ASSESSMENT OF CARDIOVASCULAR RISK FACTORS AND LEVEL OF MALNUTRITION AMONG THE ELDERLY OF RURAL AND URBAN AREAS IN MOROGORO, TANZANIA

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By

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A Dissertation report submitted in partial fulfilment for dissertation of the requirements for the degree of Master of Science in Physiology of the Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance of dissertation entitled ***Assessments of Cardiovascular Risk factors and Level of Malnutrition Among the Elderly of Rural and Urban areas in Morogoro, Tanzania*** in (partial) fulfilment of the requirements for the degree of Master of Science in Physiology of Muhimbili University of Health and Allied sciences.

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Dr. B.L Mtinangi

(Supervisor)

Date: **.....**

DECLARATION AND COPYRIGHT

I, Mwangengwa Lusekelo Msomba, declare that this dissertation is my own original work and has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature…… Date .....

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DEDICATION

This work is dedicated to my two beloved daughters; Anna and Luth who were patient enough at all time of my absence during the conduction of my studies. Other dedication goes to my young brother Luka Msomba and my sister Huruma Msomba for taking care of my children during the period of my absence.

ABSTRACT

Back ground: The rise in elderly population globally, is apparently accompanied by the increase in prevalence of Cardiovascular Risk Factors (CRF) and nutritional challenges.

Methodology: A descriptive cross-sectional study was conducted to determine the levels of common CRF and nutritional status among the elderly of urban and rural areas in Morogoro region. A sample of 300 elderly participants was studied and the Body Mass Index (BMI) (kg/m^2), lipids profile (mg/dL), Fasting Bood Glucose (FBG) (Mmol/L), Blood pressure (BP) (mmHg) and Mini nutrition score points were determined.

Results: Of the 300 participants, (73.4%) had dyslipidemia and the prevalence was higher in female sex ($P<0.001$). The prevalence of hypertension was 46.3% and was higher in female sex ($P<0.05$). Dyslipidemia and hypertension were the most prevalent and were more revealed among the urban residents. Obesity, more diagnosed in females sex was revealed in (27.3%) of 300 participants and cases were highly found among the urban occupants. Hyperglycemia marginally higher in female's sex was found in 19% of 300 participants and the number was marginally higher in the urban compared to rural dwellers. Association of hypertension with obesity ($P<0.01$, RR=1.5), hyperglycemia ($P<0.05$, RR=1.5) and dyslipidemia ($P<0.05$, RR =1.7) was revealed statistically and many elderly with obesity were also diagnosed with dyslipidemia ($P<0.05$, RR=2) and hyperglycaemia ($P<0.05$, RR= 1.8) respectively. Association of smocking with lowered High Density Lipoprotein (HDL) was also revealed in the study ($P<0.05$, RR= 1.6). In this study ware also revealed some cases of nutritional problems as it was observed that 24.6%, (n=300) of the studied elderly, were either malnourished or at risk of malnutrition. Additionally the risk of malnutrition was more revealed among the rural residents when compared to the urban living elderly people.

Conclusion: The results revealed a burden of CRF and nutrition challenges among the ≥60 aged elderly people of Morogoro in Tanzania. Creating awareness on healthy life styles may help to ameliorate the modifiable CRF and nutrition challenges hence perpetuate the healthy elderly population.

Key words; Prevalence, Cardiovascular risk factors, Malnutrition, Elderly

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LIST OF ABBREVIATION AND ACRONYMS

BP	Blood Pressure
LDL	Low Density Lipoprotein
HDL	High Density Lipoprotein
TG	Triglycerides
TC	Total Cholesterols
VLDL	Very low Density Lipoprotein
MNA$^{(R)}$	Mini Nutritional Assessments
BMI	Body Mass Index
MUHAS	Muhimbili University of Health and Allied Sciences
WHO	World Health Organization
CRF	Cardiovascular Risk Factors
SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure
IDH	Isolated Diastolic Hypertension
ISH	Isolated Systolic Hypertension
COSTECH	Commission of Science and Technology
FBG	Fasting Blood Glucose
JNC7	The Seventh Report of the Joint National Committee (US department of Health and Human services)

CHAPTER ONE

1. BACK GROUND INFORMATION

1.1. Introduction

Aging refers to the accumulation of miscellaneous deleterious changes which take place in cells and tissues. With advancing age, these changes are accountable for increased risk of diseases and death [1]. The average total number of years that a human expects to live defines life expectants, while the maximum number of years lived by a person defines a life span [1]. For purpose of the analysis, ageing in the Tanzanian perspectives is defined as a biological process which has its own dynamics largely beyond human control. The age of 60 years and above roughly equivalent to retirement ages in Tanzania, is said to be the beginning of old age [2].

Several theories which explain the pathophysiological mechanism associated with ageing includes; free radical theory, immunologic theory, inflammation theory, endocrinology theory, evolutionary theory and mitochondrial theory [1, 2, 3, 4, 5]. Each among the major theory of aging explains a particular cause of aging providing important information for the understanding of age-related pathophysiological changes [1].

Ageing as a natural process is accompanied by a number of undesirable physiological changes which include; a decrease in physical activities, increase in fat mass ratio, decrease in muscles mass, increase in bodyweight, hypertension, decrease of insulin sensitivity, hyperglycaemia and loss of sense of smell and taste [6].

Malnutrition is also among the common problems reported in elderly age [7]. The most commonly mentioned risk factors linked with malnutrition in old ages includes; poverty, living alone, poor dentition, loss of sense of smell and taste, chronic diseases, prolonged use of drugs, psychological stress and dementia [7].

The number of elderly people has been reported to increase globally [7]. Tanzania is not exceptional on this since 4% of the population are old [8]. Elderly people are reportedly to have deteriorative bodily changes attributed to accumulated pathophysiological changes [6, 9]. These alterations in body functioning among other things may affect dietary intake and raise the risk for malnutrition more in elderly than in other groups in a population [7, 9].

Studies have linked poverty, decrease in taste and smell acuity, deteriorating dental health, dysphasia and decreased physical function in old age to nutrient intake below standard leading to malnutrition [9]. It is estimated that between 2%–16% of community-dwelling elderly are nutritionally deficient in protein and calories and if mineral and vitamin deficiencies are included in the estimate, malnutrition in persons over the age of 65 may be as high as 35% [7].

Malnutrition has also been reported in elderly refugees from Rwanda in studies conducted in refugee's camps in Tanzania and Malawi [10]. Early research have also reported the prevalence of cardiovascular risk factors in the Tanzanian adults of over 35 years, 40-66 and elderly of 47-57 years old [11,12].

Regardless of existing data on the prevalence of malnutrition in elderly refugees from Rwanda in studies conducted in refugee's camps in Tanzania and Malawi [10], inadequacy of information regarding the nutritional status among the community dwelling elderly in our country other than in refugee's camps forces the need to undertake more studies.

Although studies have been conducted in Tanzania to determine the prevalence of cardiovascular risk factors in adults of over 35 years and elderly of 40-66 years, a need to establish more data particularly in the postretirement elderly age (≥60 years old) led to the conduction of this study. Investigation was therefore carried out to determine the levels of common cardiovascular risks factors among the ≥60 year's old elderly of urban and rural areas in Morogoro region, Tanzania. In addition to that and on same study area, investigation was carried out to determine the levels of malnutrition among the urban and rural dwelling elderly individuals.

1.2. Literature review

1.2.1. Elderly Over view

Ageing is a biological process which has its own dynamics largely beyond human control [2]. The age of 60 years and above roughly equivalent to retirement ages in Tanzania is said to be the beginning of old ages [2]. Elderly population consists of extremely differing members ranging from those who are fit, active and healthy individuals to those who are extremely weak, entirely dependent people with chronic disease and severe disabilities [6,7].

The UN population study reported in 2005 stated the number of Tanzania over 60 years to be 4% with 3% being over 65 years [8]. The United Nations projection for 2020 to 2050 indicates that, the number of Tanzanians over 60 years will increase three times from 2.95 to 8.39 million [8].

Increasingly high life expectancy is reported from developed countries and findings indicate that; about 16% of the population is over 65 years and 2% are over 85 years [9]. Yet some predictions indicates that, in years to come the number of elderly globally will rise dramatically and particularly in the next 30 years [8, 9].

1.2.2. Ageing and Vascular changes

Ageing as a process is said to cause changes both in the architecture and constitution of the vascular wall [6]. The aging endothelium decreases the release of nitric oxide which is very important for pliability of the arterial wall. The process is accompanied by increased collagen tissues on vascular wall with decrease and disintegration of elastic tissues followed by deposition of fat and calcium which eventually leads to concurrent loss of elasticity and atherosclerosis [6].

These aging-related changes occurring in walls of arteries have important roles to play in cardio vascular disease pathogenesis. Atherosclerosis leads to a decrease in arterial lumen thickness which in turn leads to isolated arterial hypertension [6].

The pathophysiology of arterial hypertension is highly complex as it associates a number of related factors including changes in a number of systems which ultimately affects the relation between the thickness of arterial wall and its lumen [6].

The increase in thickness and rigidity of the wall of elastic aorta, great vessels and small blood vessels leads to narrowing of the lumen, limitation in blood flow and a raise in arterial blood pressure [6]. The observed greater vascular reactivity in hypertensive elderly is also partly explained by the decrease in membrane sodium pump activity, decreased beta-adrenergic receptor activity as well as age-related arterial structural changes [13].

Toshio Ogihara and colleagues (2003) explained the pathophysiology of hypertension in elderly to be characterized by increased total peripheral vascular resistance, decreased compliance of large and middle arteries leading toward a decrease in cardiac output and circulating blood volume, increased lability of blood pressure due to age-related decrease in baro-receptor function, decreased blood flow and dysfunction of auto regulation in important target-organs such as the brain, heart and kidneys [14].

A complex interaction between some genetic variants and the specific environmental factors has also been linked to hypertension [15]. It is assumed that, the same genetic variants responsible for regulation of blood pressure can after sometimes work in the opposite way [15]. Furthermore, the gene variant for hypertension is said to be highly frequent in hypertensive cases when compared to the controls [15].

1.2.3. Dyslipidemia and Hypertension

Cholesterols and triglycerides are among the blood plasma components transported by lipoproteins [16]. Except for the chylomicrons which are formed in the enterocytes (transports TG, cholesterol esters and phospholipids), other lipoproteins are formed in the liver [17].

The commonly mentioned lipoproteins include; very low density lipoprotein (VLDL) which transports TG and LDL cholesterol, low-density lipoprotein (LDL) which transport cholesterols to the peripheral tissues and high-density lipoproteins (HDL) that carry cholesterol from the body's tissues to the liver for excretion or re-utilization[16,17,18].

Body regulation of lipoprotein levels is crucial for regulation of plasma lipids level. Increasing or decreasing the production rate of lipoproteins is one of the regulatory mechanisms [16]. Regulation of lipoprotein and cholesterols is critical for good health consequences because cholesterol derangements can lead to a number of long standing health problems [16, 19].

Generally, high cholesterol level of LDL and VLDL or a high level of TG increases the risk for atherosclerosis and thus the risk for heart attack and stroke [16, 19]. On the other hand, high HDL level decreases the risk for atherosclerosis while the opposite is true for lowered level of HDL [16, 19]. Similarly in this case, interaction between some genetic traits and the environmental factors seems to operate at molecular level to cause the abnormally raised levels of lipoproteins and cholesterols [16, 19].

In addition to that, individual differences in sensitivity to effect of diet as related to hypercholesterolemia may indicate that, genetic constitution of different individuals influences the rate at which the body handles, utilizes and disposes the consumed lipids [16].The mechanism of atherosclerosis involves the interaction of low density lipoprotein cholesterol, the intima and sub endothelia space of the blood vessels and is commonly associated with arterial hypertension in old age [20].

Several authors have reported the evidence of links between dyslipidemia, high blood pressure and sub-endothelia thickness [21,22,23,24,25,26,27,28,29,30,31,32]. Increased release of free fat acids from adiposity into the circulation does occur with ageing. Raised level in circulation of free fat acids leads to increased synthesis of bad cholesterol such as LDL -cholesterol hence increasing the risk for Cardiovascular disease [33].

Body composition of fat and lean tissues seems to change with ages [30]. A large proportional of lean tissues decreases in elderly age due to impaired protein metabolism [34]. Nevertheless, the increase in body fat mass ratio with ageing, attains maximum in old age where it either remain steady or start to decline with ages [35,36,37,38,39,40].

Central accumulation of fat (visceral fat) with ageing is accompanied by degeneration of peripheral fat mass and is a characteristic feature of fat distribution in elderly [35,41]. Furthermore, the pattern of fat distribution in elderly age is associated with increased risks for stroke, diabetes mellitus, hyperlipidaemia, heart disease and hypertension [42].

Systolic hypertension is more prevalent in elderly than the systolic/diastolic hypertension or the diastolic hypertension [43,44]. The trend related to systolic and diastolic blood pressure has also been observed to change with ages. While the systolic blood pressure increases, the diastolic blood pressure seems to decrease with ageing [14].

1.2.4. Role of Kidney on Hypertension in the Elderly Population

The most common renal patho-physiological abnormalities in elderly age includes; glomerulo-nephritis, renal-atherosclerosis, amyloidosis, diabetic-nephropathy, chronic pyelonephritis and chronic renal failure of any cause which may lead to inefficient regulation of salts and extracellular body fluids leading to renal caused hypertension [14]. High salt consumption in elderly with renal problem may also lead to impaired osmoregulation and hypertension [14, 45].

1.2.5. Overweight and Obesity in the Elderly Population

Obesity results from excessive accumulation of fat in the body followed by increased weight beyond that considered desirable with regard to age [37]. In order for one to attain a constant body weight, total daily intake of energy should balance with expenditure [37,46]. The body obtains most of its energy from the metabolic processes (glycolysis, Krebs cycle, electron transport chain) of food stuff (Carbohydrates, Lipids and protein) consumed daily during the normal meals [46,47,48].

Energy is expended daily during the body activities which involves muscle movements. Such activities include; physical activities, exercises, sports and during some bodily metabolic activities [43,44]. The pathophysiological mechanism of overweight and obesity in the elderly is partly explained by the imbalances developed between the intake and expenditure of energy [46].

When energy consumption exceeds expenditure, the extra is stored as fat leading to increment in fat mass, overweight and obesity [46]. Moreover, declined resting metabolic rate, alteration in hormonal secretion, functioning and increased appetite in some case due to impaired leptin signaling mechanism are accountable for overweight and obesity cases which occur in elderly age [46].

1.2.6. Obesity and genetic traits

Some genetic traits called the Fat mass and obesity gene are accountable for some observed cases of obesity. Studies has revealed that, humans carrying the prevalent rs9939609 A allele of the fat mass and obesity-associated gene are more susceptible to developing obesity than non carriers [49,50]. In elderly age, obesity-associated gene has been linked with obesity, reduced brain volume [50] and difficult speaking [49].

Mutations in genes related to leptin receptors [51] and leptin expression [52] as well as mutation of melanocortin receptor genes [53] impairs the appetite regulating mechanism leading to obesity. Additionally, the variation in body weight changes as experienced between individuals exposed to similar kind of diets may reflect the effect of genetic involvements [54].

Although genetic predisposition is linked to malfunctions in energy homeostasis, the recent increase in prevalence of obesity has been linked to inability of the body to cope up with high intake of energy rich food, along with sedentary life styles and lack of exercise and/or physical work [51].

1.2.7. Ageing, Obesity and Hyperglycemia

Ageing is accompanied by a decrease in physical activities [46]. Limitation in physical activities is partly accountable for a tremendous gain in body weight and insulin resistance [54, 55]. Fat deposition in viscera leads to abdominal obesity which is common with ageing and may lead to decreased insulin sensitivity and hyperglycaemia [46, 56].

Several hormones like factors are liable for increased insulin resistance and raised fasting blood glucose (hyperglycemia) in obese elderly individuals. These factors are released from the liver and adipose tissue as a result of inflammatory reaction which is common in obese individuals [51].

The commonly well studied factors like the cytokines, resistin, Tumor necrosis factor, interleukin-6 and retinol-binding protein 4 operate under a mechanism involving the interruption of the normal insulin signaling pathways at cellular level [51, 56] leading to insulin resistance.

Other patho-physiological mechanism like the decline in muscle glycogen synthase activity, decreased glycogenesis, raised insulin resistance directly by activation of 5' adenosine monophosphate-activated protein kinase and indirectly via central neural pathways with a complex mechanism involving the reduction of the intracellular lipids levels, has been linked to hyperglycaemia [51, 55, 56].

Overweight and obesity are the leading risk factors for a number of chronic illnesses including; cardiovascular disease, diabetes mellitus and cancer [57, 58]. Obesity is a far most important determinant of hypertension, dyslipidemia and diabetes mellitus and is one of the most prevailing cardiovascular risk factors in elderly age [58].

Diabetes mellitus is accompanied by the increase in morbidity and mortality specifically due to complications like diabetic retinopathy, neuropathy, nephropathy and cardiovascular disease [59]. Hypertension and diabetes mellitus has frequently been mentioned among the major risk factors for the development of cardiovascular diseases and could result to damages of macro and micro vasculatures if not timely treated [60, 61, 62].

1.2.8. Prevalence of Cardiovascular Risk factors in Africa

High prevalence of cardiovascular risk factors has been reported in some recently conducted studies in West, East and sub-Saharan Africa [11,45, 63]. The prevalence of hypertension in elderly of ≥ 65 years was 30-40% in rural West Africa, 50% in semi urban West Africa and 50-60% in mixed South African population [45].

In a cross-sectional population-based survey conducted in 2010 in Imezi-Owa in Nigeria to estimate the prevalence of major cardiovascular risk factors in elderly aged 40-70, the overall prevalence of hypertension was 46.4% and was higher in elderly males than females.

Dysglycaemia was observed in 38 (4.4%) participants, hypercholesterolemia was found in 32 (3.7%) participants and obesity determined by BMI was observed in 257 (30%) participants [63].

Another study was undertaken in Tanzania in 1998 in Dar es Salaam, Monduli and Handen to examine the prevalence of selected risk factors in elderly people of 47 to 57 years old. The study was conducted based on the World Health Organisation (WHO) Cardiac Study protocol, comparing the results with the previously conducted studies [11].

The prevalence of hypertension was higher in males (41.1%) than in females (38.7%) and was said to be higher than the results of the previously conducted studies. The overall prevalence of hypercholesterolemia was 21.8%, in men and 54.0% in women; obesity was 22.8% and was also reported to be higher than the results of previously conducted studies hence suggesting an increase in mean levels and prevalence of selected cardiovascular risk factors in Tanzania [11].

1.2.9. Ageing and Malnutrition in Elderly

Malnutrition is defined as the state of being poorly nourished [9]. Most of the nutritional problems in elderly are due to dietary deficiencies although; in some other case increasingly problems of over nutrition associated with nutrition switch are being seen among some segments of elderly population in some countries [10].

According to Jennie (2006), elderly population is at high risk of malnutrition compared to other adult groups [7]. This is because, ageing is frequently associated with some pathophysiological changes like the decreased taste acuity and smell, deteriorating dental health, dysphasia and a decline in physical activities which may affect the intake of nutrient leading to malnourishments [9].

Other ageing related changes like the accumulated reactive oxygen and nitrogen species (free radicals) as well as alteration of protective and regenerative processes, damages the myenteric plexus affecting the gastro-intestinal motility which in turn leads to constipation and decreased nutrients intake [64].

Poverty, social isolation, severe dementia, inability to move, food attitudes and cultural preferences, alcohol, drug misuse and chronic illnesses are among the other factors leading to malnutrition in elderly age [7]. Malnutrition and compromised cognitive functions has also been associated with ageing. Decreased cognitive function such as what occur in pre-Alzheimer disease condition may lead to decreased ability to search and prepare a meal, which may adversely affect an elderly patient's ability to ensure sufficient nourishment [7].

1.2.10. Prevalence of Malnutrition in some African Countries

Many Africans are said to approach old ages after a long term of suffering in poverty and poor access to health care with a diet that is usually inadequate in quantity and quality [38]. Some estimation revealed that, between 2%–16% of community-dwelling elderly are nutritionally deficient in protein and calories [7]. In addition, if mineral and vitamin deficiencies are included in the estimate, malnutrition in persons over the age of 65 may shoot up to 35% [7].

Moreover, in ageing and sick population malnutrition is a widespread problem that is commonly evident in hospitals, residential care and community based elderly [62,65,66]. Some studies have indicated anaemia as a common problem in elderly age and its prevalence seems to increase with age [67].

According to the third National Health and Nutrition Examination Survey carried out in United States, the prevalence of anaemia was 11% in community-dwelling men and 10.2% among women of ≥65 years of age [68]. The levels of malnutrition reported in elderly refugees from Rwanda in their camps in Tanzania and Malawi were as follows; prevalence of undernourished refugee's men was 19.5% in Tanzania and 36.1% in Malawi. For women the prevalence of malnutrition was 13.1% in Tanzanian refugees and 27% for those in Malawi. In both countries the observed prevalence was higher in the male's sex [10].

A nutrition survey conducted in pastoral and agro-pastoral community in Ethiopia found out that 77.3% of a sample of 220 elderly participants aged 55 years were undernourished and most notably 46.8% of elderly had Mid-Upper Arm Circumference values indicative of severe under nutrition [10]. After using three anthropometric indices and/or low serum albumin concentrations, a study involving 201 low income elderly women living in slums and poor urban areas in Nairobi, Kenya, found a prevalence of marasmic-like protein-energy malnutrition of 10.4% [10].

Karen and colleagues (2001) reported the outcome of a study conducted in three areas in Zimbabwe (two rural and one urban; n = 5 278) in community-dwelling elderly aged ≥60 years; after using other indicators of nutritional status to determine the level of malnutrition the study came up with the following findings; almost a quarter (23%) of investigated participants were anemic (Hb, 13g/dL in men and 12 g/dL in women); 3% had microcytic anemia and 20% had macrocytic anemia. Red blood cell folate levels were low in 30% of the participants while 13% had low serum vitamin B_{12} levels [10].

Another reported study was conducted in South Africa whereby over a quarter (27%) of men and over a third (36%) of elderly women had energy intakes 67% of the Ration Daily Allowances a cut-off often used to indicate a low intake of nutrients [10]. Besides there are reports which link functional disabilities pathophysiological alterations, and poor health associated with ageing to dietary intake below the normal indices of nutritional requirements [69, 70].

1.3. Problem statement

Recent studies indicates a globally increase in elderly people [7, 8]. In Tanzania, 4% of the population are old [8]. Studies indicates that majority of elderly suffers deteriorative bodily changes attributed to accumulated pathophysiological changes [6, 9]. These changes among other things may lead to increased level of cardio vascular risk factors [6], affect dietary intake [7] and raise the risk for malnutrition more in elderly than in other age groups in a population [7, 9].

Poverty, decreased taste and smell acuity, deteriorating dental health, dysphasia and a decline in physical function associated with old age have been among the culprits for decreased nutrients intake and malnutrition in the elderly people [9].

Estimation from a study done in Ethiopia revealed that, between 2%–16% of community-dwelling elderly are nutritionally deficient in protein and calories and if mineral and vitamin deficiencies are included in the estimate, malnutrition in persons over the age of 65 may be as high as 35% [10]. In Tanzania and Malawi, elderly refugees have been observed to suffer malnutrition. The situation is however not known in non refugee's adults in Tanzania and Malawi [10].

Another study [11, 12] reported the prevalence of cardiovascular risk factors in Tanzanian adults of over 35 years, 40-66 and elderly of 47-57 years old. Another study [71] linked the pattern of fat distribution in elderly as a major contributing factor for increased risk of abnormalities in heart function, developed insulin resistance, high lipid profile, hypertension and stroke.

The reported findings provide some evidence on the existence of nutrition challenges and cardiovascular abnormalities in the growing elderly population. Nevertheless, paucity of enough data on the nutritional status and levels of the common CRF in the ≥60 year's old elderly individuals in our community required the conduction of more studies.

1.4. Rationale of the study

Despite of the reported level of malnutrition in elderly refugees from Rwanda [10], studies to evaluate the magnitude or level of malnutrition among the elderly in our country other than in refugees camps are inadequate. That being the case, one of the aims in the current study was to establish some data related to nutritional status in the community dwelling elderly individuals.

Other findings from studies conducted in Tanzania described the prevalence of cardiovascular risk factors in adults of over 35 years and elderly of 40-66 years old. Nevertheless, the present study aimed to determine the prevalence of cardiovascular risk factors specific to the elderly age of ≥60 years which is equivalent to postretirement age in Tanzania.

The expected outcome is to establish some baseline data as references for designing prevention and intervention strategies against the alarming incidence of chronic disease conditions which emanates from the modifiable cardiovascular risk factors and nutritional challenges.

1.5. Study questions

- What is the prevalence of cardiovascular risk factors among the elderly of ≥ 60 years of age in urban and rural areas in Morogoro region?
- What is the level of malnutrition among the elderly of ≥ 60 years old in urban and rural areas in Morogoro region?

1.6. Study objectives

1.6.1. Broad objective

- To determine the levels of cardiovascular risk factors and nutritional status among the ≥60 years old elderly of rural and urban areas in Morogoro, Tanzania.

1.6.2. Specific objectives

- To determine the levels of common cardiovascular risks factors among the ≥60 years old elderly of urban and rural areas in Morogoro region.

- To determine the level of malnutrition among ≥60 years old elderly living in rural and urban areas of Morogoro region.

CHAPTER TWO

2. METHODOLOGY

2.1. Study design

- Descriptive cross-sectional study design involving some field and laboratory works was employed in conduction of this particular study.

2.2. Duration of the study

- The study was conducted for one year from August 2011 to May 2012 covering all the seasonal variations.

2.3. Study area

- The study was conducted in Morogoro region involving the Morogoro urban and Mvomero districts which represented the urban and rural areas respectively.

2.3.1. Description of the Study area

Morogoro urban Mvomero District

Figure 1. Photos of rural and urban areas of Morogoro region [72]

Figure 2: Geographical map of Morogoro region [72]

Morogoro Region is one of the 28 Regions in Tanzania Mainland. The Region lies between latitude 5^{o} 58" and 10^{o} 0" to the South of the Equator and longitude 35^{o} 25" and 35^{o} 30"to the East. Morogoro is bordered by seven other Regions. Arusha and Tanga regions to the North, the Coast Region to the East, Dodoma and Iringa to the West, and Ruvuma and Lindi to the South. Morogoro Region occupies a total of 72,939 square kilometres which is approximately 8.2% of the total area of Tanzania mainland [72].

Morogoro is the third largest region in the country after Arusha and Tabora Regions. Administratively Morogoro region is divided into the following districts; Mvomero, Ulanga, Kilosa, Morogoro urban, Morogoro rural and Kilombero [72]. The districts in Morogoro region are divided into thirty divisions; these in turn are further sub-divided into 140 wards. There are 457 villages in the region.

According to the 2002 Population Census, the population of people in Morogoro is 1,753,362. The number of elderly (60 years or more) is reported to be 107,537 with 52,824 males and 53,710 females [72]. The main ethnic groups in Morogoro region are the Waluguru, Wasagara, Wakaguru, Wandamba and the Wapogoro. Additionally, Morogoro region has more than just the ethnic groups due to a number of some immigrants from other regions of the country. Local beliefs, Christianity and Islam are the major religion practiced by people in the region.

Generally, the region experiences good climatic condition of moderate temperature and enough rainfalls. The major activities practiced for livelihood in urban areas includes small scale farming and livestock keeping activities, formal and informal employment works, small and large scale business activities. The major activities in the rural areas include large and small scale farming activities, livestock keeping, small scale businesses and some office works [72].

2.4. Study population

- All the elderly individuals aged ≥60 years were eligible for purpose of this study.

2.5. Inclusion Criteria

- Any elderly of ≥ 60 years of both sexes with free consent were included for purpose of this study.

2.6. Exclusion criteria

- Unwilling and terminally ill elderly were not eligible for this particular study.

2.7. Definition of terms

From the Tanzanian context, participants were considered as elderly at ≥ 60 years of age (post retirement age) [2]. Normal blood pressure was defined as SBP/ DBP; 120-140/70-90 mmHg respectively while hypertension was defined as SBP > 140 and DBP > 90 mmHg [73] or was under anti hypertensive drugs. Hypertension subtypes were defined as follows; isolated diastolic hypertension (IDH):120-140SBP/>90DBP mmHg, isolated systolic hypertension (ISH) : >140SBP/90-70DBP mmHg [73].

Stages of hypertension were classified based on the JNC7 and WHO classification criteria. Classification based on JNC7 criteria was as follows; Normal BP: SBP<120 and DBP<80 mmHg. Pre hypertension: SBP=120-139 or DBP=80-89 mmHg. Stage 1 hypertension: SBP=140-159 or DBP=90-99 mmHg. Stage 2 hypertension: SBP ≥169 or DBP≥100 mmHg [74].WHO classification criteria of hypertension was as follows; Grade 1: SBP 140- 159 or DBP 90-99 mmHg, Grade2: SBP 160-179 or DBP 100-109 mmHg, Grade 3: SBP ≥180 or DBP ≥110 [75]

On the other hand, hypotension was defined as SBP <90 and DBP <60 mmHg [64, 76].

Normal fasting blood glucose was defined by FBG of 3.9 to 5.8Mmol/L. Participants were considered hyperglycaemic at FBG of ≥7.2Mmol/L [77] or was under anti diabetic drugs. Participants were classified as hypoglycaemic at FBG of < 3.9Mmol/L [78].

Participants were considered to have dyslipidemia if had at least any of the following lipid derangements; TC: ≥ 240mg/dL (≥ 6.20mmol/L), LDL cholesterol: ≥160mg/dL (≥4.13mmol/L), TG: ≥200mg/dL (≥5.18mmol/L) and HDL: < 40 mg/dL (<1.03mmol/L) in males and<50mg/dL (< 1.04mmol/L) in females [10, 79] or was under cholesterol lowering drugs.

Individual cholesterols classification was done as follows; desirable TC: < 200 mg/dL, borderline high TC: 200-239 mg/dL, high TC: ≥ 240mg/dl. Optimal LDL cholesterol: < 100 mg/dL, near optimal LDL cholesterol: 100-129 mg/dL, border line high LDL cholesterol: 130-159 mg/dL, high LDL cholesterol: 160-189 mg/dL and very high LDL cholesterol: ≥190 mg/dL. Normal TG: < 150mg/dL: borderline high TG: 150-199 mg/dL, high TG: 200-499 mg/dL and very high TG: 500 mg/dL. High HDL: 60+ mg/dL, normal HDL > 40 mg/dL (in men) and > 50 mg/dL (in women), low HDL < 40 mg/dL (men) and< 50 mg/dL (women) [79, 80].

Normal body weight was defined as BMI ranges of ≥18.5–24.9 kg/m^2. Abnormal body weight was defined as underweight: BMI<18.5 kg/m^2, overweight: BMI ≥ 25.0–29.9 kg/m^2 and obesity: BMI > 30 kg/m^2 [81]. Normal nutritional status was defined as nutrition score range of 12-14 points, persons at risks of malnutrition had 8-11 score points and malnourished ones had 0-7 score points [7, 82, 83].

2.8. Sample size calculation

The sample size was determined by the Epi-info version six using the following assumptions:

Prevalence of obesity in elderly individual = 22.8% [11],

Significance level = 5%,

The maximum likely error (d) =5%,

The sample size was calculated from the following formula;

$$N= Z^2 P (100- P)/ E^2$$

Whereby; Z = Critical value 1.96 corresponding to 5% significance level,

N = Estimated sample size,

E = Margin of error (5%),

P = Prevalence of obesity in Elderly.

Therefore $N= 1.96^2*22.8(100-22.8)/5^2 = 270$.

The calculated sample size was 270. However, 11% was added to take care of non respondents, hence the sample size for this study included 300 elderly participants.

2.9. Sampling procedures

The study employed a combination of cluster and simple random sampling methods [84]. Random sampling method was done in a lottery way. Nineteen (19) wards in Morogoro urban and seventeen (17) wards in Mvomero district were identified and to each were assigned unique numbers using special tags.

The numbers were put in two separate containers for the respective Mvomero and Morogoro urban districts and numbers in each container were mixed thoroughly. The blind-folded co-researcher was then involved to pick up some five numbered tags from each container. All wards bearing the numbers picked by co-researcher were included in the study. The wards selected from Morogoro urban were Mafiga, Kilakala, Kihonda, Kichangani and Sultan areas. While in Mvomero district; Kibati, Mvomero, Doma, Melela and Mlali wards were selected.

The wards consisted of villages in Mvomero while constituted Streets in Morogoro urban. The same lottery sampling method was employed to obtain five representative villages or streets from each selected ward. Special numbers were marked to each street/village using special tags and after a thoroughly mixing, same selection procedures were employed to obtain the representative streets or villages. A total of 50 study areas (villages/streets) were included in the study. The list of elderly from each street and village was obtained from every ward's offices. Each elderly person's name from the selected streets/villages was given special numbers using special labels and the numbers were thoroughly mixed in pots representing each street or village.

Same selection procedure as explained above was used in this case whereby 6 labels were picked by a blind folded co-researcher from 50 pots representing the streets/villages. This process yielded a total of 300 elderly participants who were then recruited for this study. The municipal, districts and other local government officials played a key role to facilitate the identification of the elderly containing premises.

2.10. Data and Sample collection

The data collected for purpose of this study consisted of the fasting blood glucose (FBG), body mass index (BMI), low density lipoprotein (LDL cholesterol), high density lipoprotein (HDL), triglyceride (TG), total cholesterol (TC), blood pressures (BP), nutrition assessment score points and the social demographic data. Blood was the only sample collected during this study.

2.10.1. Measurement of Blood pressure (BP)

The blood pressure for all the elderly participants was measured by a standard mercury Sphygmomanometer with appropriate cuff and a Stethoscope. The measurement was done after 5 minutes of rest using the left upper arm at the heart level just above the elbow joint. The measurement was taken three times with the subject on the sitting and relaxed posture. The first and fifth phases of Korotkoff sounds were recorded for SBP and DBP respectively and the mean BP values were used for the data analysis. The interpretation for the ranges of BP considered such factors as age, sex and the physiological state of the individual.

2.10.2. Measurement of Body Mass Index (BMI)

Body weight was measured from all participants on off shoes. A calibrated clinical detecto beam scale with the capacity of 140kg, and 0.1kg accuracy (Detecto-medic, Detecto scale inc, Brooklyn.N.Y.USA) was used. Body height was measured by a standard stadiometer. Height measurements was done while on off shoes with the participant's heels, the back, and the occipital facial level touching the scale and the participants looking straight ahead. The height of each participant was measured to the nearest 0.1 cm. Body mass index was calculated by dividing weight in kilograms by height in meters squared (Wkg/Hm^2) [63, 65, 67] and the resulting values were used for the data analysis.

2.10.3. Assessments of nutritional status

Nutritional status in the elderly was estimated by the MNA® short questionnaire (see appendix 1). The MNA® tool is a validated nutrition screening and assessment questionnaire that can identify geriatric patients faced by malnutrition [7, 82, 83, 85]. The score points related to nutrition status gathered by the questionnaires were used for the data analysis.

2.10.4. Measurement of fasting blood glucose (FBG)

Participants were informed not to take their morning meal in order to preserve the fasting blood glucose. Blood samples just after its collection was used for measurements of FBG. Gluco plus™ blood glucose meter, Product code GP0011600 and the Gluco plus blood glucose test strip produced by Gluco Plus Inc (Canada), was employed for FBG measurement. The tool test range was 30-600mg/dl (1.6-33Mmol/L) and the results recorded in Mmol/L were used for the data analysis.

2.10.5. Collection of blood samples

The blood samples were collected by a qualified Nurse. The plain vacutainer tubes and 5 cc syringes were used for blood collection. Methylated spirit was used for disinfection of the blood collection site and a tourniquet was applied to control the flow of blood in veins and arteries and blood was collected from the brachial artery, the major blood vessel of the (upper) arm. The plain tubes were used for coagulation of blood to prepare serum for lipids measurements. The coagulated blood was centrifuged by a macro centrifuge (Sigma Labozentrigugen 202 MC, 3600 rpm, German) to obtain serum which was transferred into eppendorf storage tubes and stored in a freezer at -40 ^{0}C for four weeks.

2.10.6. Measurement of Lipid profiles

The calorimetric enzymatic methods by the ARCHITECH c System c8000 (origin Abbott Laboratories USA) was used for assays of total cholesterol, triglycerides and high density lipoprotein from which the Friedewald equation [LDL cholesterol] = [TC] - [HDL] - ([TG]/5) was used for determination of LDL cholesterol. This calculation requires independent measurements of total Cholesterol, HDL-cholesterol, and triglyceride for LDL cholesterol to be calculated. The quotient (TG)/5 was used as an estimate of VLDL cholesterol based on two assumptions; firstly all the plasma TG is carried on VLDL cholesterol and secondly the TG: Cholesterol ratio of VLDL cholesterol is constant at about 5:1 [73, 80].

The measurements were in Mmol/L and conversion to mg/dL was done as follows; for TC, HDL and LDL cholesterol the values in Mmol/L were multiplied by 38.67 a constant used for conversion of values from Mmol/L to mg/dL specific for cholesterols.

Conversion of TG from Mmol/L to mg/dL was done by multiplication with 88.57 a constant used for that purpose [86]. The values related to TC, LDL cholesterol, TG, HDL serum levels in mg/dL were used in the analysis.

2.10.7. Collection of social demographic data

Information on social lifestyle was collected using a simple designed questionnaire (see appendix II). The questionnaire was written in Kiswahili for easy understanding. Contents of the collected information incorporated the short profile of participants which consisted of name, age, sex, education profile and marital status.

This was followed by information on recent and background life style based on smoking habit, usage of anti-diabetic drugs, usage of cholesterols lowering drugs, usage of ant-hypertensive drugs and heart attack family history.

Social demographic data used for testing the association with other measured parameters consisted of sex, age, smoking habit and heart attack family history. Information on usage of ant-diabetic, ant-cholesterols and ant-hypertensive, was gathered to help on interpretation of the measured fasting blood glucose, cholesterols and blood pressure respectively. Categorization of ages at ranks of 60-69, 70-79, 80-89 and ≥90 years was done in order to establish the trend of the mean values and prevalence as related to cardiovascular risk factors and nutritional status with advancing elderly age.

2.11. Variables

2.11.1. Dependent Variables*;* Lipids profile, fasting blood glucose, blood pressures, Mini nutrition scores points and body mass index constituted dependent variables.

2.11.2. Independent variables*;* Ages, sex and Social demographic factors were the independent variables.

2.12. Ethical considerations

All ethical procedures were closely observed during the conduction of this study and participants consented at their will prio to their involvements.

2.13. Data analysis

Data analysed for the purpose of this study included the lipids profile, fasting blood glucose, nutrition screening score points, blood pressure, body mass index and the social demographic data. Data analysis was performed using Epi-Info version 6 and Excel 2007 software packages. The percentile distribution of elderly based on lipids profile, fasting blood glucose, blood pressure, nutrition status and BMI was determined. Tables and figures were used for presentation of results.

Test for association and correlation coefficient between binary, categorical and social demographic data were also computed. Fisher exact, Chi-squared and Logistic regression tests were employed in testing the relationship between the various categorical variables.

Unpaired T-test was used for comparison of means between quantitative variables. ANOVA was also used for comparisons of multiple quantitative means. Statistical differences and association for the various computational tests were considered significant at $P<0.05$ and highly significant at $P<0.01$.

CHAPTER THREE

3. RESULTS

3.1. Profile of Elderly participants

A sample size of 300 elderly participants was employed. The number consisted of females 176(58.7%) and males 124(41.3%). The age ranges of all participants were 60 to 95 years and the mean age in years was 67 ± 7.22 for females and 69 ± 7.99 for males ($P > 0.05$) and age category range of 60 - 69 years contained more elderly people and the number of participants declined significantly toward the higher ages (Table 2).

The pooled data of the 300 studied elderly partcipants indicated majority of them to have either no education (40.3%) or had some primary school education (53.3%) while minority (6.4%) had either secondary school or some college education level. The number of female with no education was more than their male's counterpart while on other hand; male's elderly with primary, secondary and college education levels were significantly more compared to their matching female participants (Table 1).

Table 1: Distribution of the elderly people sampled from Morogoro region (n=300) based on sex and education profiles.

Education profile	Males (n=124)	%	Females (n=176)	%	P value
No education	31	25	90	51.1	0.000036
Primary school	77	62	83	41.2	0.01
Form 1-6	9	7.3	2	1.1	0.0067
Collage	7	5.6	1	0.6	0.012

Table 2: Distribution of elderly participants sampled from Morogoro region (n=300) based on sex and ages.

	Males		Females		
Age ranks	**(n= 124)**	**%**	**(n=176)**	**%**	**P value**
60-69 years	61	49.2	111	63.1	0.023
70-79 years	48	38.7	48	27.2	0.05
80-89 years	11	8.9	15	8.5	0.01
≥90 years	4	3.2	2	1.2	0.2

3.2. Body mass index (BMI) in Elderly

The results related to body mass index (BMI) were as displayed in Figures 3 to 6 below. From the 300 studied participants, obesity was found in 82 (27.3%) elderly. Obesity cases highly diagnosed in female compared to male's participants (Figure 3). Overweight was revealed in 99 (33%) elderly participants and the difference between sex was probably by chance (P>0.05). The estimated relative risk (RR) of obesity was 1.4 in females and 0.7 in males. The prevalence of underweight was 6.7% and was marginally higher in male's participants. There was no significant link between the elderly heart attack family history and body mass index in both males and females participants (Table 15).

The calculated mean BMI (kg/m^2) was marginally higher in females (28.00 ± 6.8) compared to males participants (23.97 ± 4.6) (P > 0.05). The decline in prevalence (Fig 4) and a negative correlation related to mean BMI with advancement of age (r = -0.94, P = 0.04) was also revealed statistically. The prevalence of obesity, overweight and underweight based on age ranks are illustrated in Figures 5, 6 and 7.

The overall prevalence of obesity and the prevalence of obesity specific to female participants were highest in 60 - 69 age rank before declined significantly with advancement of ages (Figure 5). The prevalence of obesity in males was inconsistence with ages. The number of elderly with overweight decreased with ages in males while increased with ages in females (Figure 6). While there was a gradual decline in the 60 - 69 and 80 - 89 ages respectively, the prevalence of overweight increased in the 80 - 89 and $\geq$ 90 ages respectively (Figure 6). The prevalence of underweight increased with ages in both sexes and was highly prevalent in the 80 - 89 age groups (Figure 7).

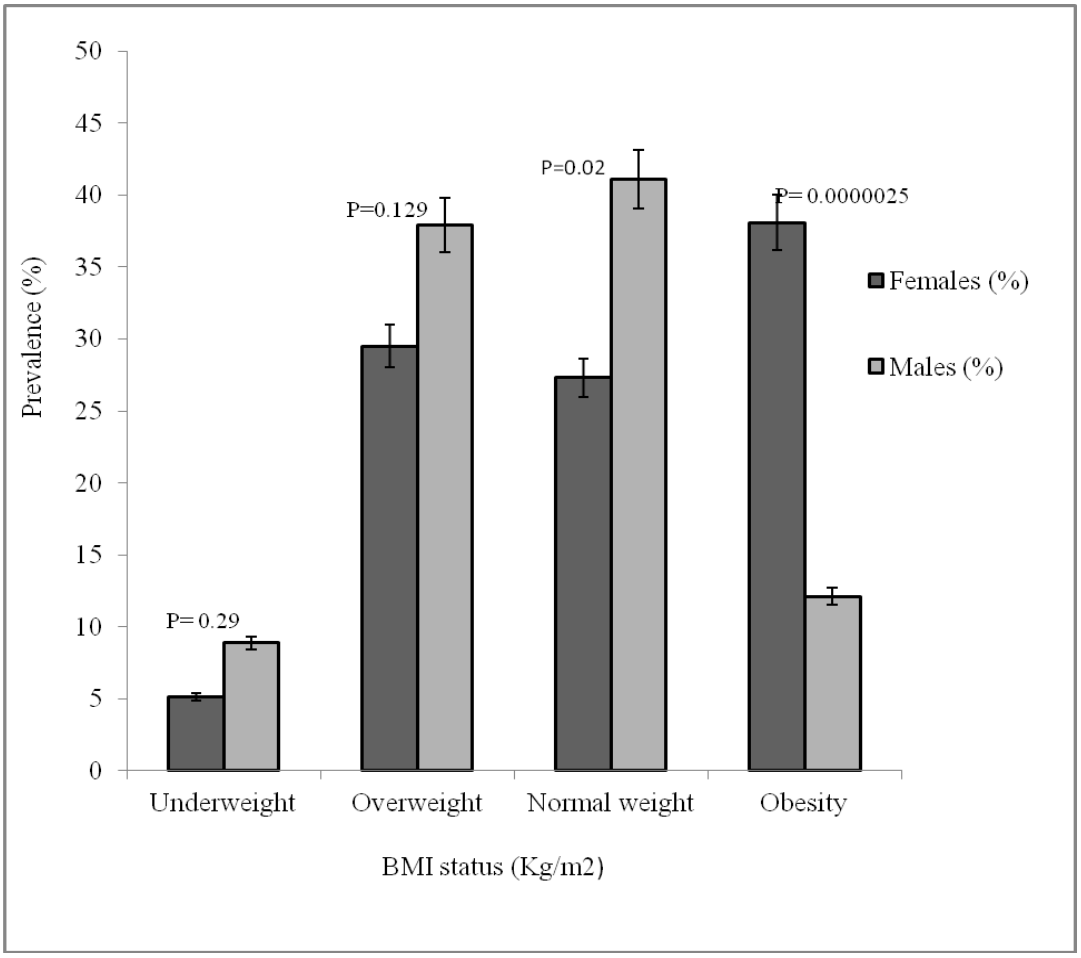

Figure 3: The histograms display the status of BMI among the elderly people sampled in Morogoro region (n=300).

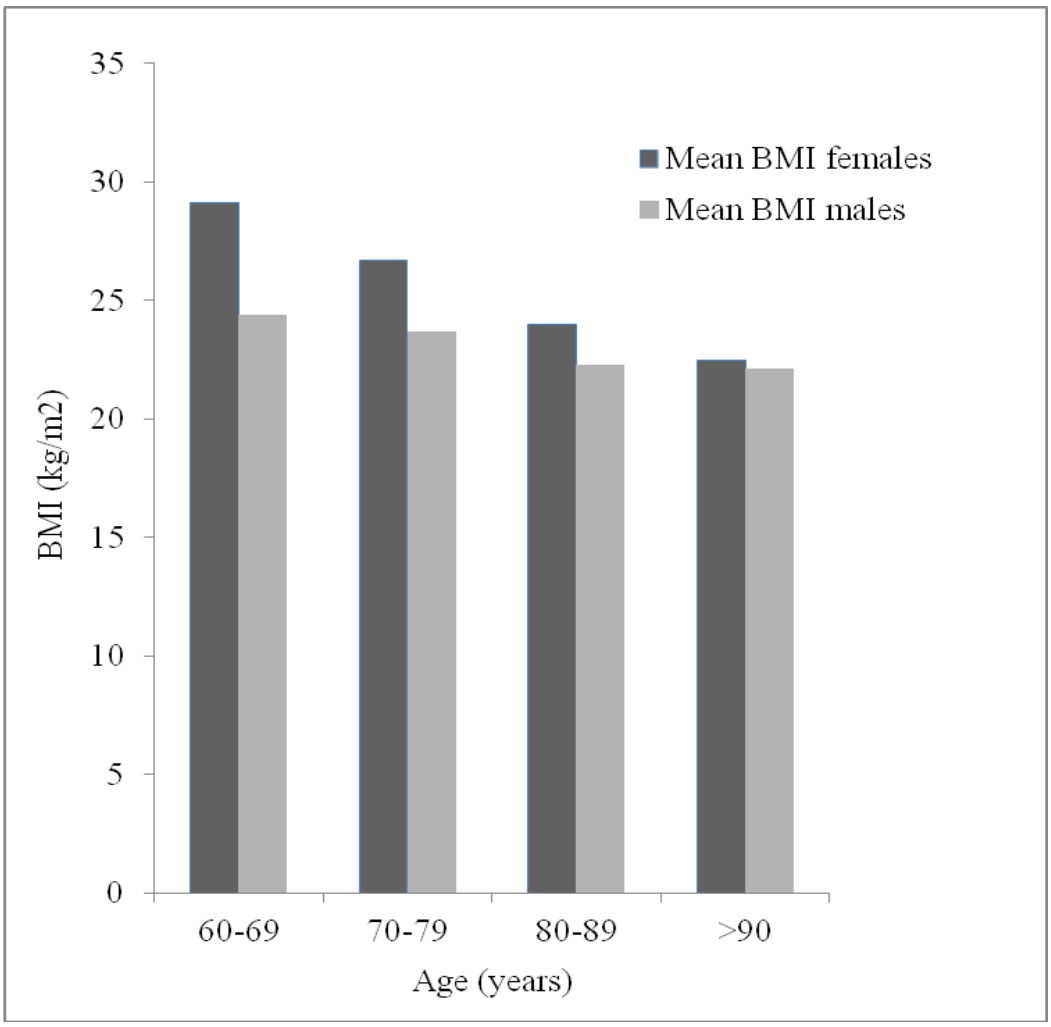

Figure 4: Histograms showing the mean BMI of the elderly people sampled in Morogoro region (n=300).

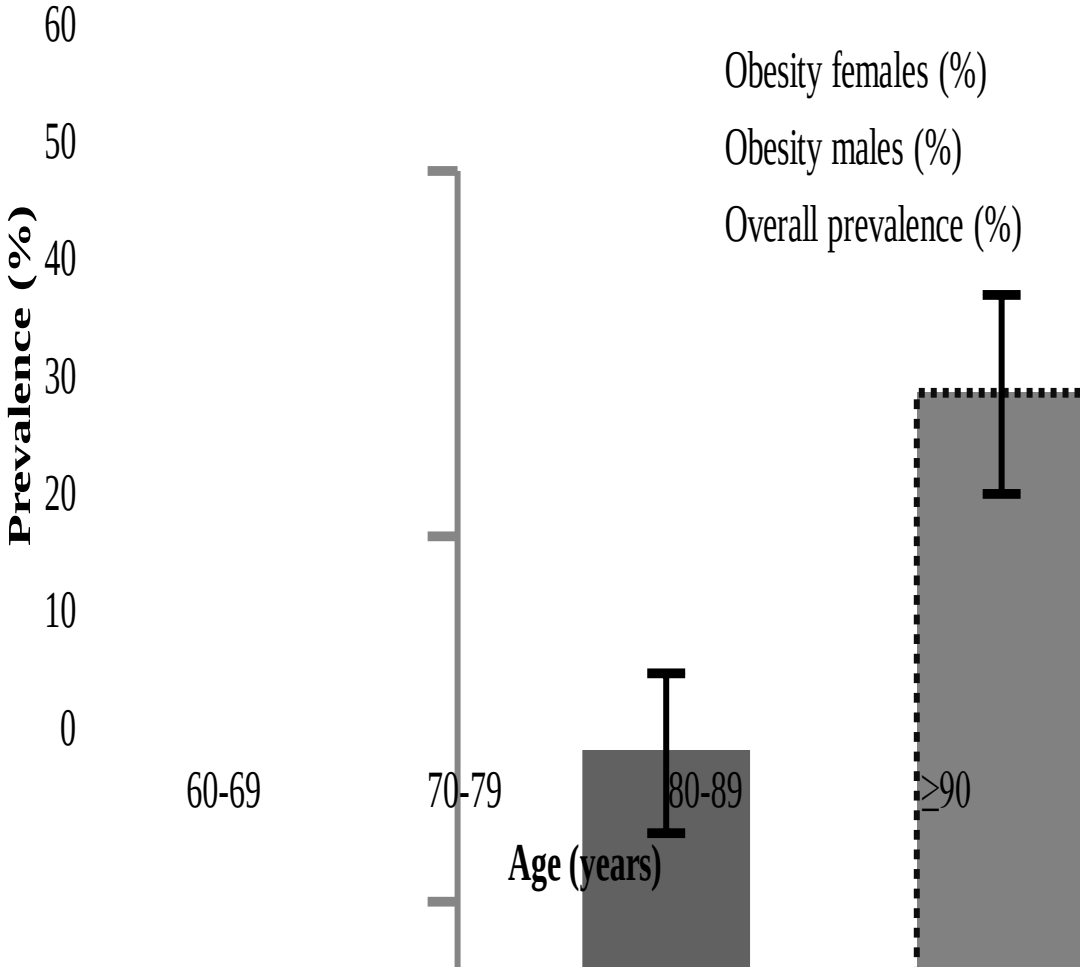

Figure 5: Histograms showing the prevalence of obesity distributed by sex and ages among the elderly individuals sampled in Morogoro region, (n=300).

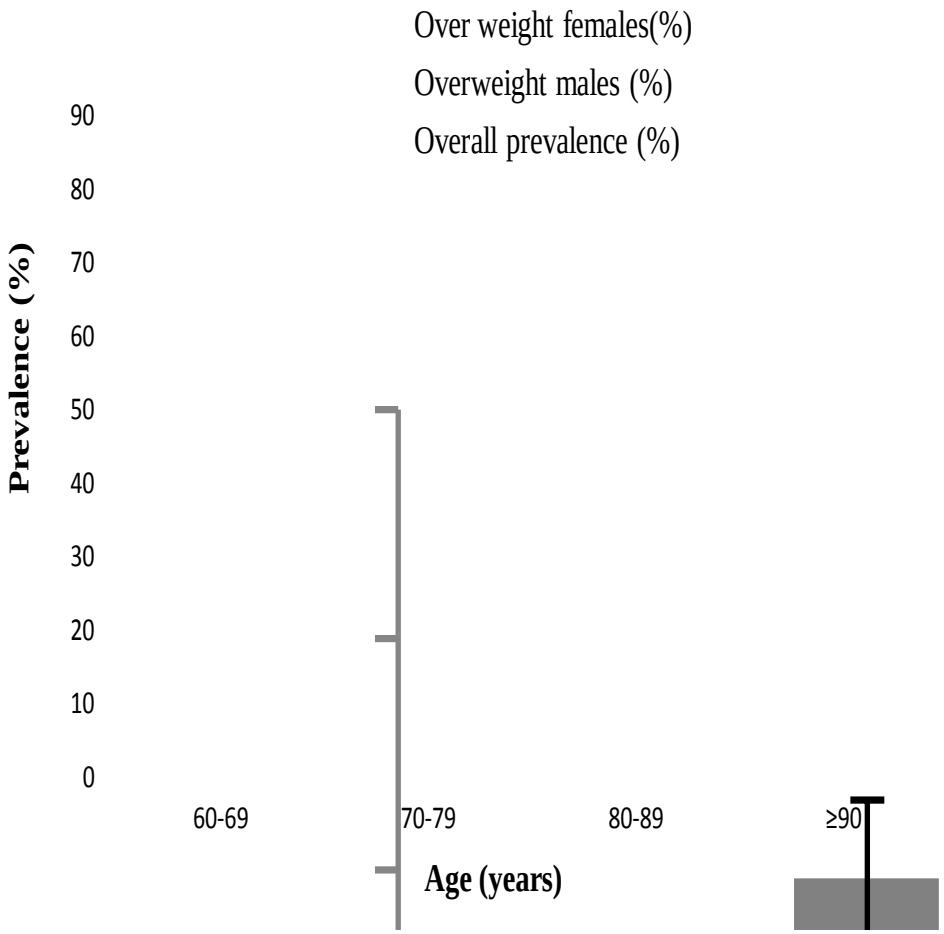

Figure 6: Histograms showing the prevalence of overweight among the elderly people sampled in Morogoro region (n=300).

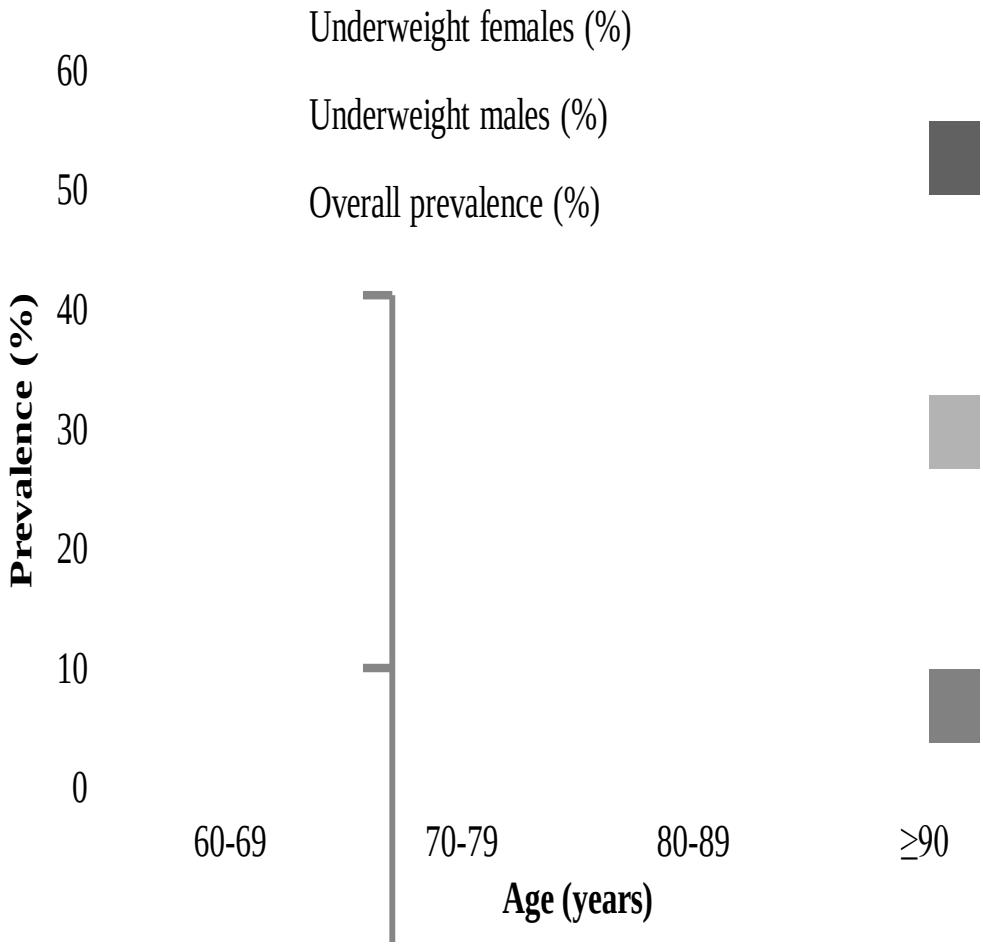

Figure 7: Histograms showing the prevalence of underweight among the elderly people sampled in Morogoro region (n=300).

Table 3: Obesity status (≥30kg/m^2) as related to Other CRF among the elderly people sampled in Morogoro region (n=300)

	Obesity				
	yes	No	Total	df = 1	P-value
Dyslipidemia					
Yes	70	150	220	$\chi^2 = 7.53$	0.006*
No	12	68	80		
Hyperglycemic					
Yes	52	35	87	$\chi^2 = 4.14$	0.04*
No	30	183	213		
Systolic/Diastolic hypertension					
Yes	50	89	139	$\chi^2 = 8.93$	0.002*
No	32	129	161		
ISH					
Yes	14	44	58	$\chi^2 = 0.27$	0.66
No	68	174	242		
IDH					
Yes	1	4	5	$\chi^2 = 0.018$	0.58
No	181	214	395		
TC					
Yes	12	33	45	$\chi^2 = 0.0018$	0.96
No	70	183	253		
LDLc					
Yes	24	39	63	$\chi^2 = 3.98$	0.04*
No	58	179	237		
TG					
Yes	12	23	35	$\chi^2 = 0.6$	0.43
No	70	195	265		

Lowered HDL-c levels					
Yes	47	83	130	$\chi^2 = 8.22$	0.004*
No	35	135	170		

*significance differences between groups are indicated

3.3. Lipids profile

The mean lipid values in mg/dL are depicted in Figure 8. The Mean Total-cholesterol was 202.41±49.58 in females and 182.25±44.90 in males (P<0.01). Mean LDL cholesterol was 140.19±41.14 in females and 123.37±35.26 in males (P<0.01). Mean Triglyceride was 130.23±65.49 in females and 126.23±77.59 in males (P>0.05) while mean HDL was 50.94±15.53 in females and 47.86±15.40 in males (P>0.05).

The mean TC, LDL cholesterol and TG (mg/dL) declined steadily from 60 to 80 and relatively steeply from 80 to ≥ 90 elderly ages. On the other hand, mean HDL levels declined slightly with ages from 60 to ≥ 90 years old (Figure 9).

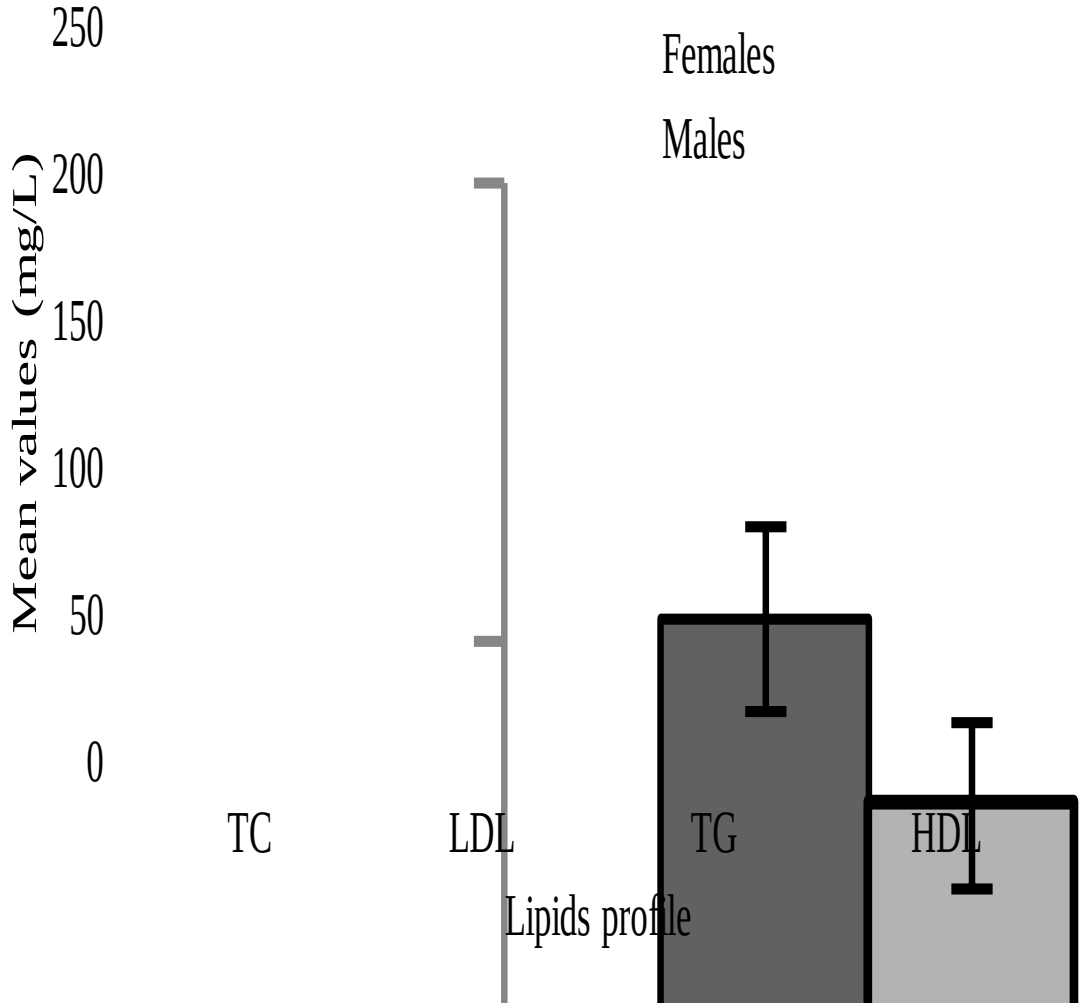

Figure 8: Histograms showing the calculated mean (mg/L) of serum lipids grouped by sex among the elderly sampled in Morogoro region (n=300).

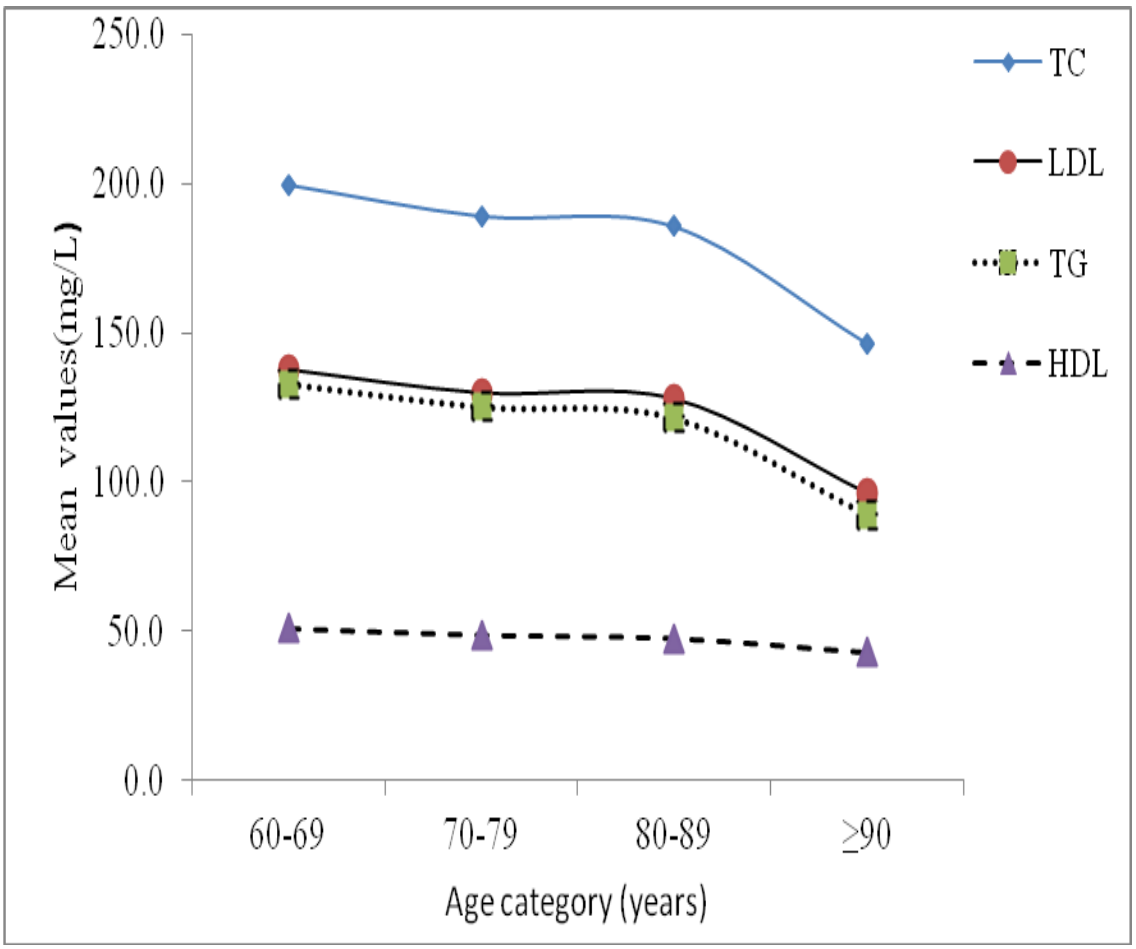

Figure 9: The mean TC, LDL cholesterol, TG and HDL at increased ages of the elderly participants (n= 300) sampled in Morogoro region.

3.3.1. Dyslipidemia

Out of the 300 studied elderly, 220 (73.3%) participants had lipids derangements. Based on sex the prevalence of dyslipidemia was significantly higher in female participants (Table 4). Obesity was significantly associated with dyslipidemia in both male and female participants (Table 3). The number of elderly with dyslipidemia was highest in 60 - 69 age groups and fell progressively with ages. The prevalence of dyslipidemia was significantly higher in females than male's sexes in the 60 - 69 and 70 - 79 age groups respectively (Table 4).

Table 4: Percentile distribution of dyslipidemia among the elderly participants (n=300) sampled in Morogoro region.

Status of Lipid	**Females (n=176)**	**(%)**	**Males (n=124)**	**(%)**	**P value**
Normal	30	17.1	50	40.3	0.0488
Dyslipidemia	146	82.9	74	59.7	0.00001

Table 5: Distribution of dyslipidemia among the elderly people sampled from Morogoro region and grouped by sex and ages (N=300).

	Females		**Males**		
Age (years)	**(n=146)**	**%**	**(n=73)**	**%**	**P value**
60 - 69	91	62.3	38	52.7	0.014
70 - 79	41	28.1	26	35.1	0.001
80 - 89	12	8.2	7	9.5	0.3
≥ 90	2	1.4	2	2.7	0.4

Table 6: Status of dyslipidemia among the elderly people of Morogoro region (n=300) as related to hypertension and hyperglycemia.

	Dyslipidemia				
	Yes	No	Total	$\chi^{2,df=1}$	P-value
Hypertension					
Yes	95	44	139	3.93	0.047*
No	91	70	161		
Hyperglycemia					
Yes	41	16	57	2.44	0.11
No	145	98	243		

*Significant differences between groups are indicated.

3.3.2. Total cholesterols (TC)

From the 300 elderly participants; 83(27.7%) had borderline high Total cholesterol while 47(15.3%) had high Total cholesterols. Obesity was associated with elevated serum TC levels in both sexes (Table 3). Heart attack family history and cigarette smoking did not reveal any positive connection with elevated serum TC levels in both males and females participants (Table 15).

The mean TC correlated negatively with elderly ages (Figure 9) and a significant high number of females appeared to have higher TC levels compared to the male's counterpart (Table 7) and the cut off values for elderly with elevated TC was inconsistent with ages (Figure 10). The number of females with elevated TC decreased in between 60 - 69 and 70 - 79 elderly ages and then increased toward the 80 - 89 age rank. The number of male with elevated TC increased in between 60 - 69 and 70 - 79 and then decreased toward the 80 - 89 elderly ages.

Table 7: Percentile distribution elderly participants of Morogoro region, (n=300) based on the Total cholesterol (TC) levels.

Status of lipids	Females (n=176)	%	Males (n=124)	%	P value
< 200 mg/dL: desirable	88	50	83	67	0.52
200-239 mg/dL: borderline high	54	30.7	29	23.3	0.71
≥ 240mg/dL: high	34	19.3	12	9.7	0.041

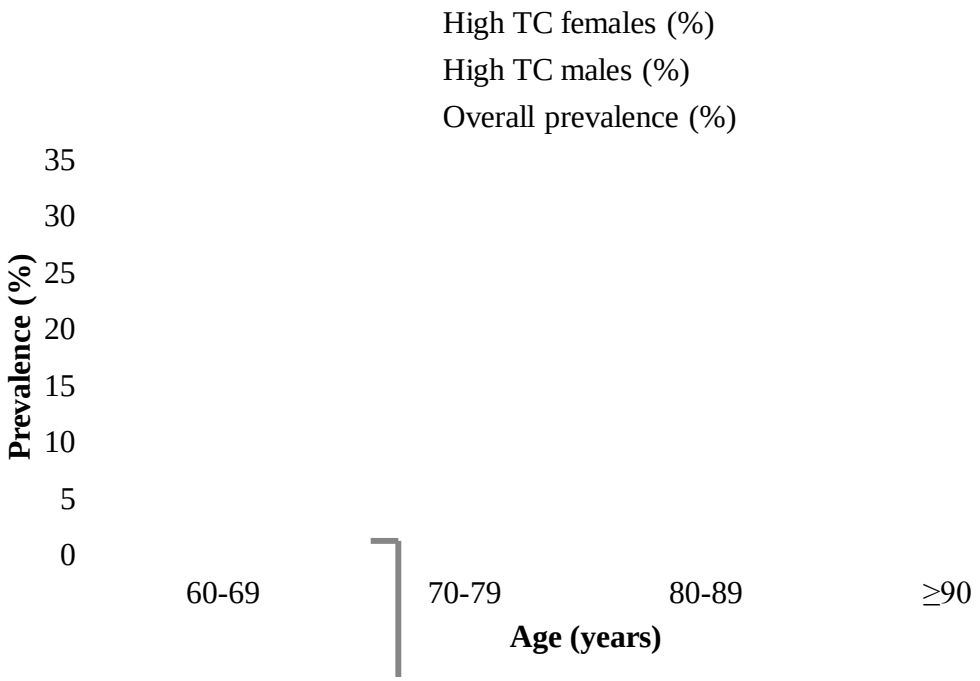

Figure 10: Histograms showing the prevalence of elevated Total cholesterol (TC) distributed by sex and ages among the elderly individuals sampled in Morogoro region (n=300).

3.3.3. Low density lipoprotein (LDL cholesterol)

The mean LDL cholesterol levels decreased steadily with advancing elderly ages (Figure 9). Out of the 300 involved participants, 92(30.4%) had borderline high LDL cholesterol, 40(13.2%) had high LDL cholesterol and 25(8.3%) had very high serum LDL cholesterol levels. The prevalence of high and very high LDL cholesterol was significantly higher in females (Table 8).

The overall prevalence of elevated serum LDL cholesterol was high in age group of 60 - 69 years before declined with increasing ages. The number of females with elevated LDL cholesterol decreased in between 60 - 69 and 70 - 79 age groups then increased slightly in 80 - 89 elderly ages. The number of males with elevated LDL cholesterol was almost at same levels in between 60 - 67 and 70 - 79 elderly ages before it declined in the 80 - 89 age group (Figure 11). Neither male nor female cases with elevated LDL cholesterol levels were observed in the ≥90 elderly ages. While obesity was associated with elevated LDL cholesterol levels (≥60mg/dL) in both sexes (Table 3), heart attack family history was not associated with elevated LDL cholesterol levels in both males and females participants (Table 15).

Table 8: Percentile distribution of elderly participants sampled from Morogoro (n=300) based on LDL-c levels.

Serum LDL Levels	Females n=176	(%)	Males n= 124	(%)	P value
< 100 mg/dL: optimal	29	16.5	35	29	0.14
100-129 mg/dL: near optimal	42	23.9	37	29.8	0.38
130-159 mg/dL: border line high	58	33	34	27.4	0.36
160-189 mg/dL: high	25	14.2	14	11.3	0.013
≥190 mg/dL: very high	22	12.5	3	2.4	0.001

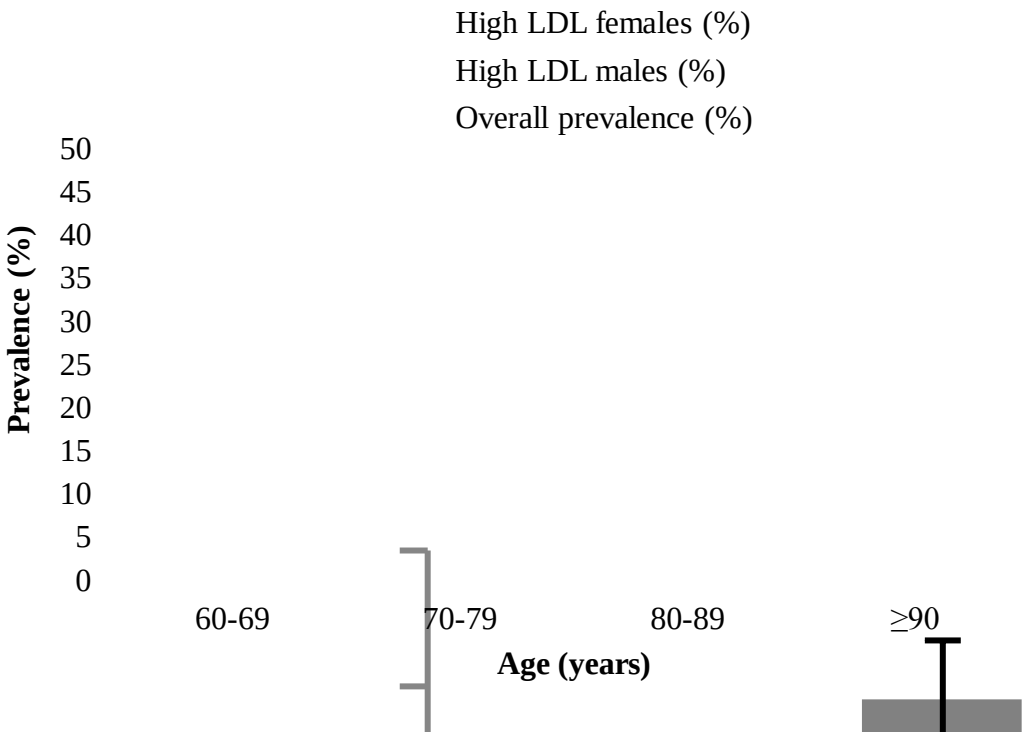

Figure 11: Histograms showing the prevalence of elevated LDL-c among the elderly individuals sampled in Morogoro region (n=300).

3.3.4. Triglycerides (TG)

The mean serum TG levels correlated negatively with advancing elderly ages (Figure 9). Out of the 300 studied elderly personnel; 46(15.3%) had borderline high TG, 34(11.3%) had high TG and 1(0.3%) had very high serum TG levels. The number of females with borderline high, high and very high serum triglycerides was marginally higher compared to male's number with similar TG profile (Table 9).

The overall prevalence of elevated TG levels decreased progressively with increasing ages (Figure 11). Female's case with elevated TG increased slightly in between 60 to 69 and 70 to 79 age groups and no case of raised TG levels was observed in ≥80 years of age. On the other hand, the prevalence of elevated TG levels in males was inconsistent with ages (Figure 11).

Obesity lacked association with elevated serum TG levels in both sexes (Table 3). On the other hand, heart attack back ground in a family was not positively linked with cases of elevated serum TG levels in both male and female participants (Table 15).

Table9: Percentile distribution of elderly participants sampled in Morogoro (n=300) based on serum Triglycerides (TG) levels.

	Females		**Males**		
Serum TG level	**n=176**	**(%)**	**n=124**	**(%)**	**P value**
< 150 mg/dL: normal	126	73.9	92	71.8	0.62
150 - 199 mg/dL: borderline high	28	15.9	18	17.4	0.72
200 - 499 mg/dL: high	22	12.5	13	9.8	0.4

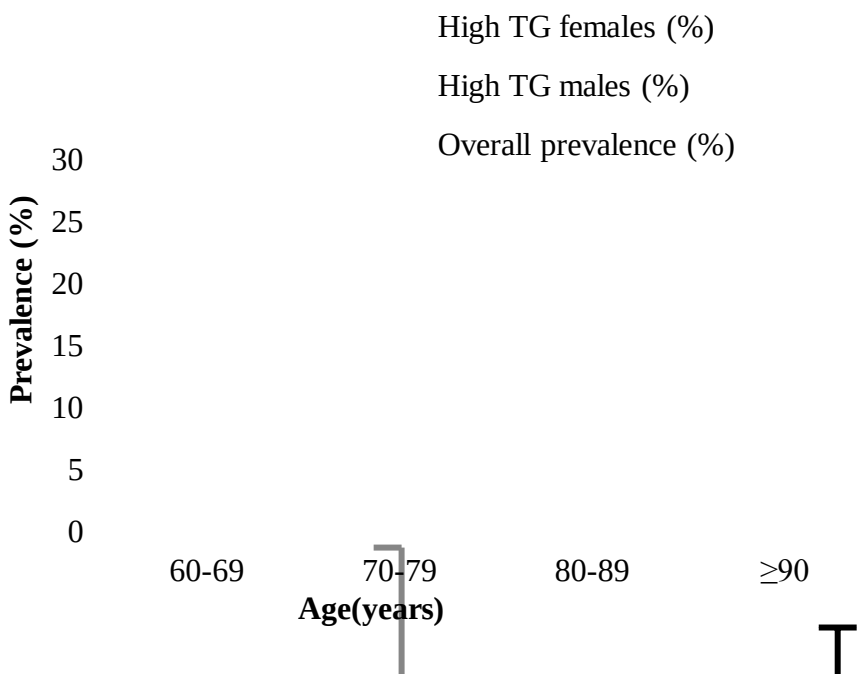

Figure 12: Histograms showing the prevalence of elevated serum Triglycerides (TG) among the elderly individuals sampled in Morogoro region (n=300).

3.3.5. High density lipoprotein (HDL)

The mean HDL levels did not show any significant correlation with ages (Figure 9). From the 300 elderly participants, 132(43.7%) had lowered HDL level. Based on sex, the number of elderly cases with lowered HDL was significantly higher in female compared to male's participants (Table 10).

Smoking habit (Table 14) and Obesity (Table 3) were significantly associated with lowered HDL levels in both males and females participants. Heart attack family history was found to have no positive connection with lowered HDL levels in both sexes (Table 15). The overall prevalence and the prevalence specific to sex of lowered HDL was lowest in 60-69 age group before it increased with advancing ages in both males and females participants (Figure 13).

Table 10: Percentile distribution of elderly participants sampled in Morogoro (n=300) based on serum HDL levels.

	Females		**Males**		
Serum HDL-level	**n=176**	**(%)**	**n=124**	**(%)**	**P value**
≥60 mg/dL: high >40 mg/dL (men),>50 mg/dL (women): normal	35 44	19.9 25	17 73	13.8 59.4	0.22 0.000002
< 40 mg/dL (men),< 50 mg/dL (women): low	97	55.1	33	26.8	0.000003

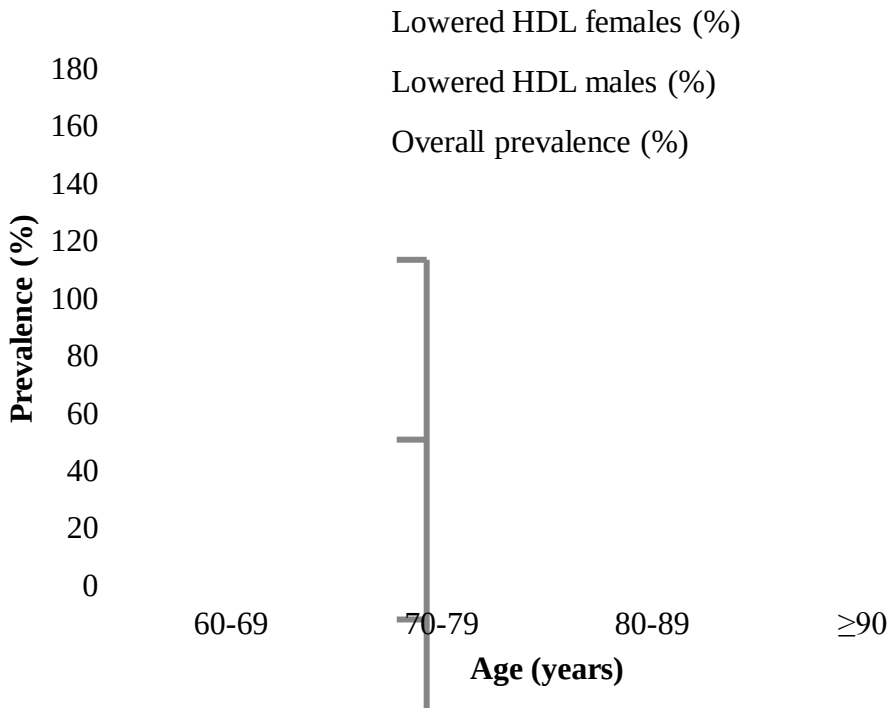

Figure 13: Histogram showing the prevalence of lowered HDL serum levels among the elderly individuals sampled in Morogoro region (n=300).

3.4. Blood pressure (BP)

Figures 14 and 15 present results related to systolic and diastolic blood pressure. The overall mean of blood pressure was marginally higher in female than in male participants and was as follows; 147.06±26.473 SBP and 88.33±14.2 DBP for females, 137.74±28.417 SBP and 83.84 ±15.016 DBP for males. The observed SBP mean increased slightly with increasing age from 60 to 80 years then declined toward the ≥90 years while the mean for DBP declined steadily from 60 toward the ≥ 90 years (Fig 14).

Out of the 300 studied individuals, 139 (46.3%) were hypertensive. The blood pressure readings classified based on the JNC7 criteria into four stages of hypertension (Table 11) were as follows; 47(15.7%) out of the 300 participants, had normal BP while 79(26.3%) were in prehypertensive state,79(29.3%) were in stage 1 hypertension and 95(31.7%) were in stage 2 hypertension. Based on WHO criteria (Table 12), diagnosed cases of hypertension were graded as pre hypertension 127 (42.3%), grade 1 hypertension 77(25.7%), grade 2 hypertension 45 (15%) and grade 3 hypertension 51(17%).

The difference between sexes as related to pre hypertension and stage 1 hypertension was only marginal (Table 11). Based on hypertension subtypes, elderly participants with combined systolic and diastolic hypertension were 75(25%). The prevalence of combined systolic and diastolic hypertension was significantly higher in female participants ($P<0.05$). Participants with ISH and IDH were 58(19.3%) and 5(1.7%) respectively. No difference between sexes as related to prevalence of ISH and IDH was noted (Figure 15).

Obesity in elderly was associated with combined systolic/diastolic hypertension (Table 3). On the other hand, a lack of statistical confirmation to connect obesity as a risk factor for ISH and IDH (Table 3) was evident from the results. While dyslipidemia revealed a significant association with hypertension in both sexes (Table 6), statistical tests showed a lack of positive link between the prevalence of hypertension and the history of heart attack in the families (Table 15).

The prevalence related to hypertension subtypes within the various age groups was as displayed in Figures 16, 17 and 18. With reference to Fig 16, the overall prevalence of systolic/diastolic hypertension increased steadily in between 60 and 89 years and declined substantially at ≥90 elderly ages. The number of female with systolic/diastolic hypertension was almost constant in all the ages while in males the prevalence increased with advancing ages (Figure 16). The results displayed in Figure 17 indicate that, the overall prevalence of ISH and the prevalence specific to female sex increased with ages. Male's elderly cases with ISH were almost constant in 60 - 69 and 70 - 79 age groups before it fell in later ages. There was no ISH case in males and females in ≥ 90 years of age.

The distributions of elderly with isolated diastolic hypertension within the different age groups are displayed in Figure 18. Female cases with IDH were observed mainly in the 60 - 69 age group. Male cases with IDH increased slightly in 60 - 79 years and the prevalence was highest in 80-89 years. No case of IDH was observed in elderly age of ≥ 90 years in both sexes. Nevertheless, the overall prevalence of IDH displayed in this study was certainly lower than the systolic/diastolic and ISH (Figure 15) and on other hand statistical tests gave results with no evidence of association between smoking habit with respects to systolic/diastolic hypertension, ISH and IDH (Table 14).

Despite the evidence associating hyperglycaemia with systolic/diastolic hypertension, a lack of association between hyperglycaemia with respects to ISH and IDH (Table 13) was revealed statistically.

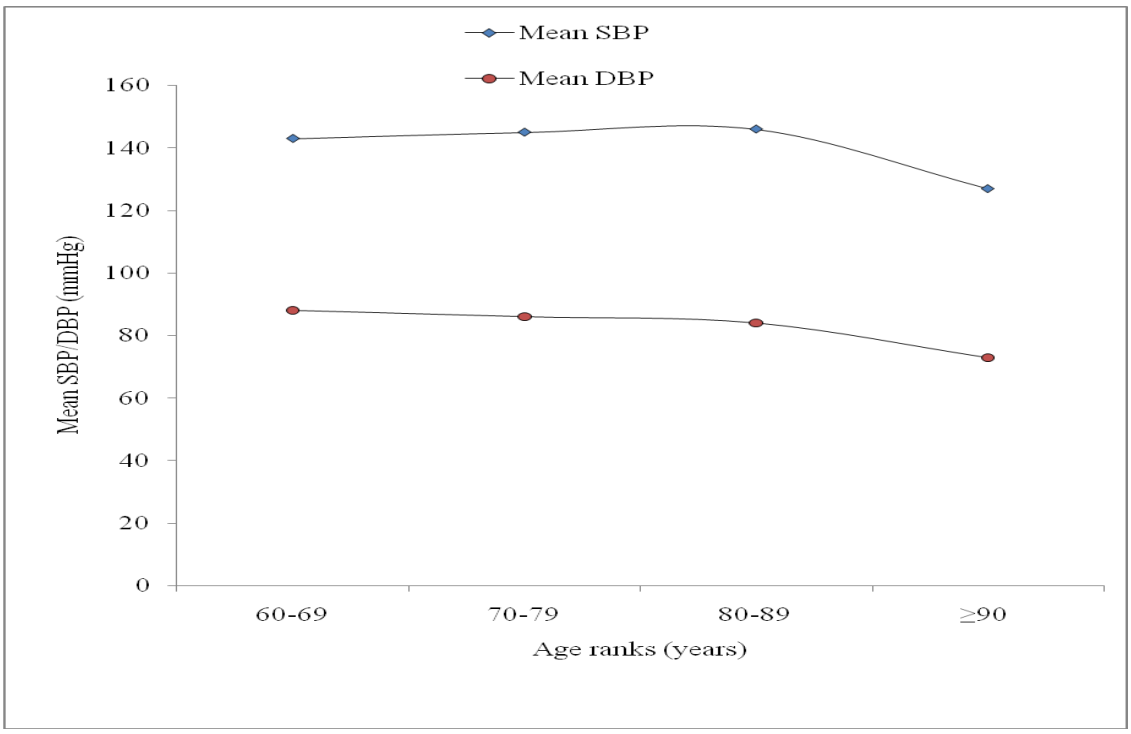

Figure 14: The mean SBP and DBP (mmHg) distributed by ages among the elderly people sampled in Morogoro (n=300).

Table 11: Percentile distribution of elderly people sampled in Morogoro region (n=300) based on hypertension stages.

BP stages	Females (n=176)	%	Males(n =124)	%	P value
Normal BP	21	11.9	26	21	0.05
Pre-hypertension	43	24.4	36	29	0.4
Stage 1 hypertension	46	26.1	33	26.6	0.96
Stage 2 hypertension	66	37.5	29	23.4	0.013

Table 12: Hypertension grades among the elderly of Morogoro classified based on WHO criteria

WHO classification	Females n=176	% 100	Males n=124	% 100	Total 300	% 100	P value
Pre hypertension	66	37.5	61	49.2	127	42.3	0.07
Grade1	43	24.4	34	27.4	77	25.7	0.9
Grade2	33	18.8	12	9.7	45	15	0.04
Grade3	34	19.3	17	13.7	51	17	0.2

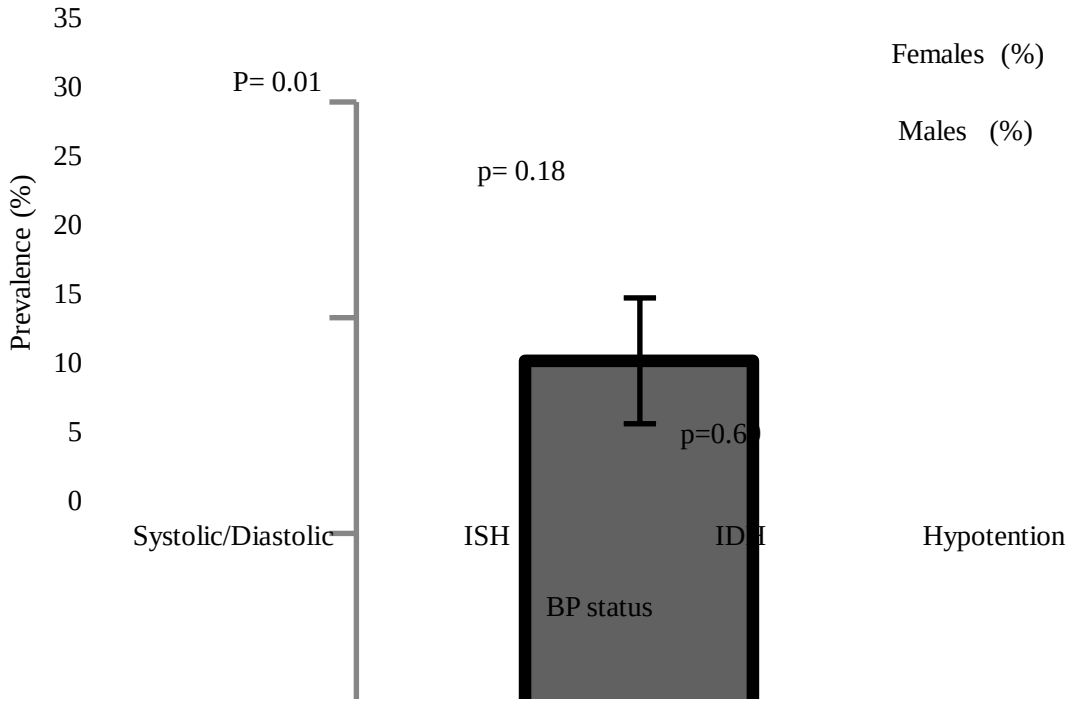

Figure 15: Histograms showing the prevalence of hypertension subtypes among the elderly individuals sampled in Morogoro region (n=300).

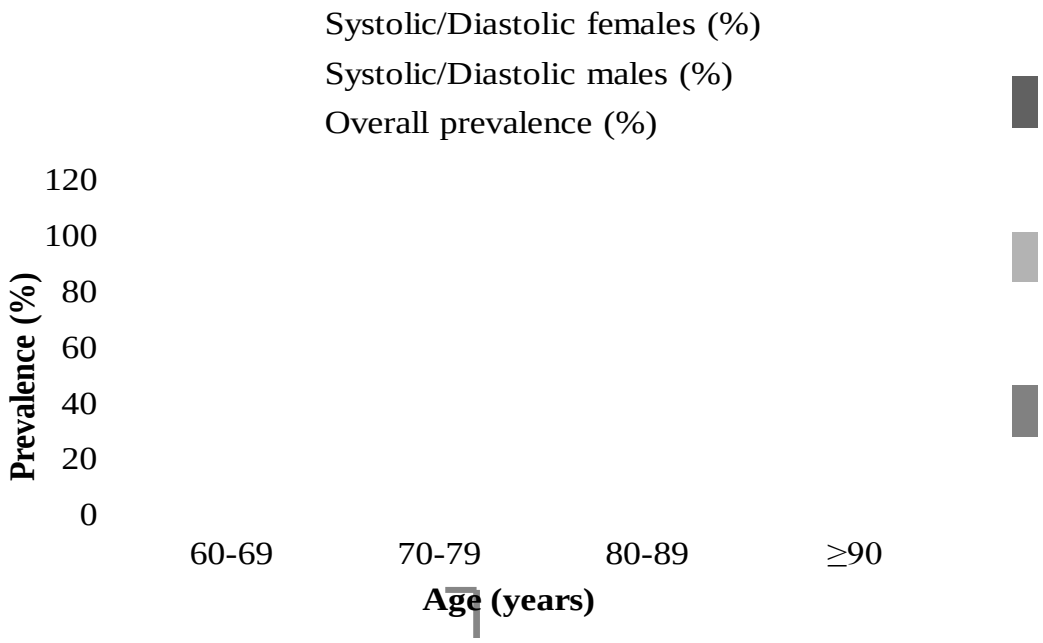

Figure 16: Histogram showing the prevalence of systolic/diastolic hypertension among the elderly individuals sampled in Morogoro region (n=300).

Figure 17: Histogram showing the prevalence of isolated systolic hypertension among the elderly individuals sampled in Morogoro region (n=300).

Figure 18: Histogram showing the prevalence of isolated diastolic hypertension among the elderly individuals sampled in Morogoro region (n=300).

3.5. Fasting blood glucose (FBG)

The overall mean of FBG (Mmol/L) levels was marginally higher in males (6.21±2.4) compared to females participants (6.07±2.3). Values of FBG fluctuated among the different age groups studied (Fig 19). Moreover, the results revealed that; from the 300 elderly participants, 57 (19%) were hyperglycemic while only 9(3%) were hypoglycemic. There was no significant difference between sex as far as the prevalence of hyperglycemia and hypoglycemia was concerned (Fig 20).

Obesity was associated with hyperglycemia in both sexes (Table 3). The RR of developing hyperglycemia in obese elderly was 1.8 and obese individuals were two times likely to develop hyperglycemia than non obese (OR=2). Dyslipidemia (Table 6) was not associated with hyperglycemia. On the other hand, there was no clear pattern related to prevalence of hyperglycemia with the advancement of ages (Figure 21).

The overall prevalence of hyperglycemia was high in 60 and 69 elderly age group, declined in the 70-79 then increased again in the 80-89 and ≥ 90 years elderly ages . The number of hyperglycemic females was high in the 60-69 years of age and declined in the 70-79 age group before increased again in the later ages. None of hyperglycemic female's case was observed in the ≥ 90 years of age. The number of hyperglycemic males was high in the 60-69 and ≥ 90 years of age while few cases were observed in between 70-89 elderly ages.

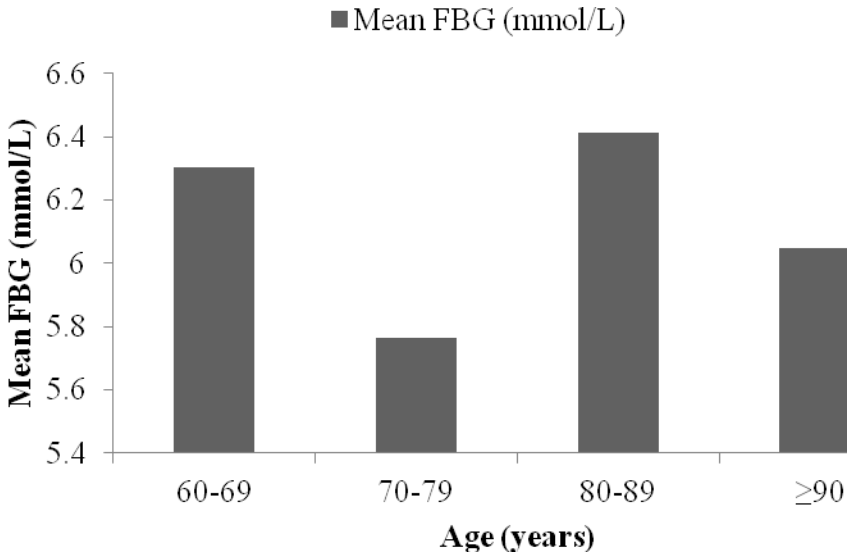

Figure 19: Histograms showing the mean Fasting blood glucose (FBG) with ageing among the elderly people sampled in Morogoro region (n=300).

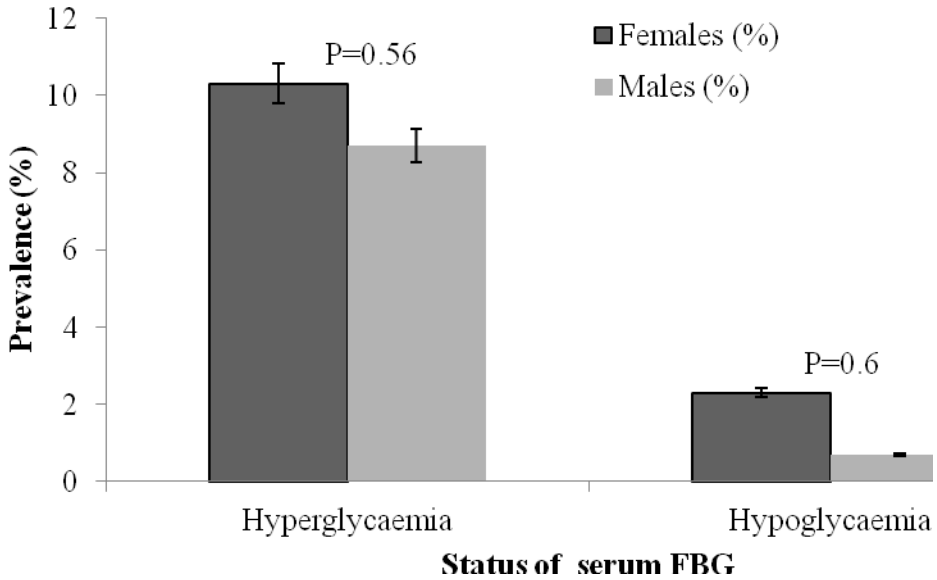

Figure 20: Histograms showing the prevalence of hyperglycemia and hypoglycemia among the elderly individuals sampled in Morogoro region (n=300).

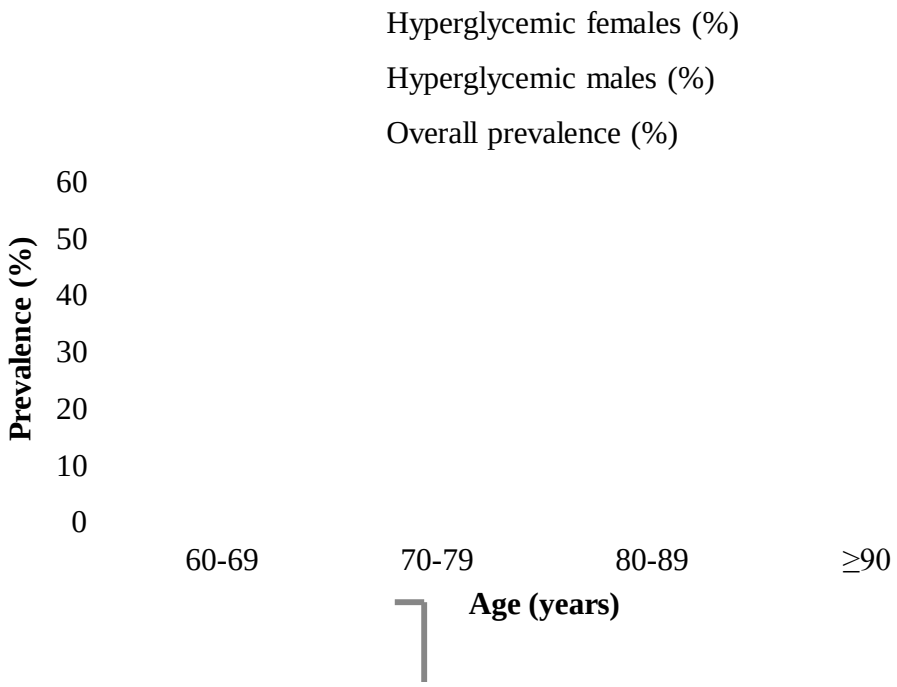

Figure 21: Histogram showing the prevalence of hyperglycemia among the elderly individuals sampled in Morogoro region (n=300).

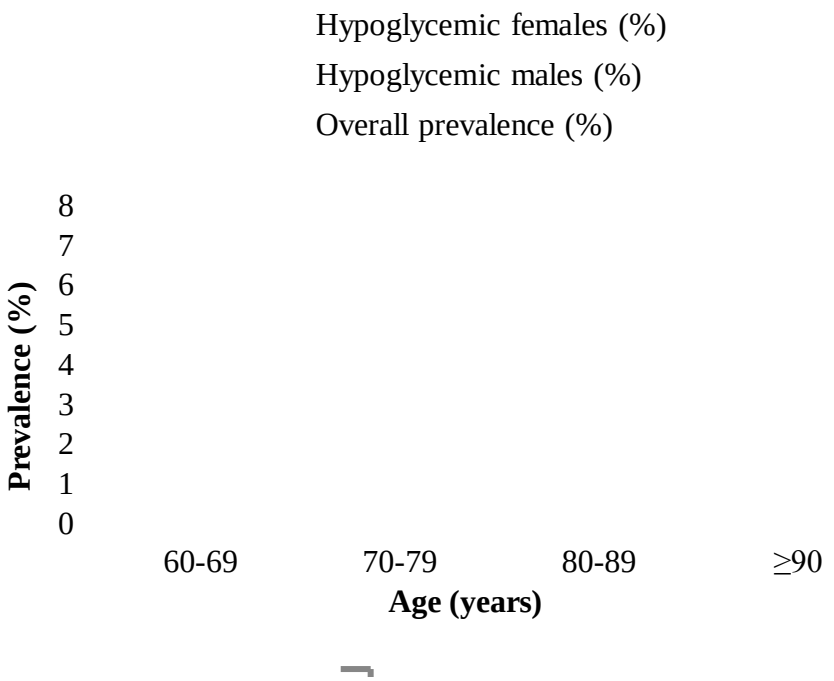

Figure 22: Histograms showing the prevalence of hypoglycemia among the elderly individuals sampled in Morogoro region (N=300).

Table 13: Hyperglycemia status as related to hypertension subtypes among the elderly people sampled in Morogoro (n=300).

	Hyperglycemic		Total	df = 1	P-value
Systolic/Diastolic hypertension	Yes	No			
Yes	43	106	149	$\chi^2 = 4.61$	0.035*
No	14	137	141		
ISH					
Yes	15	43	58	$\chi^2 = 1.68$	0.19
No	42	200	242		
IDH					
Yes	0	5	5	$\chi^2 = 0.27$	0.6
No	57	238	295		

*Significant differences between groups are indicated.

Table 14: Smoking habit as related to hypertension, lowered HDL-c and hyperglycaemia among the elderly sampled in Morogoro (n=300).

	Smoking habit			
	Yes	No	Total	P-value
Hypertension				
Yes	48	91	139	0.35
No	65	96	161	
Lowered HDL-c				
Yes	77	97	164	0.04
No	36	90	126	
Hyperglycemia				
Yes	19	38	57	0.54
No	94	149	243	

*Significant differences between groups are indicated.

Table 15: Heart attack family history as related to CRF among the studied elderly sampled in Morogoro (n=300).

	Heart attack family history			
	Yes	No	Total	P value
Obesity				
yes	45	37	82	0.5
No	130	88	218	
Dyslipidemia				
Yes	123	97	220	0.2
No	52	28	80	
Hypertension				
Yes	80	59	139	0.89
No	95	66	161	
Hyperglycemia				
Yes	30	27	57	0.4
No	145	98	243	

3.6. Summary of the cardiovascular risk factors

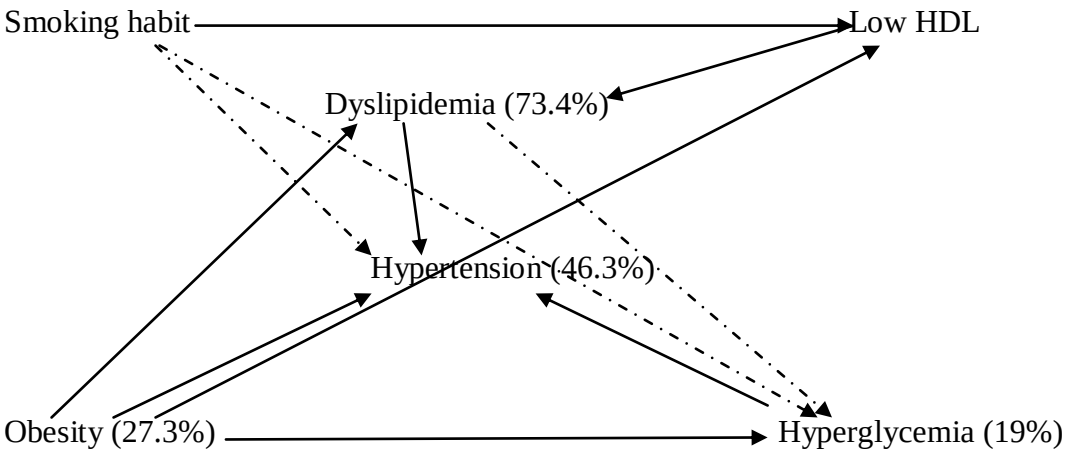

Figure 23: Summary referring to the prevalence and relationship between the common cardiovascular risk factors revealed from a study involving elderly individuals (≥60 years old) sampled in urban and rural areas in Morogoro, Tanzania.

- - - ► Association revealed previously but not in the current study.

——► Association revealed previously and in the current study.

Figure 23 indicates dyslipidemia as the most prevalent CRF followed by hypertension, obesity and hyperglycemia. Obesity is shown to be associated with all other studied CRF hence probably plays a central role in occurrences of chronic disease conditions. Smoking habit is being shown to have connection with lowered HDL-c however surprisingly lacked association with hypertension. The figure further reveals that, hypertension was frequently diagnosed in hyperglycemic, dyslipidemic and obese elderly individuals.

3.7. Nutrition status in the Elderly People

The data presented in Table16 indicates the distribution of the elderly based on sex and nutritional score points. Generally, out of the 300 studied participants; 74(24.6%) elderly were either malnourished or at risks of malnutrition. Elderly diagnosed to be at risk of malnutrition (8-11 points) were (22.7%) and malnourished ones (0-7 points) were (2%). The mean nutritional score points from the MNA® questionnaires was marginally higher in females (12.22±1.67) compared to males (11.94±1.99) (P>0.05).

Statistically, a negative correlation of mean nutrition score points with advancing elderly ages was observed (r = -0.95, P=0.023). The score points decreased from 12.41 in elderly aged 60-69 years to 10.5 points in the later age groups (Figure 24). Subsequently the number of elderly diagnosed as malnourished was smaller compared to those at risk of malnutrition. Nevertheless, further investigation for those at risk of malnutrition was not undertaken in this study. Additionally, the prevalence of elderly people diagnosed as malnourished increased with elderly ages (Figure 25).Similarly based on Figure 26, the prevalence of elderly people at risks of malnutrition increased with elderly ages.

Table 16: Distribution of elderly people (n=300) based on the nutritional score points from a study conducted in Morogoro region.

MNA score points	Males (n =124)	%	Females (n =176)	%	P value
>12 score points	87	70.2	139	79	0.14
8-11 score points	34	27.4	34	19.3	0.16
0-7 score points	3	2.4	3	1.7	0.93

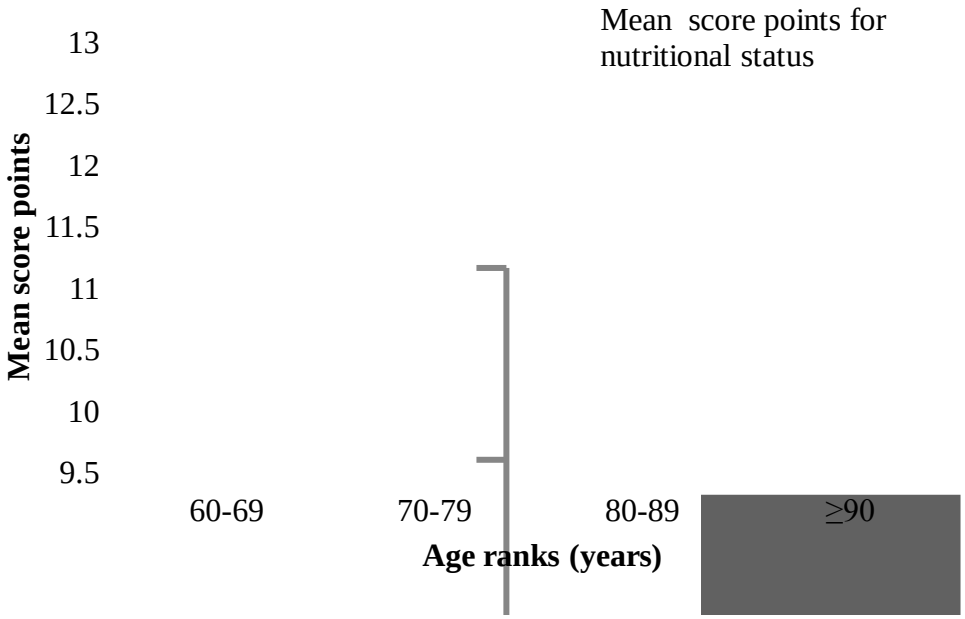

Figure 24: Histograms showing the mean nutrition score points at the different ages of elderly sampled in Morogoro region (n=300)

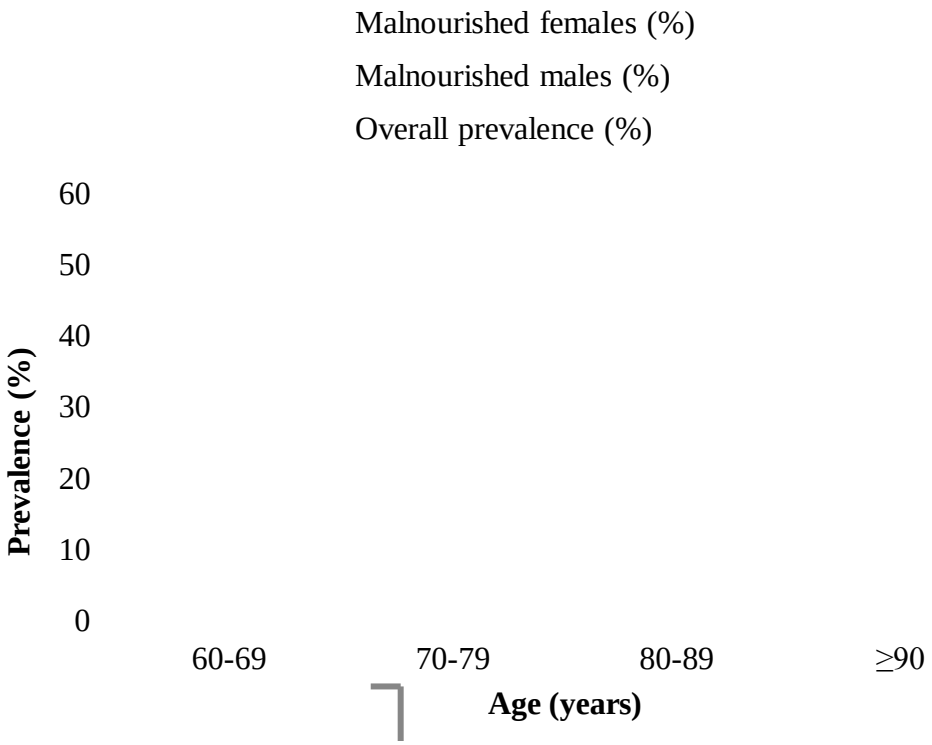

Figure 25: Histograms showing the overall prevalence and the prevalence specific to sex of malnourished elderly individuals sampled in Morogoro(N=300).

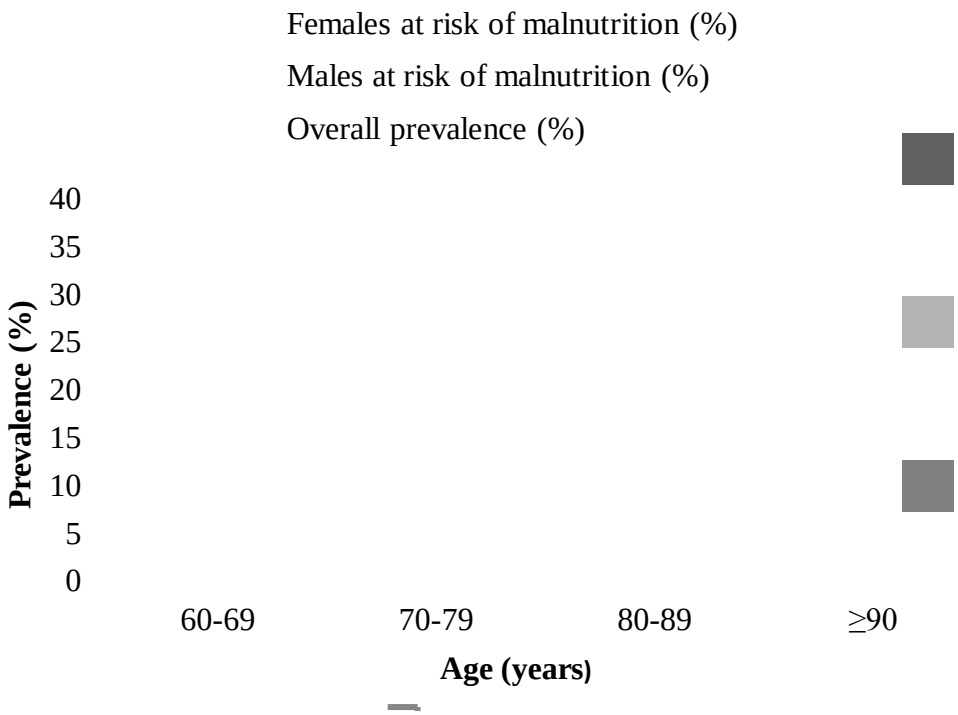

Figure 26: Histograms showing the overall prevalence and the prevalence specific to sex of elderly at risk of malnutrition in a study conducted in Morogoro region, Tanzania (N=300).

3.8. Distribution of CRF and the Risk of Malnutrition between the Rural and Urban dwelling elderly people sampled in Morogoro.

The urban dwelling elderly people had a higher mean values of BMI, TC, LDL-c, TG, SBP, DBP, FBG and nutrition score points compared to their rural counterparts (Table 17). On the other hand, equal means of HDL-c serum levels ware revealed in the elderly of both the urban and rural areas. Obesity was highly diagnosed in the urban compared to rural dwelling elderly participants. Similarly, the prevalence of dyslipidemia combined systolic/diastolic hypertension and hyperglycaemia were marginally higher in the urban compared to rural residing elderly participants. However, while the prevalence of ISH were at equal levels in the rural and urban areas, the prevalence of malnourished and elderly at risk of malnutrition were highly diagnosed in the rural compared to urban occupants. The prevalence of IDH was marginally higher in the rural dwelling elderly people (Table 17).

Table 17: Distributed between elderly of urban and rural areas of Morogoro (n=300) are Mean values of measured parameters and prevalence of CRF.

	Urban(n=150)	Rural(n=150)	df = 1	P value
BMI	30.07±6	22.6±4	t = 12.58	<0.001*
TC	201.8±46.1	187.2±47.1	t = 2.69	0.0075*
LDL-c	140.4±38.2	126.4±38.5	t = 3.11	0.002*
TG	137.1±81.1	120.4±56.5	t = 2.06	0.04*
HDL	49.6±14.8	49.9±15.7	t = 0.139	0.89
SBP	147±25.2	139.3±29.4	t = 2.43	0.015*
DBP	88.8±13.9	84±15	t = 2.85	0.0046*
FBG	6.3±2.7	5.9±1.9	t = 1.72	0.084
Obesity	73(48.7%)	9(6%)	χ^2 = 66	<0.001*
Dyslipidemia	118(78.7%)	102(68%)	χ^2 = 3.38	0.05
Systolic/Diastolic hypertension	75(50%)	64(42.7%)	χ^2 = 1.34	0.24
ISH	29(19.3%)	29(19.3%)	χ^2 = 0.021	0.8
IDH	2(1.3%)	3(2%)	χ^2 = 0.0	1.0
Hyperglycemia	34(22.7%)	23(15.3)	χ^2 = 2.17	0.14

*Significant differences between groups are indicated.

CHAPTER FOUR

4. DISCUSSION

The present study was more represented by elderly women than men. Since sampling was random, the biasness may be explained by the fact that, mortality rate is relatively higher in men than women at advanced age leading to changes of sex ratio in favor of women [87,88]. The pooled data showed more elderly on the age category range of 60 – 69 than the succeeding ages. This is probably due to the increased risk of elderly mortality in direction of higher ages [88].

Hypertension was associated with obesity, the fact partly explained by the body needs to increase cardiac output to cope with the increased demand and peripheral resistance [89]. The association of hyperglycemia with elevated blood pressure was in agreement with previous study [90] and was most likely attributed not only to its osmotic effect but also to negative effect hyperglycemia has on Nitric oxide synthesis from the endothelia lining which tends to affect the pliability of blood vessels and hemodynamic changes[90]. Dyslipidemia had connection to hypertension probably due to its role on atherosclerosis [19].

The prevalence of hyperglycaemia increased with ages probably due to insulin resistance which is common with ageing [51]. The prevalence of lowered HDL-c increased with advancing ages while the HDL-c mean values decreased with ages. The observation related to HDL-c levels may probably reflect how the increased risk for Coronary Heart Disease is in old ages. The prevalence of obesity and the means of BMI, cholesterols and TG values, all declined with advancing ages. The cause for this could have probably been the changing pattern of fat and lean tissue distributions with ageing [35]. The prevalence of dyslipidemia and hypertension was lowest in the ≥90 age category. Although this was probably attributed to small number of participants in responsible age group (Table 4), it could have also been due to survival biasness. Despite the increase in mean SBP with ages, its fall in the ≥90 age category was probably skewed by few observed cases of hypotension.

The current study revealed a burden of modifiable CRF in the elderly of post retirement ages (≥60 years) in Morogoro, Tanzania. Dyslipidemia and hypertension was be the most prevailing CRF followed by obesity and hyperglycaemia. Cigarette smocking habit showed connection to lowered HDL-c levels a finding amicable to Batić-Mujanović O. *et al* [91] findings. Batić-Mujanović O. *et al* 2006, revealed a significant lower mean HDL-c level in smokers than in non-smokers hence suggesting that cigarette smoking adversely affects HDL-c by lowering its level, which further increases the risk for developing Coronary heart disease.

In the present study smoking habit lacked a statistical connection to pathologic blood pressures. This was unanticipated and thus the following are suggested; (i) the smoking habit hypertension relationship is probably well established in young and adult individuals or perhaps in elderly too but at much larger sample size. (ii) A cross sectional study design is probably not reliable for showing this relationship in elderly people probably due to existence of many other risk factors linked to hypertension which may surpass the isolated role of smoking habit.

Stage II hypertension was the highly diagnosed hypertension stages and untreated cases may lead to series of organ damages which can be deadly [43]. The prevalence of IDH was certainly lower than the systolic/diastolic and ISH. This may suggest that, IDH is probably a minor problem in ≥ 60 elderly ages. Additionally, IDH seems to be of minor importance in the ≥ 60 elderly ages when compared to its level in other adult populations [92]. History of heart attack and strokes in families were not related to any of the studied CRF. This may show that; heart attacks or strokes may not always be the ultimate fates for any case of obesity, hypertension, dyslipidemia and hyperglycemia. For that reason heart attack family history may not reveal a truthful picture of genetic background related to CRF. Gender biasness toward females concerning the levels of hypertension, dyslipidemia, hyperglycemia and obesity was probably due to varying number of participants between sexes. But, females are said to have different life styles and body physiology from males [81].

Additionally, females are more subjected to stress than males [93]. These reasons and others may probably explain why modifiable CRF were highly diagnosed in females as compared to male's participants. Except for obesity, the present study showed a lower prevalence of CRF studied as compared to a previous study in Tanzania[11]. The difference in age group of the participants was probably behind the varying levels of CRF observed between the two studies in Tanzania.

Concerning the elderly nutritional status, results displayed in Table 16 and Figures 24-26 has shown some evidence relating to the existence of nutritional challenges among the ≥ 60 year's elderly in the Morogoro community in Tanzania. Nevertheless, the estimated level of malnutrition reported in this document was relatively lower compared to the prevalence reported in previous studies from other part of Africa and from Rwandanian's refugees from camps in Tanzania and Malawi [7, 10].

The respective findings related to the declines in nutrition score points (Figure 24), increased prevalence of malnourished elderly (Figure 25) and increased prevalence of underweight with ages (Figure 7) were most likely related and was probably a reflection of increasing risk of undernourishment with advancements of ages. Results from other study have indicated the common elderly problems in African environments like the poor economic status, living alone, lack of assistance from next of kin, inability to work, loss of site, long standing chronic illnesses, psychological problems and dementia [7] as the most likely factors behind the poor nutritional status observed in some elderly participants similar to the present study.

The prevalence of CRF was higher among the urban dwellers compared to rural dwelling elderly people. This was probably attributed to differing lifestyles and nature of daily activities between residents from the two places. Concerning the physical activeness, rural dwelling elderly of Morogoro are probably more engaged in farm based and other activities requiring high energy expenditure than the urban based elderly people who are probably more sedentary. This is because activities such as land tilting for paddy, maize, sunflower, gardening, etc for food and other activities like riding bicycle and long distance walking with livestock are relatively more practiced in rural

compared to the urban areas [72]. High energy intake with less expenditure plus the differences in dietary composition and ways of food preparations prior to consumption might have been among the reasons for the higher cases of obesity and other CRF seen among the urban inhabiting elderly personnel when compared to their rural counterparts. The risk of malnutrition was highly diagnosed in the rural compared to urban dwelling elderly people probably due to poor eating attributed to problems such as poverty, diseases and un availability of the recommended diet.

CHAPTER FIVE

5. CONCLUSSION

The current study has come up with sufficient evidence concerning the prevalence of modifiable cardiovascular risk factors and nutritional challenges among the elderly people of ≥60 years in the Morogoro community in Tanzania. The findings have revealed dyslipidemia and hypertension as the most prevailing cardiovascular risk factors followed by obesity and hyperglycaemia.

Hypertension was highly diagnosed in elderly with obesity, dyslipidemia and hyperglycaemia. Obesity was shown to play a central role in the occurrence of other cardiovascular risk factors in view of the fact that, obesity was statistically highly associated with hypertension, dyslipidemia and hyperglycaemia.

Additionally, a large percent of hypertensive individuals were in lethal stage of pathologic blood pressure (stage II hypertension). At that stage, hypertension may lead to multiple organ damages and therefore its diagnosis requires effective remedial measures as a solution against the likeliness of any deadly health consequences.

Existence of malnutrition was observed among the ≥60 year's community dwelling elderly population in Morogoro, Tanzania. The observed risk of malnutrition was evident from early in 60-69 years of age. Yet the study suggests that, elderly in more senior ages are probably at higher risk of malnourishments compared to other adult groups. This is probably due to a combination of factors including the increase in deterioration of physical and mental bodily function as well as some social issues associated with ageing with decreased nutrients intake as one of the consequences. Prolonged nutritional deficiency is very likely to be among the culprit for ill health in elderly age hence requiring the availability of acceptable frequent screening test to detect and treat those who are malnourished or at risk of malnutrition.

6. RECOMMENDATION

Most of cardiovascular risk factors emanates from unhealthy life styles probably adopted during young, adults and old ages. Creating awareness in controls of modifiable cardiovascular risk factors in all stage of people's life time is required. Special health programmes should focus on education, screening, counselling and treatment measures.

Association of obesity with other agents of cardiovascular risk factors calls for needs of involvements in scheduled physical exercises (activities) combined with dietary control as a direct remedy against obesity and indirectly as remedial against other cardiovascular risk factors.

Reduction of psychological stress, avoidance of tobacco, healthy eating and drinking should be of routine practice in people of all ages since may help to curb hypertension, hyperglycemia, dyslipidemia and obesity.

The observed level of malnutrition among the elderly of our community calls for implementation of suggested recommendations which serves as intervention strategies in malnourished and elderly at risks of malnutrition. The two measures involve the monitoring and treatments components.

In elderly at risks of malnutrition without weight loss, the suggested monitoring measures includes; close weight monitoring and rescreening after every three months while the treatment measures are applicable to individual with weight loss and includes; dietary enhancements, oral nutrition supplementation, close weight monitoring and further in depth nutrition assessments.

Treatment measures in malnourished individuals should includes; oral nutrition supplementation, diet enhancements, close weight monitoring and further in depth nutrition assessments.

Conduction of a comprehensive study should be carried out to determine the awareness or knowledge of the elderly people with regard to cardiovascular risk factors, healthy

eating and unhealthy lifestyles since these were not investigated in the current study. Long term study should carried out in conduction of a separate detailed investigation on the nutritional status among the community dwelling elderly as an attempt to come up with more data.

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APPENDIX I

Mini Nutrition Assessment –Short Form (MNA-SF)

A. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0 _ severe loss of appetite
1 _ moderate loss of appetite
2 _ no loss of appetite

B.Weight loss during last three months
0 _ weight loss greater than 3 kg (6.6 lbs)
1 _ does not know
2 _ weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
3 _ no weight loss

C. Mobility
0 _ bed or chair bound
1 _ able to get out of bed/chair but does not go out
2 _ goes out

D. Has suffered psychological stress or acute disease in the past three months
0 _yes
2 _no

E. Neuropsychological problems
0 _ severe dementia or depression
1 _ mild dementia
2 _ no psychological problems

F. Body Mass Index (BMI) (weight in kg)/(height in m)^2
0 _BMI less than 19
1 _BMI 19 to less than 21
2 _ BMI 21 to less than 23
3 _ BMI 23 or greater

Screening score (subtotal max. 14 points)
12 points or greater: Normal – no need for further assessment
11 points or below: Possible malnutrition – continue assessment

APPENDIX II: Mini Nutrition Assessment –Short Form (MNA-SF)

Swahili version.

Dodoso: hali ya lishe, toleo la kiswahili

A. Je kumekuwapo na upunguaji wa kula katika miezi mitatu iliyopita kutokana na kupotea hamu ya kula, matatizo ya tumbo, ugumu wa kutafuna au kumeza?

0 _ kupoteza kabisa hamu ya kula
1 _ kupoteza kwa kiasi Fulani hamu ya kula
2 _ hamu ya kula ilikuwepo

B.kupungua uzito ndani ya miezi mitatu iliyopita

0 _ Kupoteza uzito zaidi ya kilo 3 (6.6 lbs)
1 _ Sijui
2 _ Kupoteza uzito kati ya kilo 1 na 3 (2.2 and 6.6 lbs)
3 _ hakuna uzito ulio potea

C. Uwezo wa kutembea

0 _ Shinda kwenye kitanda au kit
1 _ naweza toka kitandani au kitini lakini si kwenda nje
2 _ naweza kwenda nje.

D. Kupatwa na matatizo ya kisikologia au ugonjwa mkubwa miezi mitatu iliyopita

0 _Ndiyo
2 _Hapana

E. Matatizo ya msongo wa akili.

0 _ msongo mkubwa wa mawazo na kupoteza kumbukumbu
1 _ msongo kidogo wa mawazo na kupoteza kumbukumbu
2 _ hamna tatizo la msongo wa mawazo na kupoteza kumbukumbu.

F. Uwiano wa uzito na Urefu(Bod-ymass index-BMI)

0 _BMI chini ya 19
1 _BMI kati ya 19 na 21
2 _ BMI kati ya 21 mpaka chini ya 23
3 _ BMI ya 23 au zaidi

Screening score (jumuisho la juu la point zitakiwazo ni 14)

Point 12 au zaidi: Hali njema ya lishe – Hamna haja ya uchunguzi zaidi.
Point 11 au Chini yake: kuna tatizo la lishe – Fanya uchunguzi zaidi.

APPENDIX III:

Questionnaire. Cardiovascular risk factors

Date..... Name……..... sex……

Age…

Weight..... Height.....

Blood glucose……..Blood pressure……

LDL CHOLESTEROL…….HDL……..

Total Cholesterol……..TG……..

BMI……MNA score……

Q1. Family History. Has any close relative of yours previously (i.e., father, mother brother, son)experienced a heart attack?

Yes

No

Don't remember

Q2. Are you currently a cigarette smoker or have you ever smoked in the past?

Yes

No

Q3. Are you currently using any ant-diabetic drug?

1. Yes
2. No

Q4. Are you using any cholesterol lowering drug?

1. Yes
2. No

Q5. Are you using any anti hypertensive drug?

1. Yes
2. No

APPENDIX IV: Cardiovascular Risk factors. Questionnaire, Swahili version

Dodoso: Viashiria vya gonjwa ya Moyo

Tarehe..... Jina……..... Jinsia…… Umri…

Uzito..... Urefu.....

Blood glucose……..Blood pressure……

LDL…….HDL……..Total Cholesterol……..

TG……..BMI……MNA score……

Q1. Historia ya ukoo. Je kuna ndugu yako yoyote wa karibu (i.e., baba, mama, kaka, mtoto)

Ambaye amewahi pata mshituko wa moyo?

1. Ndiyo
2. Hapana
3. Sikumbuki

Q.2. Uvutaji wa sigara/tumbaku. Je unavuta au umewahi kuvuta sigara au tumabaku wakati wa maisha yako?

1. Ndiyo
2. Hapana

Q3. Je unatumia dawa yoyote ya kupunguza kolestero mwilini?

1. Ndiyo
2. Hapana

Q4. Je unatumia dawa yoyote ya kupunguza sukari (dawa ya kisukari) mwilini?

1. Ndiyo
2. Hapana

Q5. Je unatumia dawa yoyote ya kupunguza shinikizo la damu?

1. Ndiyo
2. Hapana

APPENDIX V: Consent form, English version

Consent to participate in the study of Assessment of cardiovascular risk factors and nutritional status among elderly in rural and urban areas in Morogoro.

Dear Sir/Madam,

Greetings!

My Name is Dr. Mwangengwa Lusekelo, doing my Masters of Science in Physiology at MUHAS. I am conducting a study concerning Assessment of cardiovascular risk factors and nutritional status and access to health care among elderly in rural and urban areas in Morogoro

PURPOSE OF THE STUDY:

The aim of this study is to assess the magnitude of cardiovascular risk factors, nutritional status among elderly in rural and urban areas in Morogoro in order to develop strategies for intervention and improvements.

HOW TO PARTICIPATE:

Participants who will be ready to participate will sign a consent form to approve his/her willingness.

Short interview will be done and will be associated with measurement of blood pressure and then collection of blood samples for investigation will be conducted.

CONFIDENTIALITY:

Information obtained from you will be confidential and will be of help in this study and better care for elderly in our country.

COSTS:

You will not be required to pay anything for your participation.

VOLUNTARY PARTICIPATION & RIGHTS TO WITHDRAW

Your participation is voluntary and you have the right to withdraw from participating in our study at any time. Whatever your decision may be, it will not affect in any way your rights to care and treatment.

RISKS

We don't expect risk by drawing blood although you will feel some pain when the needle pierces your skin for drawing this blood.

BENEFITS:

Your participation in this study will help you know your status as far as the cardiovascular risk factors and nutrition are concerned. More over the information from this research will be useful in contributing to improve the quality of health care and nutritional counselling for elderly in our setting.

CONTACT PERSONS:

If you have any inquiries about this study, please do not hesitate to contact:

Dr. Mwangengegwa Lusekelo

Principal Investigator

Muhimbili University of Health and Allied Sciences (MUHAS)

Department of Physiology

P.O. Box 65001 Dar es Salaam.

Tel. 0754947777

OR in case of any information about your rights as a participant in this study please contact:

The Director

Research and Publication Committee

Muhimbili University of Health and Allied Sciences (MUHAS)

P.O. Box 65001 Dar es Salaam

Tel. 2151489

I will be grateful if you willingly agree to participate in this study.

I _____

Have understood the above information and my questions have been answered by the investigator to my satisfaction. I willingly agree to take part in this research.

Name of the participant: _____

Signature of the participant: _____Date _____

Signature of Investigator _____

APPENDIX VI: Consent form, Swahili version

FOMU YA MAKUBALIANO YA KUSHIRIKI KATIKA UTAFITI

Habari! Naitwa Dr. Mwangengwa Lusekelo nikisomea shahada ya Uzamili katika Chuo Kikuu Cha Sayansi Za Tiba cha Muhimbili. Nafanya utafiti kuhusu Viashiria vya magonjwa ya moyo na lishe mwilini miongoni mwa watu wazima

Dhumuni ni kujua kiwango cha viashiria vya magonjwa ya moyo na kiasi cha lishe miongoni mwa wazee ili kupanga namna ya kukabiliana na hilo tatizo na uboreshaji wa huduma za afya.

Jinsi ya Kushiriki:

Mhusika ambaye yuko tayari kushiriki ataweka sahihi yake , ili kuonyesha utayari. Yatafuata maswali machache ya Utangulizi, kisha vipimo vya pressure na uchukuaji wa damu kwa ajili ya uchunguzi zaidi.

Usiri:

Taarifa ya magonjwa yako hazitatangazwa kwa yoyote zaidi ya mtafiti. Matokeo ya utafiti kwa ujumla yatasaidia kuboresha huduma kwa wazee hasa katika masuala ya upatikanaji wa huduma ya afya na ushauri kuhusu lishe.

Gharama:

Hutatakiwa kulipa gharama yoyote kwa kushiriki kwako.

Utayari wakushiriki au kujitoa:

Kushiriki kwako ni hiyari na waweza kujitoa.

Faida:

Kushiriki kwako katika utafiti huu, kutakusaidia kujua hali yako kuhusu kiasi cha viashiria vya magonjwa ya moyo na lishe.Pia utapewa ushauri namna ya kuboresha lishe yako kwa namna ambavyo inasaidia kuboresh afya ya mwili.

Ni tumaini letu kuwa utafiti huu utasidia kuboresha huduma za afya kwa wazee hasa katika ushauri wa namna kuboresha lishe na mahudhurio ktika vituo vya tiba.

Nitakushukuru kwa kushiriki kwako utafiti huu. Aksante.

Iwapo utakuwa na swali lolote kuhusu utafiti huu wasiliana na Dr.Mwangengwa Lusekelo, Chuo kikuu Cha Afya Na Sayansi za Tiba Muhimbili; Idara ya Phisiologia; S.L.P 65001 Dar Es Salaam. Simu 0754947777.

AU endapo utakuwa na swali lolote kuhusu haki zako kama mshiriki katika utafiti huu wasiliana na:

Mkurugenzi wa kamati ya tafiti na matoleo chuoni. Chuo Kikuu Cha Afya na Sayansi za Tiba Muhimbili; S.L.P 65001 Dar Es Salaam. Simu 2151489.

Mimi……nimeelezwa/ nimesoma yaliyomo katika fomu hii na nimeelewa maana yake. Nakubali kushiriki katika utafiti huu.

Sahihi…….. (Mshiriki) Tarehe……..

Sahihi…….. (Mtafiti) Tarehe……..