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# Factors associated with hypertension among employees in arusha city, Tanzania

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# FACTORS ASSOCIATED WITH HYPERTENSION AMONG EMPLOYEES IN ARUSHA CITY, TANZANIA

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**A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master's in Life Sciences of the Nelson Mandela African Institution of Science and Technology**

**Arusha, Tanzania**

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## ABSTRACT

Tanzania is one of developing countries with a higher prevalence of hypertension than many other developing countries. Healthcare workers, teachers and bankers are occupation groups exposed to hypertension due to the nature of their work. There is currently limited published data on the burden of hypertension among this group in Tanzania. A descriptive cross-sectional study was therefore conducted and collection of the data was done from August 2019 to February 2020 to identify the predicting factors for hypertension among teachers, bankers and healthcare workers in Arusha city council. A total of 305 working adults aged 18–60 years were involved in the study. A modified World Health Organization (WHO) STEPwise approach to chronic disease risk factor surveillance questionnaire collected information about socio-demographic characteristics, lifestyle behaviors, dietary practices, physical activity level, anthropometric measurements and biochemical measurements. The data collected were calculated and ranked by using WHO guidelines. The overall hypertension prevalence among working adults was 23.8%. Age (Adjusted Odds Ratio [AOR=34.98, 95% CI: 1.30-94.03]), alcohol consumption (AOR=6.55, 95% CI: 1.22-35.28), low salary (AOR=6.44, 95% CI: 1.12-37.18) and high Low-Density Lipoprotein cholesterol (LDL-C) (AOR=5.93, 95% CI: 1.24-28.45), were significantly associated with hypertension. These findings can be used by local policymakers, education, financial and health sectors as baseline information when planning strategies for management and prevention of hypertension and other Non-Communicable Diseases (NCDs) at workplace, by designing workplace wellness programs to mitigate the associated factors.

## DECLARATION

I, Dalahile Zubery do hereby declare to the Senate of Nelson Mandela African Institution of Science and Technology that this dissertation is my original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

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## CERTIFICATION

The undersigned certify that they have read the dissertation titled "*Factors Associated with Hypertension among Employees in Arusha City, Tanzania*" and recommend for examination in fulfilment of the requirements for the degree of Master's in Life Sciences of the Nelson Mandela African Institution of Science and Technology.

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## DEDICATION

This work is dedicated to my parents.

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## LIST OF ABBREVIATION AND SYMBOLS

| | |
|---|---|
| AOR | Adjusted Odds Ratio |
| BMI | Body Mass Index |
| BP | Blood Pressure |
| CI | Confidence Interval |
| COR | Crude Odds Ratio |
| CVDs | Cardiovascular diseases |
| DBP | Diastolic Blood Pressure |
| HDL-C | High-Density Lipoprotein Cholesterol |
| JNC VII | Seventh Report of the Joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure. |
| KNCHREC | Northern Tanzania Health Research Ethics Committee |
| LDL-C | Low-Density Lipoprotein cholesterol |
| MET | Metabolic Equivalent |
| MmHg | Millimeters of Mercury |
| Mmol/L | Millimole per Liter |
| NCDs | Non-Communicable Diseases |
| OR | Odds Ratio |
| RBG | Random Blood Glucose |
| RPM | Revolutions per Minute |
| S.D | Standard Deviation |
| SBP | Systolic Blood Pressure |
| SPSS | Statistical Programme for Social Science |
| TG | Triglycerides |
| TC | Total Cholesterol |
| WC | Waist Circumference |
| WHO | World Health Organization |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Problem

Cardiovascular diseases (CVDs) are the leading cause of death among all non-communicable diseases (NCDs), causing about 44% of all NCDs deaths and 31% of all global deaths (World Health Organization [WHO], 2018). Hypertension is the major risk factor for CVDs, like heart attack, stroke and heart failure (Mozaffarian *et al.,* 2014; Ogah *et al.,* 2012). Globally, 22% of adults have hypertension (WHO, 2018). There is an increase in the number of hypertensive adults from 594 million in 1975 to 1.13 billion in 2015 (Zhou *et al.,* 2017). The highest hypertension prevalence (27%) has been reported in the African region and the lowest prevalence (18%) is found in America (WHO, 2018). In a review of hypertension prevalence in developing countries, it was reported a higher hypertension prevalence in Tanzania than in many other developing countries (Ibrahim & Damasceno, 2012).

Hypertension prevalence in Tanzania has risen from 2% to 10% in 1960s to 13% to 79% in 2016 for rural and urban populations (Isungula & Meda, 2017). The higher hypertension prevalence in Tanzania is attributed to tobacco smoking, excessive use of alcohol, unhealthy eating habits and physical inactivity (Mayige *et al.,* 2011). A sedentary lifestyle is one of predicting factors for hypertension (Henson *et al.,* 2013) ascribed by rapid unplanned urbanization, which influences the adaptation of sedentary occupations (Brownson *et al.,* 2005). Occupation is the predicting factor for hypertension due to its association with socio-economic status and lifestyle factors such as physical inactivity and sedentary lifestyle (Allman Farinelli *et al.,* 2010; Henson *et al.,* 2013).

Healthcare workers, teachers and bankers are occupation groups identified to be exposed to the risk of hypertension (Mohmmedirfan *et al.,* 2011; Shivaramakrishna *et al.,* 2010; Sovova *et al.,* 2014). The nature of their work makes them spend long hours at work doing sedentary activities also the socio-economic status can influence the adaptation of less physical activities. Determining the factors that may predict hypertension among employees in this study was important due to the following reasons: Firstly, protection of available workforce productivity from chronic illnesses; secondly, healthcare workers play a great role in taking care of patients and promoting a healthy lifestyle for patients; thirdly, teachers are role models to students and

may influence the adaption of healthy lifestyle by students and their parents; and lastly, bankers have a great role in building and maintaining the financial sector in the country.

Despite that, there is limited documentation on the predictors of hypertension among adults in Tanzania, and Arusha specifically. Therefore, the current study aimed to identify the factors associated with hypertension among healthcare workers, teachers and bankers in Arusha City Council for designing workplace intervention for management and prevention of hypertension and other NCDs at workplace.

## 1.2 Statement of the Problem

While the prevalence of hypertension in adults among developed countries has declined in the last few decades, it has been stable or increasing in many developing countries (WHO, 2018). Although there is limited published data on the predictors of hypertension among working adults in Tanzania, the 2012 WHO Stepwise survey reported that 26% of the adult population is hypertensive, with 68% of the population never screened for blood pressure (WHO, 2012). In Tanzania, the prevention and management of NCDs at workplace through workplace programs for physical activity and healthy eating habit is still a challenge.

Workplace health programs have been identified by WHO as the most cost-effective ways for management and prevention of hypertension in countries where the provisions of health care for chronic diseases are still limited (Bosu, 2016; WHO, 2010). To implement workplace health programs, World Health Organization (WHO) recommended identifying the factors associated with hypertension as an important step in providing baseline information in planning for prevention and management of hypertension and other NCDs (WHO, 2013).

Since there is limited information to inform policymakers on the predicting factor for hypertension among working adults, the study aimed to identify the predicting factor for hypertension among healthcare workers, teachers and bankers to generate baseline information in designing workplace intervention for the prevention and management of hypertension and other NCDs at workplace.

## 1.3 Rationale of the Study

The higher prevalence of hypertension have been reported in Tanzania than in many other developing countries. Despite that, there is limited information on the burden of hypertension

among working adults. Therefore this study aimed to determine the factors associated with hypertension among healthcare workers, teachers and bankers. This will enable the identification of predictors of hypertension among working adults and help to design workplace intervention for the prevention and management of hypertension at workplace.

## 1.4 Objectives

### 1.4.1 Main Objective

To determine the factors associated with hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council.

### 1.4.2 Specific Objectives

(i) To determine the prevalence of hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council.

(ii) To assess the behavioral factors associated with hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council.

(iii) To determine the biochemical factors associated with hypertension such as blood glucose and serum lipid profile among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council.

## 1.5 Research Questions

(i) What is the prevalence of hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council?

(ii) What are the behavioral factors for hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council?

(iii) What are biochemical factors associated with hypertension among healthcare workers, teachers and bankers aged 18-60 years old in Arusha City Council?

## 1.6 Significance of the Study

The findings from the current study fill the knowledge gap on the factors associated with hypertension among working adults in Arusha and generate baseline information about the

factors associated with hypertension among healthcare workers, teachers and bankers. It informs the policy makers to develop workplace intervention strategies to mitigate the risk factors for hypertension and related NCDs but also indirect community intervention through patients, students and customers.

## 1.7 Delineation of the Study

The current study was descriptive cross-sectional which is limited on exploring the causal relationship between the risk factors and hypertension since data were collected at once. Furthermore, the study participants were working professionals from urban residents hence, generalizing the result to all working adults is not appropriate especially for those who are working in rural areas. In addition, majority of the study respondents were female in comparison with other studies due to a large proportion of females than males in the study population. Another limitation encountered was on blood sample collection for biochemical assay tests. Random blood samples were collected among study respondents. This may cause misclassification of the biochemical assay, especially on triglyceride levels as it remains high for several hours after a meal. Moreover, the best way to assess dietary intake of salt is by measuring the urinary electrolyte but in this study, the assessment was based on a questionnaire only. Also, the one month recall of foods consumed on assessment of dietary intake may be subjected to recall bias that may result to misreporting or over-reporting.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Hypertension or Raised Blood Pressure

Hypertension is a condition in which the blood vessels have persistently raised pressure (WHO, 2013). The measurement of blood pressure is done in millimeters of mercury (mmHg) and recorded as systolic blood pressure, the highest pressure in blood vessels when the heart beats and diastolic blood pressure, the lowest blood pressure in blood vessels between heartbeats (WHO, 2013). The normal blood pressure for adults is systolic blood pressure less than 120 mmHg and diastolic blood pressure less than 80 mmHg and raised blood pressure is categorized as systolic blood pressure equal to or above 140 mmHg and diastolic blood pressure equal to or above 90 mmHg. Normal blood pressure is required for the overall health and wellbeing of vital organs such as heart, kidneys and brain (Momin *et al.,* 2012; WHO, 2013). Hypertension is associated with cardiovascular disease, hardening of the arteries, kidney disease, stroke, and eye damage (WHO, 2009).

## 2.2 Prevalence of Hypertension

Globally, the hypertension prevalence among adults is 22%, whereby one in five women and one in four men had hypertension (WHO, 2018). In sub-Saharan Africa, the overall prevalence of hypertension ranges from 30.0% to 31.1% among adults indicating a major health threat to the community (Ataklte *et al.,* 2014; Nduka *et al.,* 2015). The hypertension prevalence varies from country to country as follows; Kenya (24.5%), Namibia (46.0%), Ethiopia (35.2%), and Tanzania (25.9%) (Alwan, 2011; Craig *et al.,* 2018; Kagaruki & Mayige, 2016; Mohamed *et al.,* 2018). The variation in hypertension prevalence between countries may be caused by a difference in the level of urbanization, cultural habits, dietary practices and ethnicity (Ogah & Rayner, 2013). Despite, the increased hypertension prevalence in developing countries, including Tanzania, there is limited documentation about the hypertension prevalence among working adults.

## 2.3 Occupation and Hypertension

Occupation is another factor associated with hypertension (Allman Farinelli *et al.,* 2010; Henson *et al.,* 2013). Healthcare workers, teachers and bankers are recognized as a high-risk

group exposed to hypertension and other cardiovascular diseases (Awosan *et al.*, 2017; Mohmmedirfan *et al.*, 2011; Shivaramakrishna *et al.*, 2010; Sovova *et al.*, 2014). This is caused by sedentary nature of their work that makes them less physically active (Ogungbenle *et al.*, 2017). Besides, urbanization has fueled changes in lifestyle, whereby people have reduced physical activity and changes in dietary habits (Contento, 2010). Although different studies have shown that, healthcare workers (Osei-Yeboah *et al.*, 2018; Sovova *et al.*, 2014), teachers (Fikadu & Lemma, 2016; Wijayathunge & Hettiaratchi, 2017), and bankers (Ismail *et al.*, 2013; Kumar & Sundaram, 2014; Manjula *et al.*, 2016) are high-risk group exposed to hypertension, this occupation group is neglected during research studies in Tanzania.

## 2.4 Factors Associated with Hypertension

### 2.4.1 Non-modifiable Risk Factors for Hypertension

Non-modifiable risk factors associated with hypertension include sex, family history, age and genetics (Ibekwe, 2015). Increased age is associated with hypertension for both females and males. Studies have shown that, as the age of the person increases, the chance for increased blood pressure becomes high (Craig *et al.*, 2018; Kunutsor & Powles, 2009; Mohamed *et al.*, 2018). Other studies done in Africa including individuals aged 15 years and above had similar findings (Dzudie *et al.*, 2012; Walker *et al.*, 2000).

High risk of hypertension is mostly found in males compared to females (Asfaw *et al.*, 2018; Ekwunife *et al.*, 2010; Ibrahim *et al.*, 2008) but after menopause, the risk of hypertension in term of age become the same. World Health Organization (WHO) Stepwise survey conducted in African countries between 2003-2009 has found a high hypertension prevalence in males than females in the majority of the countries although in some countries the findings were vice-versa (Van de Vijver *et al.*, 2014). The association between genetics and hypertension depends on the family history of hypertension. He *et al*. (2011) studied genes relating to hypertension and found 20 different genes which affected sodium handling in the kidney hence affecting the blood pressure of the affected individual.

### 2.4.2 Modifiable Risk Factors for Hypertension

The behavioral factors associated with hypertension include unhealthy eating habits, overweight and obesity, physical inactivity, excessive use of alcohol and tobacco smoking which result in metabolic syndrome such as hyperlipidemia, diabetes and hypertension (WHO,

2013). Unhealthy eating is associated with too much consumption of trans-fats and saturated fat, high dietary intake of salt and low consumption of vegetables and fruits (WHO, 2012). The association between unhealthy eating habit and hypertension have been observed in different studies (Njelekela *et al.,* 2003; Nurwanti *et al.,* 2018; Onyango *et al.,* 2017; Popkin, 2006).

Overweight and obesity are other factors associated with hypertension in the population. Excess body weight increases the demand for nutrients and oxygen to the tissues, the increase in blood volume that flow through blood vessels increase the pressure on the arteries which can result in hypertension (Bouchi *et al.,* 2016). For adults aged 18 years and above the estimate shows that among three adults one of them is overweight and more than one in ten are obese, whereby women have excess body weight compared to men (WHO, 2016).

Physical inactivity is the contributing factor for hypertension. The WHO has reported that 28% of adults have inadequate physical activity according to the recommendation while men are active by 32% compared to females 23% (WHO, 2018). Findings show that physical inactivity contributes to the high risk of hypertension and other heart diseases due to increased heart rate that hardens the contraction of the heart and increases pressure to the arteries also, physical inactivity is associated with excessive weight gain (Hayes *et al.,* 2002; Huai *et al.,* 2013; Ketkar *et al.,* 2015, Werneck *et al.,* 2018).

Another factor associated with hypertension is excessive alcohol consumption which results in disabilities and premature deaths among different populations in the world (WHO, 2008). Excessive alcohol users are more exposed to hypertension compared to non-alcohol users (Kotwani *et al.,* 2013; Mohamed *et al.,* 2018; Wamala *et al.,* 2009; Williams *et al.,* 2013). There is more than one mechanism that links excessive alcohol consumption and hypertension such as baroreceptors sensitivity, the effect on the level of calcium and cortisol. For example, baroreceptors help the body to regulate blood pressure but excessive use of alcohol prevents the detection of the body's baroreceptors to detect the need of stretching the blood vessels to increase the diameter of the blood vessels resulting in raised blood pressure (Husain *et al.,* 2014). The use of tobacco which includes smoking and smokeless tobacco is also associated with onset of hypertension caused by the release of tobacco chemicals that damage the arteries walls and cause narrowing of the arteries which end up with raised blood pressure (Burns, 2003; Stein *et al.,* 2008).

### 2.4.3 The Biochemical Factors Associated with Hypertension

Diabetes and hyperlipidemia are metabolic syndromes associated with hypertension. Diabetes is characterized by the failure of the pancreas to produce insulin hormone or the pancreas having a reduced ability to produce insulin in the body (Association, 2005). Diabetes and hypertension may influence each other. This is because insulin resistance cause sugar builds up in the blood that increases the volume of the blood and raises the blood pressure. Also, diabetes can damage the small blood vessels resulting in stiffening of blood vessels which results to hypertension (Kabakov *et al.,* 2006). The association between diabetes and hypertension have been reported in different studies (Lloydm Sherlock *et al.,* 2014; Mayige *et al.,* 2011; Mosha *et al.,* 2017).

The raised lipid profile is associated with the formation of atherosclerosis that hardens and narrows the arteries and increases the chance of developing hypertension (Arora *et al.,* 2007; Chamba *et al.,* 2017). Raised lipid profile has been reported in several general population studies in Africa (Vorster, 2002). However, raised lipid profile is increasing in developing countries like Tanzania. A study done by Kagaruki and Mayige (2016) for example, has reported elevated serum Total Cholesterol prevalence of 4.4% and 25.8% prevalence of elevated Triglycerides (TG) among adults in Tanzania. Determining the raised blood glucose and abnormal lipid profile levels among working adults fills the knowledge gap on the relationship between lipid profile and hypertension among working adults.

# CHAPTER THREE

# MATERIALS AND METHODS

## 3.1 Study Design

The study was a descriptive cross-sectional that measure the outcome (hypertension) and exposure at one point in time.

## 3.2 Study Area

The study was conducted in Arusha City Council, Arusha Region. It is a third urbanized region in Tanzania due to an urban population of 31.3% than the national average of urban population 23.1% (Worrall *et al.*, 2017). Arusha City is found near the foot of Mount Meru. As per the National Census of 2012, the city has a total population of 416 442 of which 160 091 are employees (The United Republic of Tanzania [URT], 2016). By comparing with other districts in the region, Arusha city has a high number of employees. The Southern part of the region is bordered by Singinda and Manyara regions, the Northern part is bordered by Kenya, the Eastern part is bordered by Kilimanjaro region and the Western part is Simiyu region. The region is a global tourist destination having national parks such as Lake Manyara National Park, Arusha National park and Ngorongoro Conservation Area (URT, 2015).

## 3.3 Study Population

The study involved healthcare workers, primary and secondary teachers and bankers aged between 18-60 years working in the Arusha City Council. The study included both males and females from government and non-government institutions excluding part-time workers and pregnant women.

## 3.4 Sample Size Determination

The sample size was estimated by using the Fischer formula (Fischer *et al,* 1991).

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

Where; n = sample size, p = the prevalence of hypertension, d is precision of estimate =5%, Z = standard value of 95% CI =1.96 and q= 1-p.

The minimal sample size estimated was 380 participants; the Prevalence of hypertension was 45%, from a study conducted at Arusha City council by Katalambula *et al.* (2017).

### 3.5 Sampling Procedure

A multistage sampling technique was used in this study. At the first stage, clusters were formed purposively for Healthcare institutions, Educational institutions (primary and secondary schools) and Financial Institutions (Banks). In the second stage, out of 25 wards, 3 wards (Levolosi, Sekei, and Themi) were selected purposively due to an adequate representative number of health centers, schools and banks. In the third stage, randomly selection of health centers, schools and banks from 3 wards were as follows: out of 21 health centers 8 were selected, for schools out of 22 schools 10 were selected and for banks, out of 18 banks 8 were selected by using ballot method and lastly, a representative sample was obtained by using probability proportional to the size and the sample from healthcare workers was 51, teachers 176 and bankers 153. From each site, the eligible number of participants from health center was at least 8 healthcare workers, for schools and banks at least 13 participants from each and at this stage the participation was voluntary.

### 3.6 Data Collection Tools

Participant enrollment and collection of data was done from August 2019 to February 2020. The pre-tested modified WHO STEP-wise survey questionnaire including the Global Physical Activity Questionnaire translated from English to Swahili for easy administration collected data on behavioral factors, which included socio-demographic data, as well as information on alcohol consumption, tobacco use, dietary intake, anthropometric measurement, biochemical measurement, physical activity level and history of chronic diseases (Appendix 1). The dietary habit of the study participants was collected by using the Food Frequency Questionnaire (Appendix 2) which was validated by Jordan *et al.* (2013).

### 3.7 Data Collection Methods

#### 3.7.1 Determination of Prevalence of Hypertension

Blood pressure was measured by using a digital sphygmomanometer (CITIZEN®) in a seated position. Three measurements were done in the right upper arm after 5 minutes rest interval and the average of it was used in data analysis. The classification of blood pressure based on

the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) as follows: Normotensives were classified as systolic blood pressure (SBP) < 120 mmHg and diastolic blood pressure (DBP) < 80 mmHg, prehypertension (SBP 120–129 mmHg or DBP 80–89 mmHg), hypertension stage 1 (SBP 140–159 mmHg or DBP 90–99 mmHg), and hypertension stage 2 (SBP ≥ 160 mmHg or DBP ≥ 100 mmHg) (Chobanian *et al.,* 2003). The prevalence of hypertension was determined using the WHO formula (WHO, 2006).

### 3.7.2 Assessment of Behavioral Factors for Hypertension

#### (i) Assessment of Tobacco Use and Alcohol Consumption

The use of tobacco was assessed by previous and current smoking status, the duration of smoking, daily frequency of tobacco use, exposure to second-hand smoking and the use of smokeless tobacco. The assessment of alcohol consumption was done by recalling if the study participant was a lifetime abstainer, 12-month abstainer and past 30-day drinker. Also, the frequency of alcohol use, type of alcohol consumed frequently and consumption of alcohol with food was documented.

#### (ii) Assessment of Dietary Intake

The assessment of dietary intake included the number of days on the consumption of fruit and vegetable in a week, the serving portion, type of meals eaten at work per week, type of fat and oils used frequently in meal preparation at home. Salt consumption assessment was done by asking the study respondents about the frequency of salt used during food preparation at home, the use of table salt, perception of the amount of salt consumed and its association with health problems, also the health benefit of minimizing salt intake and the strategies undertaken to control salt consumption. The Food Frequency Questionnaire (Appendix 2) was used to assess the frequency of consumption of food groups in a month to determine the dietary practices of the participants.

#### (iii) Anthropometric Measurements

Anthropometric measurements were taken by a qualified healthcare provider. A portable SHORR$^{TM}$ stadiometer (Shorr Productions, Olney, MA, USA), was used to measure the height of the study participants. The respondents removed shoes and stand still with their back against

the wall and heels put together in a V-shape while looking forward and the measurement was taken nearest to 0.5 cm. SECA$^{TM}$ digital weighing scale (Seca GmbH, Hamburg, and Germany) was used to measure body weight. The participants were asked to remove their footwear and heavy accessories and measurement were taken nearest 0.1 kg. Then, the Body Mass Index (BMI) was calculated using the WHO formula (kg/m$^2$) and the results were ranked as follows: ≤ 18.4 kg/m2 as underweight, 18.5-24.9 kg/m2 as normal weight, 25.0-29.9 kg/m2 as overweight, and ≥ 30 kg/m2 as obese (WHO, 2016). Waist circumference was measured midway between the last rib bone and iliac bone by using a measuring tape and the measurement was taken nearest to 0.5 cm. The results were ranked as follows: >80 cm for females and >94 cm for males had increased risk of metabolic complication and >88 cm for females and >102 cm for males had substantially increased risk of metabolic complication. The measurements lined with the standard method of anthropometric measurement (WHO, 2005, 2014).

**(iv) Assessment of Physical Activity Level and stress**

The physical activity level was assessed by using the Global Physical Activity Questionnaire by considering the intensity, frequency and duration of physical activity in different areas specifically during transport, at work and in recreational areas. The collected data included the number of days in a week, time spent doing physical activity in hours and minutes during transport, at work and recreational area for at least 10 minutes or more continuously in a day (Armstrong & Bull, 2006). To determine the Metabolic Equivalent (MET) which measure the energy expenditure of physical activity, the intensity, frequency and duration of physical activities performed in a week were used and physical activity level was classified by following a standard classification as high physical activity level, moderate physical activity level and low physical activity level (Armstrong & Bull, 2006) and sedentary work was classified as a job that needs a person to sit for 6 hours out of 8 hours at work. For stress, the participants were asked about feeling stressed at work, perception of the salary, working for long hours, unrealistic time pressure and respect at work.

### 3.7.3 The Biochemical Factors Associated with Hypertension

**(i) Determination of Blood Glucose and Lipid Profile**

A standardized Glucometer machine (GlucoPlusTM Inc. Quebec, Canada) was used to measure Random Blood Glucose (RBG) by using the capillary finger-prick method. Diabetes was

determined by having random plasma glucose of ≥ 11.1 mmol/L or the use of diabetic drugs. A random sub-sample of half of the participants was selected for additional measurement of serum lipid profile. The size of this sub-sample (153 participants) was determined based on the availability of resources. A qualified healthcare provider collected blood samples from participants. The Vacutainer needle collected blood from the median basilic vein of the participant and stored in a red top Vacutainer® blood collection tube and left to clot for 45 minutes. Then, centrifugation was done at a spin rate of 1100-1300 rpm for 10 minutes. Afterwards, serum was pipetted from the clotted blood and stored in a 2 ml Eppendorf tube. All serum samples were frozen at -20 °C until analysis. Serum lipid profiles included; Total cholesterol (TC), Triglyceride (TG), High-Density Lipoprotein Cholesterol (HDL-C) and Low-Density Lipoprotein Cholesterol (LDL-C). All biochemistry assays were carried out at Mount Meru Regional Hospital laboratory using fully automated Chemistry auto analyzer XL-180 (Vital Scientific, B.V. Kanaalweg 24, and Netherlands). The identification of serum lipid profile was ranked according to the WHO cut-off point (WHO, 2005).

### 3.8 Statistical Analysis

The collected data were entered in Microsoft Excel™ (2016) and exported to Statistical Package for Social Science Version 20.0 software (SPSS Inc., Chicago, IL, USA) for analysis. Descriptive statistics analyzed social-demographic characteristics and frequency and percentage were used to analyze categorical data. For continuous data mean and standard deviation were used. On the assessment of the difference between groups, a chi-squared test was used for categorical variables and a t-test for continuous variables. To test the normality assumption of variable distribution the Kolmogorov–Smirnov test was used. Binary logistic regression analysis was done to determine the factors that were associated with hypertension. The independent variables were social demographic characteristics, behavioral risk factors which included; dietary habits, dietary salt intake, Body Mass Index, stress, physical activity level, alcohol consumption and tobacco smoking while the dependent variable was hypertension. To test the goodness fit of the model Hosmer-Lemeshow statistic was used and the results reported in odds ratios (OR) at 95% confidence intervals and $p < 0.05$ was statistically significant.

### 3.9 Ethical Considerations

The study was conducted according to the Declaration of Helsinki. Ethical clearance certificate number KNCHREC 0014 was obtained from Northern Tanzania Health Research Ethics Committee (KNCHREC). Written permission to conduct research was also sought from Arusha City Council and administrators of the selected banks, schools and health facilities. Respondents signed written informed consent after being briefed about the study. To ensure confidentiality data collection was done individually in a special prepared room in their working area and codes known only by researchers were used instead of names in identifying participants to maintain anonymity.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1 Results

### 4.1.1 Socio-demographic Characteristics of the Study Participants

A total of 305 study participants were included in this study. However, 19 were excluded from statistical analysis due to the incompleteness of data. The final sample size was 286 respondents from three occupations: healthcare workers (61; 21.3%), teachers (131; 45.8%), and bankers (94; 32.9%). The majority of the respondents (204; 71.3%) were female. Nearly half of the respondents (121; 42.3%) were aged 30–39 years; 141 (49.3%) of the study participants had attended college education and (182; 63.6%) were married or cohabiting. Nearly half 122 (42.7%) of the study respondents worked for more than seven years in the current institution and in term of estimated monthly income per month, 22 (7.7%) were earning less than 250 000 (Table 1).

**Table 1: Socio-demographic characteristics of respondents stratified by blood pressure status**

| Variable | Total n (%) | Normotension n (%) | Pre-hypertension n (%) | Hypertension n (%) | P-value |
|---|---|---|---|---|---|
| Profession | | | | | |
| Healthcare workers | 61 (21.3) | 33 (54.1) | 17 (27.9) | 11 (18.0) | 0.082 |
| Teachers | 131 (45.8) | 69 (52.7) | 37 (28.2) | 25 (19.1) | |
| Bankers | 94 (32.9) | 42 (44.7) | 20 (21.3) | 32 (34.0) | |
| Age | | | | | |
| 18-29 Years | 75 (26.2) | 44 (58.7) | 17 (22.7) | 14 (18.7) | 0.029 |
| 30-39 Years | 121(42.3) | 65 (53.7) | 34 (28.1) | 22 (18.2) | |
| 40-49 Years | 49 (17.1) | 19 (38.8) | 15 (30.6) | 15 (30.66) | |
| 50-60 Years | 41 (14.3) | 16 (39.0) | 8 (19.5) | 17 (41.5) | |
| Gender | | | | | |
| Male | 82 (28.7) | 37 (45.1) | 23 (28.0) | 22 (26.8) | 0.526 |
| Female | 204 (71.3) | 107 (52.5) | 51 (25.0) | 46 (22.5) | |
| Education level | | | | | |
| College | 141 (49.3) | 76 (53.9) | 37 (26.2) | 28 (19.9) | 0.637 |
| University graduate | 122 (42.7) | 57 (46.7) | 31 (25.4) | 34 (27.9) | |
| degree | 23 (8.0) | 11 (47.8) | 6 (26.1) | 6 (26.1) | |
| Postgraduate degree | | | | | |
| Marital status | | | | | |
| Single | 104 (33.2) | 57 (60.0) | 20 (21.1) | 18 (18.9) | 0.028 |
| Married/Cohabitating | 18 2(63.6) | 84 (46.2) | 51 (28.0) | 47 (25.8) | |
| Years with the current institution | | | | | |
| Less than a year | 24 (8.4) | 13 (54.2) | 4 (16.7) | 7 (29.2) | 0.194 |
| 1-3 years | 58 (20.3) | 36 (62.1) | 14 (24.1) | 8 (13.8) | |
| 4-6 years | 82 (28.7) | 42 (51.2) | 18 (22.0) | 22 (26.8) | |
| 7 years and above | 122 (42.7) | 53 (43.4) | 38 (31.1) | 31 (25.4) | |
| The estimated income per month | | | | | |
| Less than 250 000 | 22 (7.7) | 12 (54.5) | 4 (18.2) | 6 (27.3) | 0.299 |
| 250 000-500 000 | 79 (27.6) | 47 (59.5) | 18 (22.8) | 14 (17.7) | |
| 500 000-750 000 | 83 (29.0) | 41 (49.4) | 25 (30.1) | 17 (20.5) | |
| 750 000-1 000 000 | 64 (22.4) | 26 (40.6) | 20 (31.3) | 18 (28.1) | |
| More than 1 000 000 | 38 (3.3) | 18 (47.4) | 7 (18.4) | 13 (34.2) | |

## 4.2 Prevalence of Hypertension

The overall mean (±SD) Systolic Blood Pressure (SBP) of the study participants was 124.4±19.2 mmHg and Diastolic Blood Pressure (DBP) was 79.0±12.8 mmHg (Table 4). About half (144; 50.3%) of the study participants had normal blood pressure, 24 (8.4%) had

hypertension stage 1 and 14 (4.8%) had hypertension stage 2 (Table 2). For those who had hypertension, 42 (61.8%) were aware of their condition and 25 (59.5%) were using antihypertensive medication. Furthermore, 14 (28.6%) of hypertensive working adults had a family history of hypertension.

**Table 2: Prevalence of hypertension**

| Variable | N | Percent (%) |
|---|---|---|
| Normal (SBP < 120 and DBP < 80) | 144 | 50.3 |
| Pre-hypertension (SBP 120–139 or DBP 80–89) | 74 | 25.9 |
| Hypertension | | |
| Isolated Systolic hypertension (SBP ≤ 140 mmHg and DBP ≥ 90 mmHg) | 18 | 6.3 |
| Isolated Diastolic hypertension (SBP ≥ 140 mmHg and DBP < 90 mmHg) | 12 | 4.2 |
| Stage 1 hypertension (SBP 140–159 or DBP 90–99) | 24 | 8.4 |
| Stage 2 hypertension (SBP ≥ 160 or DBP ≥ 100) | 14 | 4.9 |

### 4.3 Behavioral Risk Factors for Hypertension

#### 4.3.1 Tobacco Use, Alcohol Consumption and Dietary Practices

None of the respondents was using tobacco. The overall prevalence of alcohol consumption was 61 (21.3%). More than half of the study participants 180 (62.9%) add table salt during eating. Furthermore, those consuming adequate fruits and vegetables per week were 123 (43.0%) and 144 (50.3%) respectively (Table 3).

#### 4.3.2 Physical Activities, Stress Level and Anthropometric Measurement

The majority of the study participants 236 (82.5%) were sedentary workers and a low level of physical activity was prevalent in the study population to about 127 (44.4%). About 115 (40.2%) of the respondents were feeling stressed at work and on the perception of salary meet the daily basic need, majority of them 234 (81.8%) reported that the salary does not meet the daily basic need (Table 3). The overall mean BMI (BMI ± SD) was 28.4 ±5.9 kg/m$^2$, and normotension and hypertension participants were 28.7 ± 5 .8 kg/m$^2$ and 31.6±5.5 kg/m$^2$ respectively. About 89 (31.1%) of the study respondents were overweight and 108 (37.8%) were obese (Fig. 1). The overall mean waist circumference of the study participant was 92.0±12.9 cm and 195 (68.2%) of the participants had abdominal obesity (Table 4).

**Table 3: Lifestyle factors of respondents stratified by blood pressure status**

| Variable | Total n (%) | Normotension n (%) | Pre-hypertension n (%) | Hypertension n (%) | P-value |
|---|---|---|---|---|---|
| Alcohol consumption | | | | | |
| Lifetime abstainers | 165 (57.7) | 82 (49.7) | 51 (30.9) | 32 (19.4) | 0.009 |
| Past drinkers | 60 (21.0) | 36 (60.0) | 12 (20.0) | 12 (20.0) | |
| Current drinkers | 61 (21.3) | 26 (42.6) | 11 (18.0) | 24 (39.3) | |
| Exposure to second-hand smoke | | | | | |
| No | 210 (73.4) | 105 (50.0) | 58 (27.6) | 47 (22.4) | 0.450 |
| Yes | 76 (26.6) | 39 (51.3) | 16 (21.1) | 21 (27.6) | |
| Type of oil or fat used at home | | | | | |
| Sunflower oil | 204 (71.3) | 100 (49.0) | 56 (27.5) | 48 (23.5) | 0.729 |
| Palm oil | 60 (21.0) | 31 (51.7) | 15 (46.7) | 14 (23.3) | |
| No specific cooking oil | 22 (7.7) | 13 (59.1) | 3 (13.6) | 6 (27.3) | |
| Kind of meals eaten at work | | | | | |
| Breakfast | 27 (9.4) | 13 (48.1) | 7 (25.9) | 7 (25.9) | 0.896 |
| Lunch | 114 (39.9) | 56 (49.1) | 31 (27.2) | 27 (23.7) | |
| Breakfast and lunch | 132 (46.2) | 69 (52.3) | 34 (25.8) | 29 (22.0) | |
| Breakfast, lunch and dinner | 13 (4.5) | 6 (46.2) | 2 (15.4) | 5 (38.5) | |
| Use of table salt | | | | | |
| Yes | 180 (62.9) | 98 (54.4) | 41 (22.8) | 41 (22.8) | 0.164 |
| No | 106 (37.1) | 46 (43.4) | 33 (31.1) | 27 (25.5) | |
| Consumption of fruits | | | | | |
| ≥ 5 days in a week | 123 (43.0) | 57 (46.3) | 31 (25.2) | 35 (28.5) | 0.258 |
| < 5 days in a week | 163 (57.0) | 87 (53.4) | 43 (26.4) | 33 (20.2) | |
| Consumption of vegetables | | | | | |
| ≥ 5 days in a week | 144 (50.3) | 75 (52.1) | 33 (22.9) | 36 (25.0) | 0.513 |
| < 5 days in a week | 142 (49.7) | 69 (48.6) | 41 (28.9) | 32 (22.5) | |
| Mode of transport to and from work | | | | | |
| Walking | 56 (19.6) | 33 (58.9) | 12 (21.4) | 11 (19.6) | 0.382 |
| Car and walking | 12 (4.2) | 4 (33.3) | 6 (50.0) | 2 (16.7) | |
| Car and motorcycle | 32 (11.2) | 15 (46.9) | 7 (21.9) | 10 (31.3) | |
| Car | 186 (65.0) | 92 (49.5) | 49 (26.3) | 45 (24.2) | |

| Variable | Total n (%) | Normotension n (%) | Pre-hypertension n (%) | Hypertension n (%) | P-value |
|---|---|---|---|---|---|
| Sedentary work | | | | | |
| Yes | 236 (82.5) | 118 (50.0) | 60 (25.4) | 58 (24.6) | 0.778 |
| No | 50 (17.5) | 26 (52.0) | 14 (28.0) | 10 (20.0) | |
| Level of physical activity | | | | | |
| High physical activity | 34 (11.9) | 19 (55.9) | 10 (29.4) | 5 (14.7) | 0.756 |
| Moderate physical activity | 125 (43.7) | 61 (48.8) | 33 (26.4) | 31 (24.8) | |
| Low physical activity | 127 (44.4) | 64 (50.4) | 31 (24.4) | 32 (25.2) | |
| Stress at work | | | | | |
| Yes | 115 (40.2) | 64 (55.7) | 23 (20.0) | 28 (24.3) | 0.160 |
| No | 171 (59.8) | 80 (46.8) | 51 (29.8) | 40 (23.4) | |
| Working for long hours | | | | | |
| Yes | 181 (63.3) | 91 (50.3) | 43 (23.8) | 47 (26.0) | 0.397 |
| No | 105 (36.7) | 53 (50.5) | 31 (29.5) | 21 (20.0) | |
| The salary meets the basic need | | | | | |
| Yes | 52 (18.2) | 23 (44.2) | 14 (26.9) | 15 (28.8) | 0.552 |
| No | 234 (81.8) | 121 (51.7) | 60 (25.6) | 53 (22.6) | |

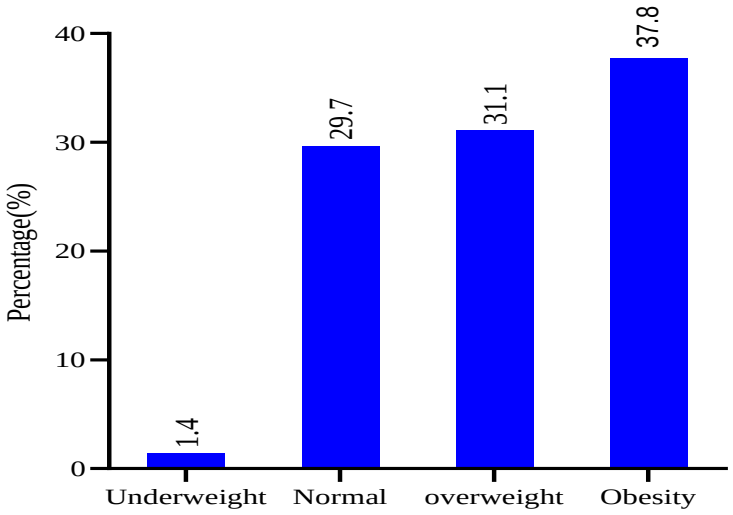


**Figure 1: The prevalence of underweight, normal weight, overweight and obesity among working adults**

### 4.3.3 Biochemical Factors Associated with Hypertension

The overall mean blood glucose level of the study respondents was 6.1±2.4 (mmol/L). There was a significant difference in the mean level of blood glucose among normotension 5.8±1.8 (mmol/L) and hypertension individuals 7.0±3.4 (mmol/L) (p=0.0001). About 13 (4.5%) of the respondent had raised blood glucose and 11 (84.6%) were using insulin or oral anti-hyperglycemic agent. Those who were aware that they are diabetic were also hypertensive. For serum lipid profile, the mean raised Total Cholesterol (TC) was 5.2±1.5 mmol/L, Triglyceride (TG) 1.8±1.7 mmol/L, raised Low-Density Lipoprotein cholesterol (LDL-C) 2.4±0.8 mmol/L and low High-Density Lipoprotein cholesterol (HDL-C) was 1.2±0.3 mmol/Significantly higher triglyceride (TG) levels were observed among hypertensive compared to normotensive individuals (Table 4).

**Table 4: Anthropometric measurement and biochemical factors stratified by blood pressure status**

| Variable | Total Mean±SD | Normotension Mean±SD | Hypertension Mean±SD | P-value |
|---|---|---|---|---|
| Height (cm) | 161.8±7.4 | 161.6±7.7 | 162.2±6.3 | 0.573 |
| Weight (kg) | 76.9±15.4 | 74.9±15 .3 | 82.9±2.3 | 0.343 |
| BMI | 28.4 ±5.9 | 28.7 ± 5 .8 | 31.6±5. 5 | 0.530 |
| WC (cm) | 29.4±5.8 | 91.6±11.7 | 101. 5±11. 4 | 0.467 |
| SBP (mmHg) | 124.4±19.2 | 116.4±11.6 | 146.7±19.2 | 0.024 |
| DBP (mmHg) | 79.0±12.8 | 73.9±8.9 | 92. 5±10.7 | 0.356 |
| Blood glucose (mmol/L ) | 6.1±2.4 | 5.8±1.8 | 7.0± 3. 4 | 0.0001 |
| Total cholesterol (mmol/L) | 5.2±1.5 | 5.8±1.8 | 5. 8±1.7 | 0.060 |
| Triglyceride (mmol/L) | 1.8±1.7 | 1.7±1.1 | 2.4±2.9 | 0.0001 |
| Low-Density Lipoprotein(LDL-C) | 2.4±0.8 | 2.2±0.8 | 2.7±0.9 | 0.593 |
| High-Density Lipoprotein(HDL-C) | 1.2±0.3 | 1.2±0 .3 | 1.3±0.4 | 0.538 |

### 4.4 Factors Associated with Hypertension

The results from univariate logistic regression analysis showed age, marital status, alcohol consumption, BMI, abdominal obesity, raised blood glucose, Total Cholesterol (TC) and Low-Density Lipoprotein cholesterol (LDL-C) were predicting factors for hypertension. However, when all the predicting factors were used in multivariable logistic regression analysis, only age, alcohol consumption, low salary and raised Low-Density Lipoprotein cholesterol (LDL-C) were predicting factors for hypertension. In the adjusted odds ratio, the odds of being hypertensive increase as age increases. The odds of working adults aged 30-39 years, 40-49 years and 50-60 years were (AOR=0.86, 95% CI: 0.06-12.57), (AOR=11.07, 95% CI:0.51-24.21) and (AOR=34.98, 95% CI: 1.30-94.03) respectively (Table 5). The results also showed that working adults who consumed alcohol had 6.55 increased odds of being hypertensive (AOR=6.55, 95% CI: 1.22-35.28) compared to non-alcohol users. The odds of study participants who responded that salary does not meet the daily basic needs was 6.44 higher than those who responded salary meets the daily basic need (AOR=6.44, 95% CI: 1.12-37.18 (Table 6). Furthermore, raised Low-Density Lipoprotein cholesterol (LDL-C) was a predicting factor for hypertension. The odds of being hypertensive was 5.93 higher (AOR=5.93, 95% CI: 1.24-28.45) compared to those having normal Low-Density Lipoprotein cholesterol (LDL-C) (Table 7).

**Table 5: Socio-demographic factors associated with hypertension**

| Variable | COR (95%CI) | P-value | AOR (95%CI) | P-value |
|---|---|---|---|---|
| Profession | | | | |
| Health workers | 1 | | 1 | |
| Teachers | 1.26 (0.49-3.25) | 0.633 | 1.31 (0.15-11.75) | 0.808 |
| Bankers | 2.07 (0.76-5.69) | 0.156 | 3.72 (0.26-53.32) | 0.334 |
| Age group | | | | |
| 18-29 | 1 | | 1 | |
| 30-39 | 1.30 (0.41-4.11) | 0.660 | 0.86 (0.06-12.57) | 0.912 |
| 40-49 | 5.92 (1.72-20.35) | 0.005 | 11.07 (0.51-24.21) | 0.126 |
| 50-60 | 8.27 (2.41-28.42) | 0.001 | 34.98 (1.30-94.03) | 0.034 |
| Gender | | | | |
| Male | 1 | | 1 | |
| Female | 0.91 (0.39-2.11) | 0.827 | 1.16 (0.13-10.40) | 0.894 |
| Education level | | | | |
| Postgraduate degree | 1 | | 1 | |
| University graduate | 4.51 (0.27-7.71) | 0.662 | 1.33 (0.07-25.117) | 0.851 |
| degree | 1.08 (0.21-5.60) | 0.930 | 0.85 (0.04-18.35) | 0.918 |
| College | | | | |
| Marital status | | | | |
| Single | 1 | | 1 | |
| Married/Cohabitating | 2.76 (1.17-6.54) | 0.021 | 0.95 (0.14-6.60) | 0.959 |
| Years with institution | | | | |
| Less than a year | 1 | | 1 | |
| 1-3 years | 0.28 (0.40-1.92) | 0.195 | 0.05 (0.002-1.38) | 0.076 |
| 4-6 years | 1.20 (0.29-5.07) | 0.800 | 0.25 (0.01-5.48) | 0.382 |
| 7 years and above | 1.63 (0.41-6.54) | 0.493 | 0.1 (0.004-2.47) | 0.161 |
| The estimated income per month | | | | |
| Less than 250 000 | 1 | | 1 | |
| 250 000-500 000 | 0.71 (0.12-4.12) | 0.703 | 0.31 (0.01-6.42) | 0.450 |
| 500 000-750 000 | 1.69 (0.32-8.96) | 0.539 | 4.39 (0.37-51.49) | 0.239 |
| 750 000-1 000 000 | 2.63 (0.50-13.92) | 0.257 | 3.53 (0.25-50.32) | 0.353 |
| More than 1 000 000 | 2.25 (0.35-14.61) | 0.396 | 2.24 (0.09-55.43) | 0.622 |

COR crude odds ratio

AOR adjusted odds ratio

CI confidence intervals

**Table 6: Lifestyle factors associated with hypertension**

| Variable | COR (95%CI) | P-value | AOR (95%CI) | P-value |
|---|---|---|---|---|
| Alcohol consumption | | | | |
| No | 1 | | 1 | |
| Yes | 2.59(1.17-5.73) | 0.019 | 6.55(1.22-35.28) | 0.029 |
| Exposure to second-hand smoke | 1 | 0.629 | 1 | |
| No | 1.21(0.56-2.64) | | 2.02(0.35-11.61) | 0.433 |
| Yes | | | | |
| Type of oil or fat used at home | | | | |
| Sunflower oil | 1 | | 1 | |
| Palm oil | 0.90 (0.36-2.23) | 0.820 | 2.67 (0.42-16.83) | 0.296 |
| No specific oil | 1.46 (0.41-5.25) | 0.559 | 1.36 (0.13-14.28) | 0.799 |
| Kind of meals eaten at work | | | | |
| Breakfast | 1 | | 1 | |
| Lunch | 1.14 (0.33-3.97) | 0.834 | 1.37 (0.19-10.20) | 0.757 |
| Breakfast and Lunch | 1.40 (0.41-4.83) | 0.594 | 1.55 (0.17-14.47) | 0.699 |
| Breakfast, Lunch and Dinner | 0.70 (0.06-7.85) | 0.772 | 11.85 (0.23-599.12) | 0.217 |
| The use of table salt | | | | |
| No | 1 | | 1 | |
| Yes | 1.95 (0.88-4.30) | 0.098 | 4.89 (0.87-27.42) | 0.071 |
| Consumption of fruits | | | | |
| ≥ 5 days per week | 1 | | 1 | |
| < 5 days per week | 0.57 (0.27-1.19) | 0.134 | 0.81 (0.20-3.38) | 0.776 |
| Consumption of vegetables | | | | |
| ≥ 5 days per week | 1 | | 1 | |
| < 5 days per week | 0.94 (0.45-1.94) | 0.860 | 0.81 (0.18-3.68) | 0.789 |
| Mode of transport to and from work | 1 | | 1 | |
| Walking | 0.60 (0.06-5.93) | 0.662 | 0.55 (0.01-34.82) | 0.776 |
| Car and walking | 1.50 (0.45-5.03) | 0.511 | 1.13 (0.10-12.61) | 0.924 |
| Car and motorcycle | 0.99 (0.39-2.50) | 0.976 | 0.30 (0.05-1.77) | 0.182 |
| Car | | | | |
| Sedentary work | | | | |
| No | 1 | | 1 | |
| Yes | 1.23 (0.49-3.14) | 0.661 | 0.76 (0.10-3.25) | 0.556 |
| Level of physical activity | | | | |
| High activity level | 1 | | 1 | |
| Moderate activity level | 1.69 (0.21-2.28) | 0.545 | 0.76 (0.09-6.79) | 0.804 |
| Low activity level | 0.93 (0.29-3.00) | 0.904 | 0.37 (0.04-3.21) | 0.364 |
| Stress at work | | | | |
| No | 1 | | 1 | |
| Yes | 0.85 (0.40-1.77) | 0.656 | 0.63 (0.15-2.66) | 0.524 |
| Working for long hours | | | | |
| No | 1 | | 1 | |
| Yes | 0.98 (0.47-2.08) | 0.964 | 0.79 (0.06-9.11) | 0.747 |
| The salary meets the basic need | | | | |
| Yes | 1 | | 1 | |
| No | 1.28 (0.51-3.21) | 0.603 | 6.44 (1.12-37.18) | 0.037 |
| Family history of hypertension | | | | |
| No | 1 | | 1 | |
| Yes | 1.07 (0.49-2.32) | 0.865 | 0.42 (0.12-1.52) | 0.186 |

COR crude odds ratio

AOR adjusted odds ratio

CI confidence intervals

**Table 7: Anthropometric and biochemical factors associated with hypertension**

| Variable | COR (95%CI) | P-value | AOR (95%CI) | P-value |
|---|---|---|---|---|
| Total cholesterol (TC) | | | | |
| Normal | 1 | | 1 | |
| Raised | 2.35 (1.10-5.03) | 0.028 | 2.92 (0.49-17.39) | 0.239 |
| Low-Density Lipoprotein(LDL-C) | | | | |
| Normal | 1 | | 1 | |
| Raised | 3.40 (1.56-7.40) | 0.002 | 5.93 (1.24-28.45) | 0.026 |
| High-Density Lipoprotein(HDL-C) | | | | |
| Normal | 1 | | 1 | |
| Low | 0.593 (0.28-1.25) | 0.168 | 0.45 (0.12-1.77) | 0.256 |
| Triglyceride (TG) | | | | |
| Normal | 1 | | 1 | |
| Raised | 1.56 (0.75-3.27) | 0.235 | 0.63 (0.11-3.60) | 0.604 |
| Blood glucose (mmol/L ) | | | | |
| Normal | 1 | | 1 | |
| Raised | 5.39 (1.23-23.74) | 0.026 | 3.63 (0.11-3.60) | 0.366 |
| Body Mass Index | | | | |
| Normal | 1 | | 1 | |
| Overweight | 3.25 (0.85-12.43) | 0.085 | 0.71 (0.06-9.11) | 0.792 |
| Obesity | 5.35 (1.47-19.44) | 0.011 | 2.64 (0.25-28.28) | 0.422 |
| Adnominal obesity | | | | |
| Normal | 1 | | 1 | |
| Abdominal obesity | 3.46 (1.14-10.52) | 0.029 | 2.19 (0.13-37.48) | 0.589 |

COR crude odds ratio

AOR adjusted odds ratio

CI confidence intervals

## 4.5 Discussion

The study aimed to identify the predicting factors for hypertension among healthcare workers, teachers and bankers in Arusha city council. Results from this study may have important inferences on strategies for management and prevention of hypertension and other NCDs at workplace. The overall hypertension prevalence among working adults in Arusha City Council was 23.8%, consistent with the Tanzanian national prevalence of hypertension 26% (Kagaruki & Mayige, 2016). Similar findings have been reported in several general population studies conducted in Tanzania 28.0%, Ethiopia 21.0%, Kenya 24.5% and Ghana 28.1% (Dosoo *et al.*, 2019; Fikadu & Lemma, 2016; Galson *et al.,* 2017; Mohamed *et al.,* 2018). However, the prevalence was lower compared with several general population studies done in Tanzania 45%, Zimbabwe 38.4% Turkey 44.0% and South Africa 52% (Erem *et al.*, 2009; Katalambula *et al.*, 2017; Marwiro, 2012; Monakali *et al.*, 2018). The disparities in hypertension prevalence among studies are due to the features of the study population. The current study included healthcare workers, teachers and bankers only while most of the comparative studies were general population studies and there are limited comparable studies of factors associated with

hypertension among working adults. For example, the study done by Katalambula *et al.* (2017) was a population-based descriptive study with a limited number of working adults while the one in Zimbabwe was based on employees working in the city council without specifying the selected departments (Marwiro, 2012).

The current study revealed, an insignificant association between occupation and hypertension. However, there are limited studies to compare three population groups on the association between occupation and hypertension. A study done in Ethiopia, among teachers and bankers reported similar findings in the comparison with two population groups (Fikadu & Lemma, 2016). The current study identified a high prevalence of hypertension among bankers 47.1% compared to teachers 36.8% and healthcare workers 16.2%. This finding was different from a study done in Ethiopia, which reported a high hypertension prevalence among teachers 21.8% than bankers 19.13% (Fikadu & Lemma, 2016). However, the author did not mention the reason for higher hypertension prevalence among teachers than bankers. The higher prevalence of hypertension among bankers in the current study could be caused by sedentary nature of their work as they spend most of the time sitting compared to other occupations and they also have low physical activities that can influence excessive weight gain.

On the other hand, age was a predicting factor for hypertension. The odds of hypertension increased as age increased. Similar findings have been reported in Ghana, India, Nigeria and Bangladesh (Addo *et al.,* 2008; Barua *et al.,* 2018; Kishore *et al.,* 2016; Ulasi *et al.,* 2010). Besides, Dosoo *et al.* (2019) identified an increase in hypertension prevalence with age and the participants who were aged ≥ 60 had higher odds of being hypertensive than other age groups. It has been evident that age is the main non-modifiable risk factor associated with hypertension ascribed by stiffening of the arteries due to the results of the ageing process which predispose the elderly to the risk of developing hypertension (Ferreira *et al.,* 2012; Sun, 2015).

Furthermore, alcohol consumption was a predicting factor for hypertension. These findings are comparable with the studies done in Northern Tanzania, Rural India, urban Varanasi India, Ethiopia and Kenya they reported that hypertension was significantly associated with excessive alcohol consumption (Galson *et al.,* 2017; Kiber *et al.,* 2019; Kishore *et al.,* 2016; Mohamed *et al.,* 2018; Singh *et al.,* 2017). In addition, the result of this study is consistent with two different studies done in Kilimanjaro, Tanzania by Galson *et al. (2017)* and Mitsunaga *et al.* (2008) who reported that alcohol consumption was an important risk factor for hypertension in northern regions of Tanzania due to cultural practices of home-brewing. Cultural practices

which allow the use of local traditional alcohol drinks could be the reason for excessive alcohol consumption in the study population and influenced the development of hypertension as explained by Husain *et al.* (2014). Hence Cultural practices should be considered when implementing a workplace wellness program at workplace especially in the northern regions of Tanzania.

On the assessment of stress as a predicting factor for hypertension, the working adults who reported that salary does not meet the daily basic needs were more likely to be hypertensive than those who reported salary meets the daily basic needs. These results concur with studies done in Japan, Bangladesh and the United State to assess household income and it is association with hypertension among employees. They reported that household income is associated with development of hypertension due to financial stress for fulfilling their basic needs (Barua *et al.,* 2018; Leigh & Du, 2012; Yanagiya *et al.,* 2020). Furthermore, Leigh and Du (2012) found that doubling the wages decrease the risk of hypertension from 30% to 25% for young working adults and 35% to 30% for women. In addition, a study done in Arusha region among pastoralists in Monduli District reported that having no income was associated with hypertension in this pastoralist community due to financial stress to meet the daily basic need (Khamis *et al.,* 2020). However, the current findings were different from other studies done in Ethiopia, China and South Africa which reported that high income is linked with the development of hypertension especially in developing countries by influencing the adaptation of unhealthy lifestyle such as the purchase of calorie-dense foods and adaptation of sedentary lifestyle as underlying causes of hypertension, however, in developed countries high income is protective due to adaptation of healthy lifestyle (Cois & Ehrlich, 2014; Fikadu & Lemma, 2016; Yu *et al.,* 2000). Inadequate salary to meet the daily basic needs among the study population might be the reason for financial stress for the fulfilment of daily basic needs and expose these working adults to the development of hypertension.

Nonetheless, the findings from this study showed that study subjects who had raised Low-Density Lipoprotein cholesterol (LDL-C) had increased odds of being hypertensive than those who had normal Low-Density Lipoprotein cholesterol (LDL-C). This result concurs with that of Akpa *et al.* (2006) and Osuji *et al.* (2012*)* that, Low-Density Lipoprotein (LDL) was higher among those who had hypertension than normotensive study participants. The odds of being hypertensive in this study was higher than the study done in Bangladesh and Mongolia (Bayart *et al.,* 2018; Choudhury *et al.,* 2014).

The raised Low-Density Lipoprotein Cholesterol (LDL-C) among the study participants might be attributed to sedentary nature of their work that makes them less physically active and it is known that doing physical activity can lower the level of Low-Density Lipoprotein Cholesterol (Szapary *et al.,* 2003). Another contributing factor on raised Low-Density Lipoprotein in this study population could be the dietary habit since majority of them reported to consume fried foods at workplace however the consumption of fried food was not significantly associated with hypertension.

The metabolic syndrome such as raised blood sugar, raised cholesterol, abdominal obesity, overweight and obesity were assessed in the current study however only raised Low-Density Lipoprotein was significantly associated with hypertension. Raised blood glucose was associated with hypertension in bivariate analysis but statistically insignificant in multivariate analysis. Also, BMI and abdominal obesity were insignificantly associated with hypertension beside been evidenced in several studies as factors associated with hypertension (Bayray *et al.,* 2018; Gebrihet *et al.,* 2017; Kayima *et al.,* 2015).

# CHAPTER FIVE

# CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

In the current study age, alcohol consumption, low salary and raised Low-Density Lipoprotein cholesterol (LDL-C) were the factors associated with hypertension. The prevalence of hypertension, overweight and obesity was high among working adults and the higher prevalence was among bankers compared with other occupations. The finding shows an emerging problem in the working population, especially among bankers as they are exposed to sedentary activities compared to other occupations. Hence this findings inform the policymakers, education, financial and health sectors to design workplace wellness programs that focus on the provision of education about the adaptation of healthy lifestyles especially on physical activities and healthy eating habits to reduce the exposure to risk factors for hypertension and other NCDs at their workplace.

## 5.2 Recommendations

(i) The policymakers, health sector, financial institutions and education sector should use these findings as baseline information in planning strategies for management and prevention of hypertension and other NCDs at workplace by designing workplace wellness programs like providing education about the adaptation of healthy eating habits and ensuring the accessibility of healthy foods at workplace, weight management programs and stress management program.

(ii) Further research is recommended on the assessment of salt intake by measuring urinary electrolytes to get the accurate dietary intake of salt instead of depending on the questionnaire only since the majority of respondents were using table salt, and excess salt intake is associated with hypertension.

(iii) Further research is recommended on the assessment of dietary practices and their association with hypertension since the current study did not find the association between the dietary practices and hypertension as the current study did not collect the quantity of foods consumed. The further linkage between hypertension, other studied

modifiable factors and NCDs should be assessed in the study area as possible causal factors for NCDs.

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## APPENDICES

**Appendix 1: Structured questionnaire for the assessment of risk factors for hypertension and assessment of work-related stress**

**(a) Structured questionnaire for the assessment of risk factors for hypertension**

**Questionnaire ID**……

INSTRUCTIONS: Please would you put (√) in an appropriate box according to the answer selected.

| **STEP I. DEMOGRAPHIC INFORMATION** | | | |
|---|---|---|---|
| **Demographic information** | | | |
| | Question | Response | |
| 1. | Sex | Male [ ]<br>Female [ ] | |
| 2. | How old are you? | _____ years old | |
| 3. | What is the highest level of education you have completed? | [ ] Up to primary school<br>[ ] Secondary level<br>[ ] College/University completed<br>[ ] Post graduate degree | |
| 4. | Job profession | …… | |
| 5. | What is your marital status? | [ ] Married/Cohabiting<br>[ ] Single<br>[ ] Separated/Divorced<br>[ ] Widowed | |
| 6. | Which of the following best describes your main work status over the past 12 months? | [ ] Government employee<br>[ ] Non-government employee | |

| | | | |
|---|---|---|---|
| 7. | How long have you been working with the current institution? | [ ] Less than a year<br>[ ] 1-3 years<br>[ ] 4-6 years<br>[ ] 7 years and above | |
| 8. | How many people older than 18 years, including yourself, live in your household? | Number …… | |
| 9. | What is your estimated monthly income? (In Tanzanian shillings) | [ ] ≤ 250 000<br>[ ] > 250 000 to < 500 000<br>[ ] 500 000 to < 750 000<br>[ ] 750 000 to < 1 000 000<br>[ ] > 1 000 000 | |
| **STEP I. BEHAVIORAL MEASUREMENTS** | | | |
| I am going to ask you some questions about various health behaviours. This includes things like smoking, drinking alcohol, eating fruits and vegetables and physical activity<br>**Tobacco use** | | | |
| 10. | Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes daily? | [ ] Yes<br>[ ] No | **If no go to question number 13** |
| 11. | How old were you when you first started smoking daily? | _____ years old | |
| 12. | On average, how many of the following do you smoke each day? | Number [ ]<br>[ ] Manufactured cigarette<br>[ ] Hand-rolled cigarettes<br>[ ] Pipes full of tobacco<br>[ ] Cigars (cheroots) | |

| | | | |
|---|---|---|---|
| 13. | In the past, did you ever smoke tobacco daily? | [ ] Yes<br>[ ] No | **If no go to question number 15** |
| 14. | How long ago did you stop tobacco smoking daily? | [ ] Years ago<br>[ ] Months ago<br>[ ] Weeks ago | |
| 15. | Do you currently use smokeless tobacco products daily? | [ ] Yes<br>[ ] No | |
| 16. | In the past, did you ever smoke daily? | [ ] Yes<br>[ ] No | |
| 17. | During the past 30 days, on how many days did someone smoke when you were present either at home or around your workplace? | **Number of days**<br>Home [ ]<br>Working place [ ] | |
| **Alcohol consumption** | | | |
| | Question | Response | |
| 18. | Have you ever consumed an alcoholic drink such as beer, wine, spirits and homebrewed wine? | [ ] Yes<br>[ ] No | **If no go to question number 23** |
| 19. | In the past 12 months have you consumed an alcoholic drink? | [ ] Yes<br>[ ] No | |
| 20. | Have you consumed an alcoholic drink within the past 30 days? | [ ] Yes<br>[ ] No | |
| 21. | During the past 30 days, when you drank alcohol, on average, how many standard alcoholic | Number [ ] | |

| | | | |
|---|---|---|---|
| | drinks did you have during one drinking occasion? | | |
| 22. | During the past 30 days, when you consumed an alcoholic drink, how often was it with meals? Please do not count snacks. | [ ] Usually with meals<br>[ ] Sometimes with meal<br>[ ] Rarely with meals<br>[ ] Never with meals | |

**Diet**

The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving.

| | Question | Response | |
|---|---|---|---|
| 23. | In a typical week, on how many days do you eat fruit and vegetables? | **Number of days**<br>Fruits [ ]<br>Vegetables [ ] | |
| 24. | How many servings of fruits and vegetables do you eat on one of those days? | **Number of servings**<br>Fruits [ ]<br>Vegetables [ ] | |
| 25. | What type of oil or fat is most often used for meal preparation in your household? | [ ] Safi<br>[ ] Korie<br>[ ] Sunola<br>[ ] Sunflower<br>[ ] Olive oil<br>[ ] Margarine<br>Others (specify)<br>…… | |

| | | | |
|---|---|---|---|
| 26. | On average, how many meals per week do you eat that were not prepared at home? | **Number of meals**<br>Breakfast [ ]<br>Lunch [ ]<br>Dinner [ ] | |
| **Dietary salt** | | | |
| | Question | Response | |
| 27. | How often is salt, salty seasoning and sauces added in cooking or during food preparation at home? | [ ] Always<br>[ ] Often<br>[ ] Sometimes<br>[ ] Rarely<br>[ ] Never | |
| 28. | How often do you add salt or salty sauce such as ketchup or soya sauce to your food before you eat it or while eating? | [ ] Always<br>[ ] Often<br>[ ] Sometimes<br>[ ] Rarely<br>[ ] Never | |
| 29. | Do you always use table salt while eating | [ ] Yes<br>[ ] No | |
| 30. | What kind of salt do you use for cooking or meal preparation in your household? | [ ] Iodized<br>[ ] Non-iodized<br>[ ] Don't know | |
| 31. | How often do you eat processed food (the foods that have been | [ ] Always | |

| | | | |
|---|---|---|---|
| | altered from their natural state, such as packaged snacks, canned food, fast-food (e.g. pickles, marinates, sheep's cheese, salami, sausages, ham and other meat products, salted nuts/biscuits, cakes, Crips)) | [ ] Often<br>[ ] Sometimes<br>[ ] Rarely<br>[ ] Never<br>[ ] Too much | |
| 32. | How much salt is recommended by WHO per day | [ ] 10g<br>[ ] 5g<br>[ ] 15g<br>[ ] Don't know | |
| 33. | How much salt or salty sauce do you think you consume? | [ ] Right amount<br>[ ] Too little<br>[ ] Don't know | |
| 34. | Do you think reducing the amount of salt you add to the food is important? | [ ] Yes<br>[ ] No<br>[ ] I don't know | |
| 35. | Do you think that too much salt<br>or salty sauce in your diet could<br>Cause a health problem? | [ ] Yes<br>[ ] No<br>[ ] I don't know | |
| 36. | If yes in above what sort of health problem do you think can be caused by a high salt diet? Put a tick to all that apply | [ ] High blood pressure<br>[ ] Osteoporosis<br>[ ] Stomach cancer<br>[ ] Kidney stones<br>[ ] Heart attack/ failure<br>[ ] Stroke | |

| | | | |
|---|---|---|---|
| | | [ ] Asthma<br>[ ] Don't know<br>[ ] Other (specify)<br>…… | |
| 37. | Do you do have regular strategies to control your salt intake? | [ ] Yes<br>[ ] No<br>**If yes indicate**<br>…… | |

**Physical activities at Work**

Vigorous-intensity activity are the activities that causes large increases of heart rate like lifting heavy loads, manual construction work, while moderate-intensity activity causes small increases of heart rate such as brisk walking, carrying light loads, and light activities are the activities that that does not increase the heart beat or heart rate like sitting in the office.

| | Question | Response | |
|---|---|---|---|
| 38. | Does your work involve either of the following activity at least 10 minutes continuously? | [ ] Vigorous-intensity activity<br>[ ] Moderate-intensity activity<br>[ ] Light activity | |
| 39. | How many days do you do the activity selected above as part of your work in a week? | Number of days [ ] | |
| 40. | How much time do you spend doing the activities at work on a typical day? | Number of<br>**Hours** [ ] : **Minutes** [ ] | |

**Travel to and from places**

The usual way to travel to and from places include travel for example to work, for shopping, to market and the place of worship.

| | Question | Response | |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 41. | Which means of transport do you use continuously from home to working place? | [ ] Bicycle (pedal cycle)<br>[ ] Walking<br>[ ] Car<br>[ ] Motorcycle | |
| 42. | In a typical week, how many days and time do you spend walking or bicycle to get to and from places? | Number of<br>**Day** [ ] **Hours** [ ] **Minutes** [ ] | |
| **Recreational activities**<br>This asks you about sports, fitness and recreational activities (leisure) excluding work and transport activities that you have already mentioned | | | |
| | Question | Response | |
| 43. | Do you do vigorous-intensity sports or recreational activities that cause large increases in breathing or heart rate such as running or football, for at least 10 minutes continuously? | [ ] Yes<br>[ ] No | |
| 44. | In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational activities? | Number of days [ ] | |
| 45. | How much time do you spend doing<br>vigorous-intensity sports, fitness or<br>Recreational activities on a typical day? | Number of<br>Hours [ ] : Minutes [ ] | |
| 46. | Do you do moderate-intensity sports or recreational activities that cause a | [ ] Yes<br>[ ] No | |

| | | | |
|---|---|---|---|
| | a small increase in breathing or heart rate, such as brisk walking, cycling,<br><br>Swimming, volleyball for at least 10 minutes continuously? | | |
| 47. | In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational activities? | Number of days [ ] | |
| 48. | How much time do you spend doing<br><br>Moderate-intensity sports, fitness or recreational (leisure) activities on a typical day? | Number of<br><br>Hours [ ] : Minutes [ ] | |
| 49. | How much time do you usually spend sitting or reclining for example watching Television, listening to the music, reading books or newspaper without including the time spent sleeping. | Number of<br><br>**Hours** [ ] : **Minutes** [ ] | |
| **History of Hypertension, Diabetes and Blood cholesterol** | | | |
| | Question | Response | |
| 50. | Have you ever had your blood pressure blood cholesterol and blood glucose measured by a doctor or other health worker? | Hypertension Diabetes Blood cholesterol<br><br>Yes [ ] [ ] [ ]<br><br>No [ ] [ ] [ ] | |
| 51. | Have you ever been told by a doctor or other health worker that you have hypertension or diabetes? | Hypertension Diabetes Blood cholesterol<br><br>Yes [ ] [ ] [ ]<br><br>No [ ] [ ] [ ] | |
| 52. | Are you currently taking any drugs (medication) in the past | Hypertension Diabetes Blood cholesterol | |

| | | | |
|---|---|---|---|
| | two weeks for hypertension, blood cholesterol or diabetes? | Yes [ ] [ ] [ ]<br>No [ ] [ ] [ ] | |
| 53. | Are you currently taking any herbal or traditional remedy for hypertension or diabetes? | Hypertension Diabetes Blood cholesterol<br>Yes [ ] [ ] [ ]<br>No [ ] [ ] [ ] | |
| 54. | In your family do you have any history of people suffering from diabetes or hypertension or both | Diabetes [ ]<br>Hypertension [ ]<br>Both of them [ ] | |
| **STEP II: PHYSICAL MEASUREMENT** | | | |
| **Height and weight** | | | |
| | Question | Response | |
| 55. | Height | **In centimeter (cm)**<br>_____ | |
| 56. | Weight | **In kilogram (kg)**<br>_____ | |
| **Waist circumference** | | | |
| 57. | Waist circumference | **In Centimeter (cm)**<br>_____ | |
| **Blood pressure measurement** | | | |
| 58. | Reading 1 | Systolic (mmHg) _____<br>Diastolic (mmHg)_____ | |
| | Reading 2 | Systolic (mmHg) _____<br>Diastolic (mmHg)_____ | |
| | Reading 3 | Systolic (mmHg) _____ | |

| | | | |
|---|---|---|---|
| | | Diastolic (mmHg)_____ | |
| **Blood measurement** | | | |
| **Blood glucose** | | | |
| 59. | Fasting blood glucose | _____ mmol/l | |
| **Blood cholesterol** | | | |
| 60. | Total cholesterol | _____ mmol/l | |
| | Low-Density Lipoprotein(LDL-C) | _____ mmol/l | |
| | High-Density Lipoprotein(HDL-C) | _____ mmol/l | |
| | Triglyceride | _____ mmol/l | |

## (b) Assessment of work-related stress

| **ASSESSMENT OF WORK RELATED STRESS** | | |
|---|---|---|
| 61. | I have unachievable deadlines | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 62. | I have to work very intensively | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 63. | I have to neglect some tasks because I have too much to do | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 64. | I am unable to take sufficient breaks | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 65. | I am pressured to work long hours | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 66. | I have to work very fast | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 67. | I have unrealistic time pressures | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 68. | I can decide when to take a break | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 69. | I have a say in my work speed | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 70. | I have a choice in deciding how I do my work | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 71. | My working time can be flexible | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 72. | If work gets difficult, my colleagues will help me | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 73. | I am given supportive feedback on the work I do | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 74. | I get the help and support I need from colleagues | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 75. | I receive the respect at work I deserve from my colleagues | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |

| | | |
|---|---|---|
| 76. | I can talk to my line manager about something that has upset or annoyed me about work | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 77. | My colleagues are willing to listen to my work-related problems | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 78. | I am supported through emotionally demanding work | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 79. | My line manager encourages me at work | Never Seldom Sometimes Often Always<br>[ ] [ ] [ ] [ ] [ ] |
| 80. | Is the salary enough to meet the daily basic need? | [ ] Yes [ ] No |
| 81. | Do you experience an unplanned shift | [ ] Yes [ ] No |
| 82. | Do you experience long working hours | [ ] Yes [ ] No |
| 83. | Poor working condition e.g. excessive noise, temperature extremes, dust etc | [ ] Yes [ ] No |
| 84. | Long-distance from home to work | [ ] Yes [ ] No |
| 85. | Do you feel stressed at work | [ ] Yes [ ] No |
| 86. | What is your level of stress | Very low [ ] Low [ ] Moderate [ ] High [ ] Very high [ ] |

**Appendix 2: Assessment of dietary practices**

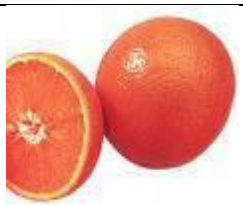
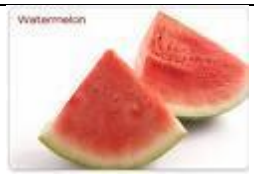
| Frequency | | | | | | |
|---|---|---|---|---|---|---|
| **Food item** | **Never** | **Rarely (≤ than once a month)** | **Everyday** | **1-2 per week** | **3-4 per week** | **1-3 per month** |
| **Cereals and cereal products** | | | | | | |
| Maize on cob | | | | | | |
| Mix of beans and other cereals | | | | | | |
| Porridge | | | | | | |
| Rice | | | | | | |
| Breakfast cereals | | | | | | |
| Stiff porridge | | | | | | |
| Spaghetti | | | | | | |
| **Banana, Roots and tubers** | | | | | | |
| Cooked Banana | | | | | | |
| Fried Banana | | | | | | |
| Cassava | | | | | | |
| Sweet potato | | | | | | |
| Arrowroot | | | | | | |
| Potatoes | | | | | | |
| French fries | | | | | | |
| Banana stew | | | | | | |
| Crips | | | | | | |
| **Meat, fish and animal product** | | | | | | |
| Beef | | | | | | |
| Mutton | | | | | | |
| Organ meat | | | | | | |
| Pork | | | | | | |
| Chicken | | | | | | |
| Sausage | | | | | | |
| Egg | | | | | | |
| Fish | | | | | | |
| Sardines | | | | | | |
| Milk | | | | | | |
| Yoghurt | | | | | | |
| **Legumes and nuts** | | | | | | |
| Beans | | | | | | |
| Green peas | | | | | | |
| Bambara nuts | | | | | | |
| Groundnuts | | | | | | |
| Cashew nuts | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Fruits** | | | | | | |
| Cucumber | | | | | | |
| Banana | | | | | | |
| Orange | | | | | | |
| Watermelon | | | | | | |
| Avocado | | | | | | |
| Pineapple | | | | | | |
| Baobao | | | | | | |
| Mango | | | | | | |
| **Vegetables** | | | | | | |
| Cabbage | | | | | | |
| Amaranth leaves | | | | | | |
| Spinach | | | | | | |
| Cowpea leaves | | | | | | |
| Pumpkin leaves | | | | | | |
| African eggplant | | | | | | |
| African nightshade | | | | | | |
| Carrot | | | | | | |
| Tomato | | | | | | |
| **Fats and oil** | | | | | | |
| Vegetable fat | | | | | | |
| Mayonnaise | | | | | | |
| Lard | | | | | | |
| Peanut butter | | | | | | |
| **Other foods** | | | | | | |
| Pizza | | | | | | |
| Burger | | | | | | |
| Water | | | | | | |
| Carbonated soft drink | | | | | | |
| Alcoholic drink | | | | | | |
| Coffee | | | | | | |
| Black tea | | | | | | |
| Milk tea | | | | | | |

## Appendix 3: Showcard

## (Diet) Serving Sizes of Fruits and Vegetables

| **VEGETABLES ARE**<br><br>**CONSIDERED TO BE:** | **1 SERVING**<br><br>**(STANDARD)** | **EXAMPLES** |
|---|---|---|
| Raw green leafy vegetables |  <br>**1 cup** | Spinach, salad, etc.<br>   |
| Other vegetables, cooked or chopped<br>raw | **½ Cup** | Tomatoes, carrots, pumpkin, cabbage, fresh beans, onion,<br>Etc<br>   <br>   |
| **FRUIT** | | |
| Cucumber (Matango) | **1 medium-size piece** |  |
| Banana<br>(Ndizi) | **1 medium-size piece**<br>**or 2 small bananas(ndizi kisukari)** |  |

| | | |
|---|---|---|
| Orange (Chungwa) | **1 medium-size piece** |  |
| Mango (Embe) | **1 medium-size piece** |  |
| Watermelon (Tikiti maji) | **¼ Kipande cha tikiti maji (134g)** |   |
| Avocado (Parachichi) | **1 small size (parachichi dogo) (110 g)** |  |
| Pawpaw (Papai) | **¼ piece (¼ kipande) (120g)** |  |
| Pineapple (Nanasi) | **¼ piece** |  |
| Fruit juice | **½ cup** | **Juice from fruit.** |

**Appendix 4: Informed consent form**

**THE NELSON MANDELA AFRICAN INSTITUTION OF SCIENCE AND TECHNOLOGY (NM-AIST)**

**CONSENT FORM**

**TITLE: DETERMINATION OF FACTORS ASSOCIATED WITH HYPERTENSION AMONG EMPLOYEES IN ARUSHA CITY COUNCIL, TANZANIA.**

**This Informed Consent Form has two parts:**

- Part I: Information sheet
- Part II: Certificate of Consent (for signatures if you agree to take part)

**PART I: INFORMATION SHEET**

**Introduction:** I am Dalahile Zubery, a master student from the Nelson Mandela African Institution of Science and Technology (NM-AIST). I am currently involved in conducting research on the Determination of Factors Associated with Hypertension among Employees in Arusha City Council. Please listen carefully and ask any questions you may have before agreeing to take part in the study.

**What the study is about:** The purpose of this study is to assess the factors associated with hypertension among employees in Arusha City Council, Tanzania.

**Purpose of the research:** Hypertension is affecting the majority of the people in the country and it has become among the ten diseases that contribute to death in the country. There is a need for identifying the risk factors associated with hypertension and make strategies to mitigate the risk factors.

**Participant Selection:** You are being invited to take part in this research because you are the employee falling in the category group that demonstrated to be at risk of the disease. If you become affected with the disease it may result in loss of manpower due to repeated absenteeism

at workplaces which can result in early retirement but there is also loss of income through providing care for the management of the disease.

**What we will ask you to do:** If you agree to be in this study, I will conduct a survey with you. The survey will include questions about your lifestyle behaviours, dietary habit, and measurement on body weight, height and waist circumference but also a collection of (5ml) of a blood sample for analysis of blood glucose, total blood cholesterol, high-density lipoprotein, low-density lipoprotein, and triglyceride the survey will take about 90 minutes to complete.

**Risks:** There is the risk that you may find some of the questions about your household to be sensitive. You may refuse to answer any particular question and may stop the interview at any time.

**Benefits:** The immediate benefits to you for taking part in this survey is that you will be able to know your health status and get free medical advice based on the screening result but the longer-term benefit will aim at developing workplace intervention strategies to mitigate the risk factors for hypertension and related NCDs.

**Compensation:** There is no compensation for taking part in this study.

**Confidentiality:** Your answers will be confidential. The records of this study will be kept private. In any sort of report, we make public we will not include any information that will make it possible to identify you. Research records will be kept in a locked file; only the researchers will have access to the records.

**Taking part is voluntary:** Taking part in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with Nelson Mandela African Institute of Science and Technology, or the District Council. If you decide to take part, you are free to withdraw at any time.

**PART II: CERTIFICATE OF CONSENT**

I have read the foregoing information or it has been read to me and has understood. My questions have been answered to my satisfaction. I agree to participate in this study.

Name of participant _____

Signature of participant _____ Date _____

I confirm that the participant was allowed to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Name of researcher _____

Signature of researcher _____ Date _____

**Thank you very much for your participation in this study.**

**Appendix 5: KNCHREC ethical clearance**

Kibong'oto Infectious Diseases Hospital- Nelson Mandela African Institution of Science and Technology- Centre for Educational Development in Health, Arusha (KIDH-NM-AIST-CEDHA) -KNCHREC

## RESEARCH ETHICAL CLEARANCE CERTIFICATE

**Research Proposal No: KNCHREC 0014** **14TH MARCH 2019**

**Study Title:** **Assessment of Risk Factors Associated with Hypertension among Employees in Arusha City**

**Study Area:** THE NELSON MANDELA AFRICAN INSTITUTION OF SCIENCE AND TECHNOLOGY

**PI Name:** Dalahile Zubery
**Co-Invigilator:**
**Institutions:** School of Life Science and Bio-Engineering (LiSBE) of the Nelson Mandela African Institution of Science and Technology

**The Proposal has been approved by KNCHREC on 14th March 2019**

1. Subject to this approval you will be required to submit your progress report to the KNCHREC, National Institute of Research and Ministry of Health Community Development Gender Elderly and Children
2. Publication of your findings is subject to presentation to the KNCREC and NIMR Approval.
3. Copies of final publication should be made available to KNCHREC, National Institute of Research and Ministry of Health Community Development Gender Elderly and Children

**Duration of Study Renewal:** Subject to Renewal within ONE YEAR
**Span From:** 14th March 2019 to 13TH March 2020.

.....
**Mr. Simon Njeya**
**Secretary**
**KNCHREC**

**Chairperson**
**KNCHREC**

**Poster Presentation**



# FACTORS ASSOCIATED WITH HYPERTENSION AMONG EMPLOYEES IN ARUSHA CITY, TANZANIA

Dalahile Zubery [1*] Judith Kimiywe [2] Haikael D Martin[1]

**Abstract**

Healthcare workers, teachers and bankers are occupation groups exposed to hypertension due to the nature of their work. A descriptive cross-sectional study was conducted to identify the predicting factors for hypertension among teachers, bankers and healthcare workers in Arusha city council. The prevalence of hypertension among working adults was 23.8%. Age,alcohol consumption, low salary and high Low-Density Lipoprotein cholesterol (LDL-C), were significantly associated with hypertension.

## Background

Hypertension is the major risk factor for CVDs, like heart attack, stroke and heart failure. In a review of hypertension prevalence in developing countries, a higher hypertension prevalence was reported in Tanzania than in many other developing countries. Despite that, there is limited documentation on the predictors of hypertension among working adults in Tanzania. Therefore, the current study aimed to identify the factors associated with hypertension among healthcare workers, teachers and bankers in Arusha City Council.

## Results

The overall hypertension prevalence among working adults was 23.8%. Age (AOR=34.98, 95% CI: 1.30-94.03), alcohol consumption (AOR=6.55, 95% CI: 1.22-35.28), low salary (AOR=6.44, 95% CI: 1.12-37.18) and high Low-Density Lipoprotein cholesterol (LDL-C) (AOR=5.93, 95% CI: 1.24-28.45), were significantly factors associated with hypertension.

## Conclusion

The current study found high prevalence of hypertension, overweight and obesity among working adults and the higher prevalence was among bankers compared with other occupations. The finding shows an emerging problem in the working population, especially among bankers compared to other occupations. Hence this findings inform the policymakers, education, financial and health sectors to design workplace wellness program specifically on healthy lifestyle to mitigate this factors.

**Acknowledgement**

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