings were taken each on the left upper arm and right upper arm with a participant in a seated position after at least 10 minutes interval of rest. To reduce the possible effect of apprehension and anxiety on the blood pressure estimation (systolic and diastolic), two measurements were taken and the mean was determined which was used in this analysis. High blood pressure was systolic blood pressure (SBP)>140mmHg or diastolic blood pressure (DBP).>90mmHg or taking anti-hypertensive medication (JNC VII, 2003).

Dietary intake was assessed *using* a food frequency questionnaire. This questionnaire consisted of three food groups, carbohydrate, fat, and protein and for each group, frequencies of less often and often used categories were assessed for each study participant. The salt addition in the meal was also assessed.

Physical activity was assessed by asking whether the participant participated or did not participate in various physical activities. The frequency of participation and no participation were recorded and expressed as percentage. Alcohol intake was evaluated

using a food frequency questionnaire and classified as: no alcohol intake or alcohol intake. Tobacco use was categorized as no cigarette smoking or smoking.

3.7 Study Variables

Dependent variable: Hypertension

Independent variables: These included age, weight, physical activity, diet pattern, salt intake, alcohol consumption and cigarette smoking.

3.8 Data management and analysis

Data coding, checking and cleaning was done on daily basis for validation to ensure consistency before entry into an Epi-Info computer program which was used for analysis using windows (Epi info; version 6). The descriptive statistics of continuous data were computed for the study participants. For nominal variables like diet, the percentages in each food group category were calculated for comparative purposes. The Chi-square test was used to investigate the statistical significance of the association between categorical variables. Significance level was set at cut-off point p-value of 0.05. Variables which had statically significant association with the outcome of interest (hypertension) were subjected to logistic regression analysis. Logististic regression analysis was carried out to model the predictors of major outcome variables of the study. A p-value of 0.05 or less was considered as indicative of statistical significance.

3.9 Ethical considerations

Ethical approval for conducting this study was obtained from the Research and Publications Committee of the Muhimbili University of Health and Allied Sciences (MUHAS). Furthermore the permission to undertake the study and data collection was obtained from Regional Administrative Secretary Dar es Salaam, Director Kinondoni municipality and Kinondoni Municipality education officer. For each selected participant, the aim of the study was explained and asked for written consent and assured of confidentiality. The height, weight and blood pressure measurements to each study participant were taken in a quiet room and all information collected was treated confidential. The study participants who were found having hypertension and not on

medication were advised to consult the doctor and make regular follow-up, for those who were found having hypertension and on treatment were advised to continue with their medication and those who were found having severe hypertension and not on treatment were advised and provided transport for admission to Mwananyamala district hospital.

CHAPTER FOUR

4.0 RESULTS

This chapter presents descriptive and analytical results from interviews of 1119 primary school teachers aged 21 to 60years in Kinondoni Municipality. The results included analysis of risk factors; age, weight, physical activity, diet pattern, salt intake, alcohol use, and cigarette smoking and association with hypertension.

4.1 Descriptive characteristics of the study participants

The Descriptive Characteristics of the study participants are shown in Table 1, the mean; age was 38(±SD10.21)years, height was 160(±SD6.92)cm, weight was 72(±SD15.01)kg, body mass index was 28(±SD5.86kg/m²) systolic blood pressures was 125(±SD22.41) mmhg, and diastolic blood pressure was 78(±SD12.41)mmhg. The minimum and maximum; age was 21years and 60years, height was 143cm and 183cm, weight was 37kg and 137kg, BMI was 15(kg/m²) and 52(kg/m²), systolic blood pressure was 80mmhg and 270mmhg and diastolic blood pressure was 60mmhg and 140mmhg.

Furthermore there were 936(83.6%) and 183(16.4%) female and male respondents respectively, and the study consisted predominantly females with the female to male ration of 5:1.

Table 1: Descriptive characteristics of the study participants

Item	Mean	Range	Std deviation
Age (years)	38	21-60	10.21
Height (cm)	160	143-184	6.92
Weight (kg)	72	37-137	15.01
Bmi *(kg/m²)*	28	15-52	5.86
Systolic bp (mmhg)	125	80-270	22.41
Diastolic bp (mmhg)	78	60-140	12.41

4.1.1 Distribution of body mass index of the study participants by sex

Table 2 shows the proportion of obesity among female respondents was (95.3%) and (4.7%) among male respondents. The proportion of overweight among female respondents was (81.8%) and (5.8%) among male respondents. The prevalence of overweight and obesity among study participants was (32.0%) and (35.8%) respectively.

Table 2: Distribution of body mass index of the study participants by sex

BODY MASS INDEX		Female	Male	Total
Underweight	<18.5	21	9	30
		70.0%	30.0%	2.7%
Normal weight	18.5-24.9	240	90	330
		72.7%	27.3%	29.5%
Overweight	25-29.9	293	65	358
		81.8%	18.2%	32.0%
Obese	≥30	382	19	401
		95.3%	4.7%	35.8%
Total		936	183	1119
		83.6%	16.4%	

4.1.2 Blood pressure distribution of the study participants

There were 152(13.6%) known hypertensive study participants and 193(17.2%) unknown. There were 102(9.1%) hypertensive study participants who were on medication and 243(21.7%) were not. The prevalence of; hypertension among study participants was (30.8%), high systolic blood pressure was (22.2%), high diastolic blood pressure was (21.4%) and severe hypertension was (11.6%). Further more the prevalence of hypertension among female respondents was (26.7%) and (4.1%) among male respondents. Moreover the prevalence of hypertension was highest among overweight respondents (25.9%), followed by age (24.8%) and prevalence of hypertension in other risk factors were; physical inactivity (24.1%), high fat intake (17.6%), salt addition (10.5%), alcohol use (9.9%), and cigarette smoking (0.3 %.)

4.1.3 Alcohol use of the study participants

The proportion of alcohol use among female respondents was (27.9%), and (49.7%) among male respondents. The prevalence of alcohol use among study participants was (31.5%) ;(23.3%) among female respondents and (8.2%) among male respondents.

4.1.4 Cigarette smoking of the study participants

The proportion of cigarette smoking among female respondents was (33.3%) and (66.7%) among male respondents. The prevalence of smoking among study participants was (0.8%); (0.3%) among female respondents and (0.5%) among male respondents.

4.2 Analytical results

4.2.1 Association between age and hypertension

The proportion of respondents who developed hypertension increased with age and was highest among age group 59-69 years (92.9%) followed by age group 48-58years (65.3%) and age was statistically significantly associated with hypertension, (X^2=267.45, P=0.001) as shown in table 3.

Table 3: Association between age and hypertension

Age group	Non hypertensive	Hypertension	Total	Significance
15-25	150	17	167	
	89.8%	10.2%	14.9%	
26-36	359	51	410	
	87.6%	12.4%	36.6%	
37-47	177	100	277	X^2=267.45
	63.9%	36.1%	24.4%	P=0.001
48-58	87	164	251	
	34.7%	65.3%	22.4%	
59-69	1	13	14	
	7.1%	92.9%	1.3%	
Total	774	345	1119	
	69.2%	30.8%		

4.2.2 Association between body mass index and hypertension

The proportion of respondents who developed hypertension increased with body mass index and was highest (47.9%) among obese respondents followed by overweight respondents (27.4%) and body mass index was statistically significantly associated with hypertension, (X^2=97.56, P=0.001) as shown in table 4.

Table 4: Association between body mass index and hypertension

Body mass Index *(Kg/m²)*	Non Hypertensive	Hypertension	Total	Significance
Under weight	26	4	30	
<18.5	86.7%	13.3%	2.7%	
Normal weight	279	51	330	
18.5-24.9	84.5%	15.5%	29.5%	
Over weight	260	98	358	
25-29.9	72.6%	27.4%	32.0%	X^2=97.56
Obese	209	192	401	P=0.001
≥30	52.1%	47.9%	35.8%	
	774	345	1119	
Total	69.2%	30.8%	100%	

4.2.3 Association between running and hypertension

Table 5 shows an association between running and hypertension, the proportion of respondents who developed hypertension among those who were not doing running activity was higher (33.6 %) than the proportion of respondents who developed hypertension among those who were doing running (23.5%) and running was statistically significantly associated with hypertension, (X^2=10.8, P=0.001).

Table 5: Association between running and hypertension

Running	Non Hypertensive	Hypertension	Total	Significance
N0	539	273	812	
	66.4%	33.6%	72.6%	X^2=10.8
Yes	235	72	307	P=0.001
	76.5%	23.5%	27.4%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.4 Association between gardening and hypertension

The proportion of respondents who developed hypertension among those who were doing gardening (41.5%) was higher than the proportion of respondents who developed hypertension among those who were not doing gardening (27.3%) and gardening was statistically significantly associated with hypertension, (X^2=19.71, P=0.001) as shown in table 6.

Table 6: Association between gardening and hypertension

Gardening	Non hypertensive	Hypertension	Total	Significance
No	612	230	842	
	79.1%	27.3%	75.2%	X^2=19.71
Yes	162	115	277	P=0.001
	58.5%	41.5%	24.8%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.5 Association between weight lifting and hypertension

The proportion of respondents who developed hypertension among those who were not doing weight lifting (31.5%) was higher than the proportion of respondents who developed hypertension among those who were doing weight lifting (18.6%) and weight lifting was statistically significantly associated with hypertension, (X^2=4.34, P=0.03) as shown in table 7.

Table 7: Association between weight lifting and hypertension

Weight Lifting	Non Hypertensive	Hypertension	Total	Significance
No	726	334	1060	
	68.5%	31.5%	94.7%	X^2=4.34
Yes	48	11	59	P=0.03
	81.4%	18.6%	5.3%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.6 Association between farming and hypertension

Table 8 shows the association between farming and hypertension, the proportion of respondents who developed hypertension among those who were doing farming was higher (40.8%) than the proportion of respondents who developed hypertension among those who were not doing farming (27.3%), and farming was statistically significantly associated with hypertension, (X^2=18.24, P=0.001).

Table 8: Association between farming and hypertension

Farming	Non Hypertensive	Hypertension	Total	Significance
No	601	226	827	
	72.7%	27.3%	73.9%	X^2=18.24
Yes	173	119	292	P=0.001
	59.2%	40.8%	26.1%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.7 Association between animal keeping and hypertension

The proportion of respondents who developed hypertension among those who were doing animal keeping was higher (37.6%) than the proportion of respondents who developed hypertension among those not doing animal keeping (29.5%) and animal

keeping was statistically significantly associated with hypertension, (X^2=4.6, P=0.03) as shown in table 9.

Table 9: Association between animal keeping and hypertension

Animal Keeping	Non Hypertensive	Hypertension	Total	Significance
No	663	278	941	
	70.5%	29.5%	84.1%	X^2=4.6
Yes	111	67	178	P=0.03
	62.4%	37.6%	15.9%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.8 Association between fat intake and hypertension

Table 10 shows an association between fat intake and hypertension. The proportion of respondents who developed hypertension among those who were taking high fat intake (33.3%) was higher than the proportion of respondents who developed hypertension among those who were taking low fat intake (29.2%) and fat intake was statically significantly associated with hypertension, (X^2=8.87, P=0.01).

Table 10: Association between fat intake and hypertension

Fat Intake	Non hypertensive	Hypertension	Total	Significance
Often	297	148	445	
	66.7%	33.3%	39.8%	X^2=8.87
Less	477	197	674	
Often	70.8%	29.2%	60.2%	P=0.01
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.9 Association between salt intake and hypertension

Table 11 shows an association between salt intake and hypertension. The proportion of respondents who developed hypertension among those who had addition of salt (33.3%) was higher than the proportion of respondents who developed hypertension among those who had no addition of salt (26.6%) and addition of salt was statistically significantly associated with hypertension, (X^2=12.5, P=0.001).

Table 11: Association between salt intake and hypertension

Salt Addition	Non Hypertensive	Hypertension	Total	Significance
Yes	448	227	675	
	66.4%	33.6%	59.1%	X^2=12.5
No	326	118	444	P=0.001
	73.4%	26.6%	39.7%	
Total	774	345	1119	
	69.2%	30.8%	100%	

4.2.10 Logistic regression

The model on binary logistic regression of the predictors of hypertension is shown on table 12. Age (OR=3.17, 95%CI=2.70-3.72), body mass index (OR=2.20, 95%CI=1.87-2.60), gardening (OR=1.89, 95%CI=1.42-2.51), farming (OR=1.83, 95%CI=1.39- 2.42), and animal keeping (OR=1.44, 95%CI=1.03-2.01) were statically significantly associated with hypertension and positive predictors of hypertension. Weight lifting (OR=0.50, 95%CI=0.26-0.98), and running (OR=0.60, 95%CI=0.45-0.82), were statically significantly associated with hypertension and negative predictors of hypertension. However age (OR=2.82, 95%, CI=2.38-3.35) and body mass index (OR=1.08, 95%CI=1.05-1.11) remained statistically significantly associated with hypertension in the final model and were strong positive predictors of hypertension.

Table 12: Logistic regression results –risk factors associated with hypertension

Risk	Univariate analysis			Multivariate analysis		
Factor	Odd ratio	P value	95%-CI	Odd ratio	P value	95%-CI
Age	3.17	0.001	2.70-3.72	2.82	0.001	2.38-3.35
Bmi	2.20	0.001	1.87-2.60	1.08	0.001	1.05-1.11
Running	0.60	0.001	0.45-0.82	1.02	0.93	0.71-1.45
Gardening	1.89	0.001	1.42-2.51	1.14	0.52	0.76-1.71
Weight Lifting	0.50	0.041	0.26-0.98	0.85	0.20	0.66-1.10
Farming	1.83	0.001	1.39-2.42	1.15	0.50	0.77-1.72
Animal Keeping	1.44	0.033	1.03-2.01	0.78	0.24	0.52-1.18
Fat intake	0.78	0.001	0.67-0.91	0.83	0.31	0.70-0.98

CHAPTER FIVE

5.0 DISCUSSION

This chapter presents discussion of results of blood pressure and association with risk factors; age, obesity, physical activity, diet pattern, salt intake, alcohol use, and cigarette smoking.

5.1 Blood pressure

The maximum systolic and diastolic blood pressure was 270mmhg and 140mmhg respectively; hence some respondents had severe hypertension and this might be due to either poor compliance to medication or not knowing that they had hypertension. The prevalence of hypertension was (30.8%) and highest among female respondents (26.7%). The prevalence of hypertension was highest among overweight respondents (25.9%) followed by age (24.8%). The prevalence of hypertension in other risk factors were; physical inactivity (21.4%), high salt intake (19.5%), high fat intake (17.6%), alcohol use (9.9%), and cigarette smoking (0.3 %.).

The prevalence of hypertension in this study was appromaximately similar to the global prevalence which was approximately 30 %(Kearney *et al.* 2005). Furthermore this prevalence was less than in studies conducted in Tanzania which showed an overall prevalence to be 41.1% in 1998, for men and 38.7% for women in a survey carried out in Dar es Salaam (urban), Handeni (rural) and Monduli (semi – nomadic area) (Edwards,R. *et al,* 2000). Moreover the prevalence of hypertension in the present study was similar to that found in earlier studies done in Tanzania in which the blue collar office workers epidemiological surveys gave the prevalence of 30-40% in Dar – es – Salaam (Makene, 1976). However the prevalence of hypertension was slightly lower than in a study done in Dar es Salaam (Bovet *et al*, 2002) who reported a prevalence of hypertension (BP > 140/90 l~ mmHg or anti-hypertensive (anti-HT) drug use) to be(27%) and (30%), among men and women respectively. This prevalence of hypertension might be attributable to changes in life style, over consumption of unhealthy diets, sedentary lifestyle, overweight, obesity, and alcohol overuse. Several gender disparities

in hypertension risk factors were observed particularly high levels of obesity among female respondents.

5.2 Age and blood pressure

The mean age of the study population was 38 years, thus the majority of the respondents were middle age. The age group 48-58years had highest prevalence of hypertension (14.7%) followed by 37-47years (8.8%), and prevalence of hypertension in other age groups were; 26-36years (4.6%), 15-25years (1.5%) and 59-69yaers (1.2%). Age was statically significantly associated with hypertension (X^2=267.45, P=0.001). Furthermore logistic regression analysis showed age was also statistically significantly associated with hypertension (OR=2.82, 95%CI=2.38-3.35) and strong positive predictor of hypertension. Blood pressure had been shown to increase with increasing age in developed communities, as well as in some developing communities (Van de Sander *et al*, 2001). In this study a marked rise in blood pressure with increasing age was found in all age groups. These findings of a rise in blood pressure with age were similar to the trend found in most of the black populations (Van der Sander *et al*, 2001). Though the rise with age of blood pressure was much sharper in Americans of African origin than those of Caucasian origin (Shaper and Whincup, 1997). Additionally, (Seedat,1998) reported that blood pressure increased with increasing age developed at an earlier age in blacks in South Africa than in whites, as was the case with Afro-Americans when compared to whites in the USA. In this study there was a trend of increasing prevalence of hypertension in all age groups even in the younger age groups.

5.3 Body Mass Index and blood pressure

The prevalence of hypertension was highest (17.1%) among obese followed by overweight (8.8%), and body mass index was statistically significantly associated with hypertension (X^2=97.56, P=0.001). Further more logistic regression analysis showed body mass index was statically significantly associated with hypertension (OR=1.08, 95%CI=1.05-1.11) and strong positive predictor of hypertension. Therefore blood pressure increased with increasing body mass index. The association between increased body mass index and blood pressure was consistent with findings from previous studies

in urban sub-Saharan African settings (Aspray *et al,* 2000 and Vorster, 2002). Obesity is associated with hypertension (Alexander, 2000). The association between hypertension and obesity had been well documented in many countries in Sub-Saharan Africa. In Zimbabwe, (Mufunda *et al,* 2000) found this strong association The prevalence of excess body weight was substantial in this study, particularly among female respondents. This was consistent with findings from a previous study in Tanzania, which noted a high proportion of overweight among women aged 47 to 57 years (Njelekel *et al,* 2001). And was consistent with other studies among women in urban areas in Cameroon and Kenya (Sobngwi *et al*, 2001, Christensen *et al*, 2008). The high proportion of overweight and obesity among female respondents in this study might be attributed to socio-cultural factors, namely gender-specific patterns of work activities, sedentary lifestyle (Walker *et al,* 2001) and cultural standard of physical attractiveness in African Societies.

The mean body mass index was 28, hence majority of the study participants were overweight. Obesity with a body-mass index of 30 or more was common and represented a major health problem in developed as well as developing populations (Abate, 2000). In this study overweight and obesity were prevalent, but female respondents had a higher prevalence of both overweight and obesity than male respondents. Similar findings had been reported in other African countries (Bovert *et al.* 1991, Seedat 1996 and 1998) as well as in Tanzania (Njelekela *et al.* 2001).

5.4 Physical Activity in relationship with blood pressure

Less physical activity participation was the predominant pattern among study participants. The prevalence of hypertension was comparatively higher among study participants who were not participating in various physical activities than those participating and it was highest in those doing no swimming (30.3%) followed by those doing no dancing (29.9%). Further more the prevalence of hypertension among those not participating in other physical activities were; weight lifting(29.9%), bicycle riding(28.5%), business supervision(27.4%), sports(26.4%), animal keeping(24.9%), running(24.4%), gardening(20.6%), and farming(20.2%). Moreover in this study the

prevalence of hypertension was lower among those participating in various physical activities than those not participating except in gardening, farming, and animal keeping in which the prevalence was higher among those participating.

The physical activity variable was subdivided into eleven variables which were related with the respondent's blood pressure, analysis showed five physical activity variables were statically significantly associated with hypertension; running(X^2=10.8,P=0.001), gardening(X^2=19.71, P=0.001), weight lifting(X^2=4.34, P=0.03) farming(X^2=18.24, P=0.001), and animal keeping. (X^2=4.6, P=0.03). The other six physical activity variables were not statically significantly associated with hypertension; sports, (P=0.1), bicycle riding, (P=0.2), swimming (P=0.2), dancing (P=0.1), house works (P=0.4) and business supervision (P=0.4). Further analysis showed gardening (OR=1.89, 95%CI=1.42-2.51), farming (OR=1.83, 95%CI=1.39- 2.42) and animal keeping (OR=1.44, 95%CI=1.03-2.01) were statically significantly associated with hypertension and positive predictors of hypertension. Gardening and farming might be related to availability of food, increase consumption of carbohydrate hence increase in body mass index and blood pressure whereas animal keeping might be related to increase consumption of fat, dairy produce and meat which are rich in saturated fats and cholesterols which might increase body mass index and blood pressure .

Several epidemiological studies have demonstrated an inverse association between physical activity level and blood pressure (Fagard and Tipton, 1994), as also observed in this study in which weight lifting (OR=0.50, 95%CI=0.26-0.98), and running(OR=0.60, 95%CI=0.45-0.82), were statically significantly associated with hypertension and negative predictors of hypertension hence had protective association. These findings were in accordance with the contention that PAL might play a crucial role in controlling blood pressure. This study supports previous observations (Berlin and Colitz, 1990) that the physical activity level (PAL) is inversely related to the body mass index (BMI), body weight, diastolic and systolic blood pressure. Generally, female and male respondents in this study lived less active life. They were less involved in physical activities and had sedentary habits. Although estimated levels of physical activity were crude, the

observations of this study suggested that low daily physical activity among respondents was one of the factors which contributed to their increased overweight, obesity and Blood pressure. These findings agreed with the outcomes of two studies done in West Africa (Forrest *et al*, 2001). The teacher's population of this study had begun to adopt a more sedentary lifestyle, as observed in westernized societies.

5.5 Diet pattern and blood pressure

Generally, diet pattern of the study participants consisted of high carbohydrate intake 74.5% and high fat intake 60.2%. Therefore high intakes of carbohydrate and fat were predominant diet pattern of the study participants. The prevalence of hypertension was highest (22.1%) among those who were taking high carbohydrate intake followed by those taking high fat intake (17.6%) and least in those taking high protein intake (9.8%). Fat intake was statistically significantly associated with hypertension, (X^2=8.87, P=0.01). Carbohydrate and protein intakes were not statically significantly associated with hypertension; carbohydrate (P=0.2) and protein (P=0.2). Further more logistic regression analysis showed fat intake (OR=0.83, 95%CI=0.70-0.98) was not statically significantly associated with hypertension.

Therefore dietary alterations including over consumption of diets with high fat as shown in this study might be associated with increase of body mass index which could contribute to the elevation of blood pressure. Although the assessments of habitual diet pattern among respondents were crude because I did not know how much fat and carbohydrate were consumed. However, the findings indicated that the participants might include more modern foods into their diet.

5.6 Salt intake and blood pressure

The proportion of respondents who developed hypertension among those who had addition of salt (33.3%) was higher than the proportion of respondents who developed hypertension among those who had no addition of salt (26.6%) and addition of salt was statistically significantly associated with hypertension, (X^2=12.5, P=0.001).

The prevalence of hypertension among those who had an addition of salt was higher (20.3%) than those who had no addition of salt (10.5%).The higher prevalence of hypertension among those who had addition of salt might be either were known hypertensive not on medication 0r without adhering to salt intake restriction. However logistic regression analysis showed salt addition was not statically significantly associated with hypertension (OR=0.85, 95%CI=0.66-1.09).

Despite that no attempt was made to measure salt intake, salt intake had been documented to play an important role in causing hypertension (Compese *et al.* 1991, Kaplan 1994, Yu *et al.*1999). The association between salt intake and hypertension had been documented among Tanzania population, particularly in males (Njelekela *et al.* 2001). Regarding these findings, it was revealed that high salt intake could be the reason that hypertension was prevalent in the studied population.

5.7 Alcohol use and blood pressure

The proportion of respondents who developed hypertension among alcohol users(31.5%) was higher than the proportion of respondents who developed hypertension among non users(30.5%), and alcohol use was not statistically significantly associated with hypertension, (P=0.7). Prevalence of hypertension among non alcohol users was higher (20.9%) than alcohol users (9.9%). Therefore, alcohol consumption was common in this studied sample, and was more common in male respondents (49.7%) than female respondents (27.9%). An alcohol intake of three or more drinks per day can raise blood pressure, thus putting heavy drinkers at higher risk (Ghannem and Fredj, 1997, Fuchs *et al.* 2001).

5.8 Cigarette Smoking and blood pressure

The proportion of respondents who developed hypertension among smokers (33.3%) was higher than the proportion of respondents who developed hypertension among non smokers(30.8%) and smoking was not statistically significantly associated with hypertension,(P=0.9). The prevalence of hypertension among cigarette smokers was (0.3%). The prevalence of smoking had been reported to be increasing in Tanzania

(Jagoe *et al*, 2002), the prevalence of current smokers in this study was lower in men (0.5%) and women (0.3%) compared to 2002 study (Jagoe *et al*, 2002), in which the prevalence was 27% and 5% respectively. This might be due to ant smoking campaign and health education on health hazards associated with smoking and prohibition of smoking in work places. Also there were more females in this sample than males and impact of antenatal clinic health education. Although smoking rates were comparatively lower in this study, smoking remains an important risk factor for hypertension and cardiovascular disease and more prevention and cessation programs are warranted in this population.

5.9 Study limitations

The study had several limitations. First a cross-sectional study did not allow inferences to be drawn with respect to the causal relationships among variables. Because exposure and outcome were measured simultaneously, therefore it was not possible to determine whether the measured exposure preceded an outcome or resulted from it.

Information bias refers to systemic error in the information obtained from participants. These errors, in turn, could be due to differences in the ways in which data collectors elicit information from participants or to the participants themselves reporting information in a non-comparable manner. To avoid biases related to collecting data from participants, trained research assistants and principal investigator administered the questionnaire and performed blood pressure and anthropometrical measurements.

Non disclosure regarding smoking, drinking and overeating behaviors for there might be a tendency to underreport, because participants might know that they should not smoke at all, or not drink or not overeat because of health consequences. Non disclosures regarding smoking, drinking and overeating behaviors were minimized by training the research assistants on proper data collection in an ethical manner, insuring confidentiality to each study participant.

Hair make style-most study participants were females whom some had hair make style which presented difficult in measuring height correctly and this might led to an error in height estimation thus underestimating the body mass index.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The prevalence of hypertension was 30.8%. Age, body mass index, gardening, farming and animal keeping were statically significantly associated with hypertension and positive predictors of hypertension. Weight lifting and running were statically significantly associated with hypertension and negative predictors of hypertension. However age and body mass index remained statically significantly associated with hypertension and strong positive predictors of hypertension in final model.

1.7 Recommendations

The results of this study point for an action to limit the prevalence of hypertension and associated risk factors among primary school teachers in Kinondoni municipality. The following are key recommendations for policy, practice and research:-

1. Age was statically significantly associated with hypertension moreover hypertension was prevalent even in younger age groups. Interventions addressing reduction overweight, obesity, physical inactivity, high fat intake and high salt intake should target middle and younger teachers through promoting healthy lifestyle, physical activity and healthy diet.

2. Sedentary life style was predominant pattern among study participants and lack of physical activity was major contributing factor to overweight, obesity and hypertension. Therefore physical activity habit promotion among teachers in Kinondoni Municipality and Ministry of Education should be advocated to reduce prevalence of overweight, obesity and hypertension.

3. Body mass index was statically significantly associated with hypertension; therefore weight control should be a priority in prevention 0f hypertension among teachers. Interventions addressing reduction of overweight and obesity should to be

implemented and strategies should focus on promotion of a healthy diet and physical activity.

4. Dietary high fat intake had been statically significantly associated with hypertension. Daily consumption of diets high in saturated fats would lead to overweight, obesity and hypertension in later life. Therefore health education should be done to limit consumption of diets rich in saturated fats e.g. red meat and promote consumption of diets rich in unsaturated fats e.g. white meat and cooking vegetable oils.

5. An addition of salt in the meal was statically significantly associated with hypertension, health education should be promoted to limit use of high dietary salt intake among teachers population.

6. Although alcohol drinking and cigarette smoking were not statically significantly associated with hypertension, interventions addressing reduction of alcohol drinking and cigarette smoking should be promoted among teachers. Also cessation programs should be encouraged because these are still potential risk factors associated with hypertension.

7. Further researches are needed to determine the prevalence's of both primary and secondary hypertension and associated risk factors among primary school teachers in Kinondoni municipality. Other risk factors should be explored such as duration of urbanization, work stresses, and family size.

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