ASSESSING RISK FACTORS ASSOCIATED WITH PRIMARY HYPERTENSION AMONG MILITARY PERSONNEL AT PETER MWESHIHANGE MILITARY HEALTH CENTRE IN WINDHOEK

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ABSTRACT

Hypertension is a preventable major risk cardiovascular non-communicable disease with a prevalence of 57% among adults aged 35 to 64 years in Khomas region, which is the highest in all regions in Namibia. The Health Management Information System (HMIS) database of the Peter Mweshihange Military Health Centre shows a high prevalence of hypertension among the military personnel in Windhoek. This study was conducted to explore non- modifiable and modifiable risk factors associated with hypertension among the military personnel in Windhoek, Namibia. A quantitative, cross-sectional and analytical study was performed using an interviewer-administered questionnaire as a data collection instrument. Simple random sampling was used to select a sample of 450 participants from 3257 military personnel population. However, 458 were distributed to cater for low responses.

The study indicates that the majority (69.7%) of the participants were male, which shows that the military is a male-dominated profession. The findings from multivariate logistic regression found age (0.000) and blood relatives with hypertension (0.000), the frequency of tobacco use on a daily basis (0.044) or every 2 hours (0.031) was statistically significantly associated with hypertension and mitigating factors for hypertension such as regular check –ups (0.000) were protective against hypertension.

It is recommended that surveillance, prevention, educational and awareness programmes on hypertension risk factors to be introduced and maintained among military personnel. Modification of lifestyle, such as reduction of alcohol consumption, reducing or cessation of tobacco use, eating a healthy diet and maintaining a healthy body weight, especially when above 30 years need to be adhered to by military personnel at Peter Mweshihange Health Centre in Windhoek. Furthermore, military personnel should go for regular blood pressure check-ups especially those who have blood relatives with hypertension whether they are hypertensive or not hypertensive for early detection and control. Further research, particularly with a different study design, such as case control study, is necessary to assess the disease status (cases and controls) of the respondents at the beginning of the study by measuring their blood pressure.

Keywords: Hypertension, Military personnel, Risk factors.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMI : Body Mass Index

BP : Blood Pressure

CI : Confidence Interval

CVD : Cardiovascular Diseases

DALYS : Disability Adjusted Life Years

EFA **:** Exploratory Factor Analysis

HBP : High Blood Pressure

HIC : High Income Countries

HIV : Human Immuno-Deficiency Syndrome

HMIS : Health Management Information System

HREC : Human Research Ethics Committee

KMO : Kaiser- Meyer Olkin

LMIC : Low and Middle Income Countries

MoHSS : Ministry of Health and Social Services

MVA : Missing Data Analysis

NCD : Non-Communicable Diseases

NDF : Namibia Defence Force

NDHS : Namibia Demographic and Health Survey

PCA : Principal Component Analysis

PMMHC : Peter Mweshihange Military Health Centre

SPSS : Statistical Package for Social Science

WHF : World Heart Federation

WHO : World Health Organization

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I am grateful to all the participants who voluntarily participated in this study.

I acknowledge Miss Chuma Mayumbelo for editing this study.

DEDICATION

This thesis is dedicated to my lovely family.

DECLARATIONS

I, Lilian Njahi Muleya, declare that this study "Assessing risk factors associated with hypertension among military personnel at the Peter Mweshihange Military Health Centre in Windhoek" is a true reflection of my own research and that this work, or part thereof, has not been previously submitted for a degree at any institution.

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Lilian Njahi Muleya	Signature	Date

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Non-communicable diseases (NCDs) are a growing global public health problem, accounting for 38 million deaths worldwide annually (World Health Organization, 2015). One of these NCDs is hypertension, a type of cardiovascular disease referring to sustained elevated systolic blood pressure above140 mmHg and diastolic blood pressure above 90 mmHg (Kasa & Shifa, 2016). Hypertension is a silent killer and it accounts for approximately 7.5 million (or 12.8%) of global deaths (WHO, 2019). According to the World Heart Federation (WHF) (2016), about 970 million people have hypertension globally and more than 60% of them live in Low- and Middle-Income Countries (LMICs). Furthermore, about 80% of deaths due to hypertension are occurring in developing countries (World Heart Federation, 2016). With increased risk factors for cardiovascular diseases in Namibia, hypertension may become a public health challenge (Kasa & Shifa, 2016). In fact, according to WHO, hypertension was among the top 10 diseases accounting for about 16.7% of all deaths in Namibia in 2012 (WHO, 2015).

All in all, it is believed that modifiable behavioural risk factors such as tobacco use, physical inactivity, unhealthy diet, and use of harmful substances such as alcohol lead to hypertension and other metabolic and physiological changes that increase the risk of hypertension (WHO, 2015).

The WHO asserts that raised systolic and diastolic blood pressure levels interfere with efficient function of vital organs such as the heart, brain and kidneys, and with the overall health and wellbeing of individuals (WHO, 2013). Furthermore, the WHO has noted that elevated systolic

and diastolic blood pressure leads to cerebrovascular disease, coronary heart disease (heart attack), heart failure, renal impairment, peripheral vascular disease and blindness (WHO, 2013).

Although it appears that there are no specific causes of hypertension, there are several factors which could contribute to the disease. These include alcohol abuse, smoking, high consumption of salt in the diet, physical inactivity, stress, being overweight or obese, old(er) age and family history of hypertension (WHO, 2013; WHO, 2015; WHO, 2019). In Namibia, behavioural risk factors such as tobacco use, alcohol abuse, physical inactivity, obesity as well as demographic factors such as age, income, education, and gender seem to be associated with hypertension (MoHSS, 2013). Since there are notable statistics of hypertension among the Namibian military personnel, the causes or contributing factors to hypertension among the military personnel need to be investigated.

1.2 BACKGROUND OF THE STUDY

The World Health Organization indicates that the prevalence of hypertension among African adults aged 25 years and above is 46% (WHO, 2013). Klatsky and Gunderson (2016) indicate that while the prevalence of hypertension among adults over 25 years has decreased in the world, the trend in Africa was going parallel the world trend. In the same study, the authors reported that in every African country, hypertension represents 20% to 30% of all hospital admissions. Sub-Saharan Africa appears to bear the heaviest burden of this preventable disease as an emerging threat (Klatsky & Gunderson, 2016).

The burden of hypertension has also been reported in Namibia, a middle-income sub-Saharan African country. The Namibia Demographic and Health Survey (NDHS) of 2013 found that 44.2% of Namibians are hypertensive (Ministry of Health and Social Services (MoHSS, 2013), with hypertension being among the top 10 diseases accounting for about 16.7% of all deaths in Namibia in 2012 (WHO, 2015).The NDHS report further stated that the Khomas region has 57% of the prevalence of hypertension—the highest reported among all the regions in Namibia (MoHSS, 2013). Moreover, a study by the MoHSS (2013) stated that the prevalence of hypertension in the Khomas region was slightly higher in females, with 57.3%, compared to, 56.5% among males.

Various studies around the world have stressed that tobacco usage is one of the risk factors associated with hypertension (WHF, 2012; WHO, 2013). A study by Ericksen, Mackay, Schluger, Gomeshtapeh & Drope (2015) discovered that a total of 5.8 trillion cigarettes were smoked worldwide in 2014. The African region has a 10% prevalence of smoking which was the lowest in all the WHO regions (WHO, 2011). Finally, statistics from the NDHS of 2013 highlighted that 20.3% of men and 6% of women in Namibia aged 15 – 49 years use tobacco (MoHSS, 2014). Furthermore, 18.3 % of men and 5.6 % of women who used tobacco were users from the Khomas region (MoHSS, 2014), a trend that may predict the higher prevalence of hypertension in the Khomas region of Namibia.

Another distinctive factor reported to be associated with hypertension was a lack of fruits and vegetables in the diet and physical activity. The intake of fruits and vegetables in Namibia was reported to be low (MoHSS, 2013). Findings from the NDHS of 2013 testified that the average

consumption of fruit and vegetable in Namibia was one serving per day on one to two days per week among people aged 15 – 49 years.

Additionally, the NDHS discovered that 73 % of Namibians aged 15 – 64 years are physically inactive (MoHSS, 2013). The report further stated that physical inactivity in Namibia was higher among women than men, with 79.6 % physically inactive women and 58.1 % physically inactive men. Correspondingly, about 76.2 % of women are physically active compared to only 50, 8 % of their men counterpart in Khomas region MoHSS (2013). Similar to the lack of consumption of fruits and vegetables, and physical inactivity, alcohol usage and obesity are also factors which contribute to hypertension. Results from the WHO STEPS II survey that was conducted in Namibia in 2005 point out that, 43.2% of women in Namibia were overweight/obese in relation to 20.3% overweight/obese men (MoHSS, 2013). All in all, about 41% of women in Khomas were believed to be overweight compared to 16.9% of male (MoHSS, 2013). Prevalence of overweight in the Khomas region may predict the higher prevalence of hypertension among military personnel in Windhoek.

This is in contrast to other military personnel, for example, the Kenyan military personnel, among whom a study by Mundan, Muiva & Kimani (2013) found that there is low prevalence of hypertension owing to health- focused recruitment, physical activities and routine check- ups. However, there is no evidence-based information about the factors which may contribute to hypertension among military personnel in Namibia. Hence, this study aimed to investigate the risk factors associated with hypertension among the military personnel at Peter Mweshihange Military Health Centre in Windhoek.

1.3 PROBLEM STATEMENT

The NDHS of 2013 established that hypertension prevalence in the Khomas region is 57% of adults aged 35 to 64 years, which is the highest in all regions in Namibia (MoHSS, 2013). There are known published cross-sectional and case-control analytic studies conducted in the Khomas region on the risk factors for hypertension (Kaputjaza, 2017; NDHS, 2013). However, the known published studies were not conducted among the military personnel in the Khomas region. Therefore, enlightenment on the risk factors for hypertension among the military personnel in the Khomas region cannot be derived from current published literature.

The Health Management Information System (HMIS) database of the Peter Mweshihange Military Health Centre shows a high prevalence of hypertension among the armed forces in the Khomas region. The system shows that in 2016, diagnosed hypertension cases were 925 (89%) out of 1043 follow up patients of all diseases. Furthermore, 689 cases (91%) of the total 761 were diagnosed with hypertension from January to September 2017. Therefore, it can be inferred that hypertension seems to be a problem among the military personnel in Windhoek.

Little is known about the risk factors that are associated with hypertension among the military community in the Khomas region at the Peter Mweshihange Military Health Centre in Windhoek. Therefore, this study aims to assess the risk factors which are associated with primary hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek, Khomas region.

1.4 PURPOSE AND RESEARCH OBJECTIVES

1.4.1 Purpose

The purpose of this study is to explore the risk factors that are associated with primary hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek

1.4.2 Research Objectives

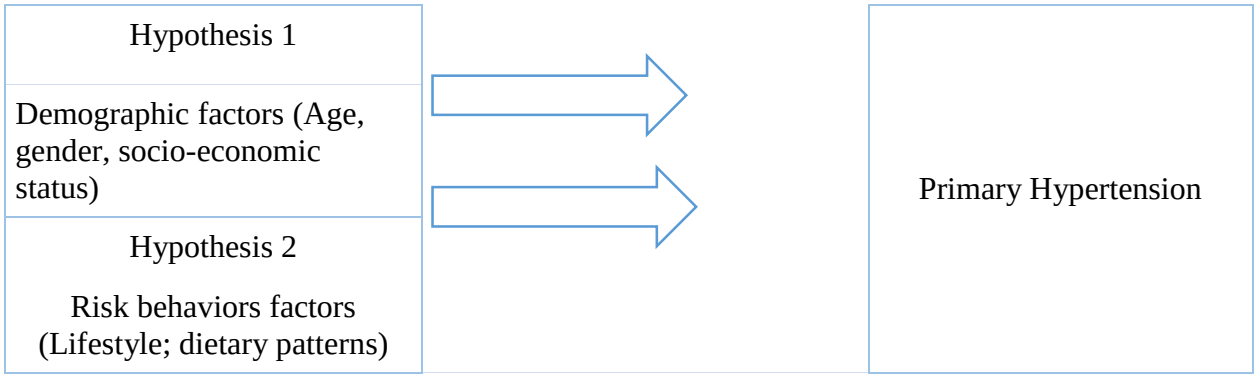
The specific objectives for the study are to:

- Determine the risk factors that are associated with primary hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek
- Determine the association between primary hypertension and socio-demographic factors among the military personnel at the Peter Mweshihange Health Centre in Windhoek.
- Determine the association between primary hypertension and behavioural risk factors (alcohol use, physical activity, tobacco use, dietary patterns and overweight/obesity) among the military personnel at the Peter Mweshihange Military Centre in Windhoek.

1.5 RESEARCH HYPOTHESES

Based on the research problem, this study hypotheses the relationship between demographic and behavioural risk factors for hypertension. The research hypotheses are presented in Figure 1 below:

Figure 1:1 Research hypotheses



In order to answer the objectives above, the study tested the hypotheses below:

Hypothesis 1:

H_0: *Primary hypertension is not associated with age, gender, rank, education and income among the military personnel at the Peter Mweshihange Military Health Centre.*

H_A: *Primary hypertension is associated with age, gender, rank, education and income among the military personnel at the Peter Mweshihange Military Health Centre.*

Hypothesis 2:

H_0: *Primary hypertension is not associated with alcohol use, physical activity, tobacco use, dietary patterns and overweight/obesity among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek.*

H_A: *Primary hypertension is associated with alcohol use, physical activity, tobacco use, dietary patterns ad overweight/obesity among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek.*

1.6 SIGNIFICANCE OF THE STUDY

According to WHO (2008), control of the rising epidemic of hypertension and cardiovascular diseases in the Khomas region requires the employment of population-wide primary prevention strategies. Such prevention will require military population-specific data on the risk factors and groups at risk to ensure that there are targeted interventions to the risk factors and high-risk groups.

The findings from the study may provide evidence of important risk factors for hypertension among the military personnel in the Khomas region, which could be used to inform local and national policies for the development of prevention strategies for hypertension. The findings may offer notional support for military personnel's awareness of risk factors that may lead to hypertension.

1.7 DELIMITATION OF THE STUDY

The study was delimited to military personnel who receive health services at the Peter Mweshihange Military Health Centre in Windhoek. Military personnel who made use of private health facilities and all other non-military members such as cleaners and other civilians at the same Military Base were not included.

1.8 DEFINITION OF TERMS

Behavioural factors	Behavioural factors are lifestyle factors that may affect personal risk for hypertension. These are modifiable risk factor such as diet, physical activity, alcohol use, tobacco use and obesity/overweight (World Health Organisations, 2013).
Hypertension	Hypertension refers to sustained elevated blood pressure of 140 mmHg (systolic) and above and 90 mmHg (diastolic) and above (Kasa & Shifa, 2016).
Military personnel	Military personnel are individuals who serve in the armed forces, members of the armed forces (Preetha, Abraham, Russell, Huffman, Deuster & Gibbons., 2018).
Risk factor	A risk factor is any attribute, characteristics or exposure of an individual that may increase the likelihood of developing a disease or health related condition (WHO, 2019).
Socio- demographic factors	Socio-demographic factors refer to the indices of person characteristics such as age, gender, marital status, education and average income (**http://www.businessdictionary.com**, 2016).

1.9 SUMMARY

This chapter outlined the background information on hypertension and its link to cardiovascular diseases as a global, regional and local problem of public health significance. The research

problem, purpose, objectives, hypothesis, significance, limitations as well as delimitations of the study were explained. The next chapter deals with a literature review on studies undertaken regarding the risk factors of hypertension among military personnel.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter covers researchers' documented views on hypertension, the phenomenon under current study. Burns and Groove (2011) defines literature review as an organized written presentation of what has been published by scholars on a phenomenon. A literature review is a critical valuation of prevailing research in an area of the study to determine the strength and weakness of such prevailing research and find a mutual strand of the major research trends (Pennsylvania State Graduate Writing Centre, 2010). The purpose of this review is to provide background information on hypertension with regard to its prevalence, socio-economic factors as well as risk factors in order to establish the basis for undertaking the current study based on the gaps in knowledge.

Literature relevant to the study is addressed in this chapter; different variables in the study are highlighted in line with prior studies. The study proposes to assess the risk factors that contribute to hypertension among military personnel. Literature on risk factors associated with hypertension in military settings worldwide and regionally is discussed in this chapter. In light of the above, this chapter discusses the demographic and socio-economic factors that are concomitant with hypertension and the behavioral risk factors that contribute to hypertension, as well as diseases that are associated with hypertension.

2.2 CONCEPTUAL FRAMEWORK

Burns and Groove define conceptual framework as an abstract with a logical structure that provides guidance to the development of the study and that may assist the researcher to link the findings to the existing body of knowledge (Burns and Groove, 2011). The study focuses on the factors that are associated with primary hypertension. These factors are displayed in a hierarchical conceptual framework of causes for primary hypertension in figure 2.1 below**.**

Figure 2:1 the conceptual framework model showing the relationship between factors that are associated with primary hypertension.

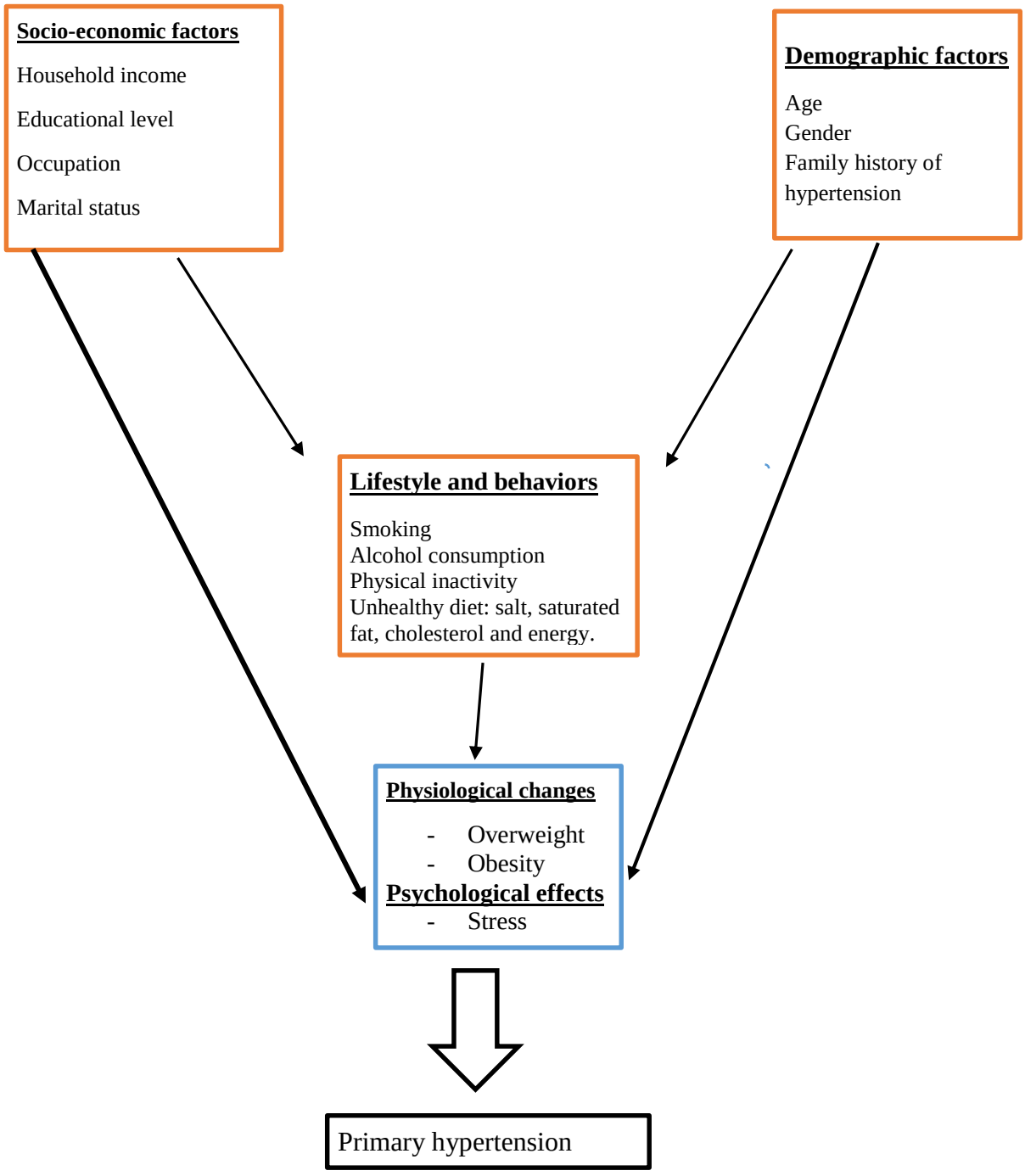


Figure 2.1 demonstrate the relationship of the independent variables (socio-economic factors, vis-à-vis: household income, educational level, occupation and marital status and demographic factors,

vis-à-vis: age, gender and family history of hypertension) and the dependent variables (lifestyle factors such as smoking, alcohol consumption, physical inactivity and unhealthy diet). Dependent variables leads to physiological changes such as obesity and overweight and the psychological effects, such as stress. As a results of the physiological and psychological effects, an individual may develop primary hypertension. Nevertheless, the independent variables as have also shown to have a direct causal relationship with primary hypertension.

2.3 PREVALENCE OF HYPERTENSION

The Literature review for this study focuses on global, regional, and local prevalence of hypertension as described in the next sections.

2.3.1 Global perspective on hypertension

Hypertension is a non-communicable disease which accounts for approximately 7.5 million deaths (12.8%) globally (WHO 2011; WHO, 2019). Hypertension is believed to be one of the leading causes of premature death worldwide (WHO, 2019). The World Health Organization reported that by 2025, the number of hypertensive people is estimated to be 1.56 billion, which accounts for a 60% increase globally (WHO, 2015). Global mortality from hypertension accounts for 57 million disability- adjusted life years (DALYS) or 3.7 % of total disability-adjusted life years (DALYs) (WHO, 2019).

2.3.2 Regional Perspective of hypertension

World Health Organization African region reported to have the highest prevalence of hypertension of over 40 % among both men and women compared to high income countries, which had a prevalence of less than 35 % (WHO, 2019).

A study that was carried out in Windhoek indicated that the local magnitude of hypertension may be higher than that of other population in Low- and Middle-Income countries (Hendriks, Wit, Roos, Brewster, Akande, de Beer & Janseen, 2012). The authors conducted four household cross sectional surveys in two rural and two urban populations in four Sub-Saharan African countries, namely, Namibia, Tanzania, Kenya and Nigeria. In Namibia, the Windhoek district was included as one of the urban populations. The report indicated that the urban populations of Windhoek and Tanzania had a higher prevalence of hypertension compared to the rural communities in Kenya and Nigeria. According to Hendriks et al. (2012), a prevalence of age standardized hypertension in Windhoek was 38 % (95% CI 35.9 -40.1) while Dar es Salaam had an average prevalence of 23.75%.

The findings on the prevalence of hypertension among the military community in the Kenyan and Nigerian Defence Forces show that military personnel aged 30 years and above had a high prevalence of hypertension (Mundan et al., 2013; Aliyu, Oyeyemi, Udoh & Oyeyemi, 2014). However, Aliyu et al. (2014) further stated that there was no difference for the prevalence by gender, educational qualification and ranks among military personnel ($p>0.05$).

2.3.3 Local Perspective of hypertension

According to the Namibia Demographic and Health Survey (NDHS) report by the MoHSS (2014), the age-standardized prevalence of hypertension among adults in Namibia was 46%. The year 2013 recorded the highest hypertension prevalence of 57% among adults aged 35- 64 years in the Khomas Region. Moreover, NDHS indicated a 44 % prevalence of hypertension among women and 45 % of men in Namibia who were taking hypertension medications (MoHSS, 2014).

The prevalence of hypertension across genders in Namibia is close to the findings by Craig, Gage and Thomas (2018), which indicate that the prevalence of hypertension among men and women was similar at 44.3 % and 44.9% respectively, while, the prevalence among both men and women seem to increase consistently with age until 55 – 59 years (Craig et al., 2018).

There is no available study conducted on hypertension among military personnel in Namibia, particularly at the Peter Mweshihange Military Health Centre in Windhoek to determine the trend of hypertension among military personnel.

2.4 RISK FACTORS FOR HYPERTENSION

A risk factor is any attribute, characteristic or exposure of an individual that may increase the likelihood of developing a disease or health-related condition (WHO, 2019). There are factors that may place an individual at risk of developing hypertension. Several studies have been conducted on the risk factors of hypertension in LMICs and in the African region. The common contributing factors that have been found to be associated with hypertension are older age, educational level, physical inactivity, obesity, low vegetable diet and male gender (Mundan et al, 2013; Kaputjaza, 2017).

The risk factors for hypertension are categorized as either modifiable or non-modifiable risk factors. In the next sections, the categories of risk factors for hypertension are reviewed.

2.4.1 Non- modifiable risk factors for hypertension

The literature has shown that the association between geographical factors, vis-à-vis: age, gender and educational attainment are some of the non-modifiable risk factors which are indirectly linked to hypertension (Beigi, Zibaeenezhad, Aghasadeghi, Jokar, Shekarforoush, & Khazraei, 2014; Mundan et al, 2013; Hendriks et al, 2012). These demographic factors influence the lifestyle and are indirectly affecting an individual's risk for hypertension.

2.4.1.1 Age and hypertension

According to Mundan et al., (2013), a majority of hypertensive in Africa were of ages 39 to 48 years. The odds of being older among participants with hypertension were highest for the 49 to 58 year olds. Additionally, the odds of hypertension in this age group were threefold that of 18 to 28 years. Age prevalence in some studies is reported at 6.5% for age groups between 20 and 40 years and 3.9% for age 41 – 60 years (Mundan, et al., 2013). Age-standardized prevalence of hypertension in urban Namibia was 38% at the age of 35 to 41 years old. The latter indicates that the risk of hypertension is directly proportional to age.

A report by NDHS of 2013 found that the prevalence of hypertension among Namibians increased with age. The lowest prevalence is recorded in the 25- 39 age group and the highest prevalence in 55 – 64 age group (MoHSS, 2013). However, the prevalence of hypertension by age in the Khomas region was not reported in the same study.

The elasticity of blood vessels decreases with older age resulting in increased peripheral resistance, and subsequent higher blood pressure (WHA, 2016; WHO, 2019). Even if blood pressure increases with age, adopting a positive lifestyle such as weight reduction, engaging in physical activity for weight reduction, avoidance or cessation of smoking and consumption of a low sodium diet may reduce the effect of blood pressure associated with age (World Heart Federation, 2016). In addition, a study by the World Health Organization found that unhealthy behavioural risk factors may further augment the risk of hypertension in people of older age (WHO, 2011). The question of concern is whether age among the military personnel in this study is associated with hypertension.

2.4.1.2 Gender and hypertension

According to Mundan et al., (2013), about 95% of Kenya Defence Force male study participants were tested positive with hypertension compared to the participants without hypertension. On further analysis, it was found that there were lower odds of being hypertensive among the female gender among the Kenyan Defence Force study population (Odd Ratio = 0.44; 95% CI 0.19 – 1.01, $P = 0.05$). Khoshdel, Seyed, and Seyed (2012) also highlighted that the prevalence of hypertension among female respondents 18 years and above was 8.6%. However, Hendriks and Marleen (2014) discovered that women had a steeper increase in blood pressure correlating with an increase in age compared to males, while males had a steeper increase in blood pressure associated with a higher BMI. The question to be answered is whether gender is associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek.

2.4.1.3 Educational level and hypertension

Hypertension shows a trend with respect to educational level because education level significantly influences the lifestyle of an individual which may increase or reduce the risk of hypertension. According to Mundan et al., (2013), 70 % of hypertensive disease prevalence had a secondary level education, while most (58, 2 %) of the normotensive had a tertiary education qualification. Therefore, a majority (87 %) of the participants with hypertension seem to have primary and / or secondary level education. Thus, an association between educational level and hypertension seems to have existed. For this study, the researcher wanted to ascertain whether the educational level of the military personnel at the Peter Mweshihange Military Health Centre is associated with hypertension.

2.4.1.4 Occupation and hypertension

In all countries, military officers play important roles in ensuring the security of the people in their countries. These individuals perform specialized work involving exposure to violence, which can affect their health directly or indirectly (Soohyun, Whittemore, Sangchoon, Davey-Rothwell, & Latkin, 2016). Currently, employed military personnel in Nigeria have also been reported to have a high prevalence of risk factors for hypertension such as obesity and related diseases such as hypertension, hyperlipidemia, cigarette smoking and sedentary lifestyle (Hendriks & Marleen, 2014). This is an indication that military forces are not exempted from the risks of hypertension. Therefore, this study aims at determining the risk factors to hypertension among army personnel at the Peter Mweshihange Military Health Centre in Windhoek.

2.4.2 Modifiable risk factors for hypertension

Modifiable risk factors to hypertension include behavioural factors that put an individual at risk for hypertension, but which can be avoided. The literature indicates that there are four main modifiable risk factors which may make people most vulnerable to hypertension (WHO 2011). These factors include smoking, alcohol abuse, excessive salt intake and a sedentary lifestyle (Cunha & Mark 2011). These are lifestyles choices that many people adopt and significantly influence their risk for hypertension. The WHO recommended a lifestyle which promotes individuals' adherence to a positive lifestyle in order to prevent risks for hypertension (WHO, 2014). In another publication, the WHO further states that modifiable behavioural risk factors such as tobacco use, physical inactivity, an unhealthy diet, and harmful use of alcohol lead to hypertension through metabolic and physiological changes that increase risk of hypertension and other NCDs (WHO, 2015). This section provides details of these modifiable risk factors and their potential association to hypertension diagnosis among the military personnel at Peter Mweshihange Military Health Centre in Windhoek.

2.4.2.1 Alcohol use and hypertension

High consumption of alcohol among adults aged above 30 years has been correlated with a rise in blood pressure over the years (Janet, 2011; Soohyum, 2016). Certain studies have established that excessive alcohol intake can increase the chance of other medical issues, such as obesity, that may lead to an increase in blood pressure and hypertension (Janet, 2011). In this regard, Soohyum et al. (2016), pointed out that 2.2% of patients with a hypertension diagnosis reported that they used to consume alcohol, although they had reduced their alcohol consumption at the time of diagnosis.

The WHO report of 2014 emphasized that about 30% of the adult population in Africa consumes alcohol, and the consumption rate is expected to increase, especially among young people and women. Moreover, the WHO global status report of 2014 on alcohol discovered that 27.7% of Namibians aged 15 years and above consume alcohol, with beer accounting for 97% of all consumed alcohol (WHO, 2014). In this regard, the Namibia Demographic Health Survey report of 2013 indicates that about 9.5% and 12.4% of women and men respectively reported having consumed alcohol on average five days before the survey commencement in 2013 (MoHSS, 2014). The same report further stated that men (52.8%) were reported to have consumed three or more drinks per day than their female (34.1%) counterparts (MoHSS. 2014). According to the global report on alcohol and health by WHO (2011), Namibia is ranked fifth on the African continent with the average rate of 9.62 litres per capita of alcohol consumption annually. In addition, the excessive consumption of alcohol reduces the ability to perform physical activities which an individual could engage in to reduce the risk of hypertension.

Mohamed (2012) indicated that 52.8% of the Nigerian armed forces consume alcohol excessively. As alluded to earlier, excessive alcohol consumption contributes to development of hypertension. The question to be answered is whether the prevalence of hypertension among the military personnel at the Peter Mweshihange Military Health Centre is associated with consumption of alcohol.

2.4.2.2 Physical activity and hypertension

Exercise and engagement in physical labor are healthy lifestyles activities that one should maintain to avoid cardiovascular diseases, including hypertension. Kaputjaza (2017) argued that physical activity is crucial in energy balance and weight management as this leads to positive changes in

weight loss and improved blood pressure. However, the literature indicates that few people engage in physical activity or perform exercises. In this regard, the findings of an experimental study conducted at Yale University, School of Nursing, for 18 months indicates that only 9% of the participants reported being engaged in physical activity or exercise (Soohyun et al., 2016).

Although a study on the Kenyan military by Victor et al (2013) shows that about 69% of the soldiers stated that their work involved lifting weights, the findings in the same report also showed that 32% of the participants with hypertension, compared to 21% normotensives, did not perform physical activities. There was a statistical significance of χ^2 = 9.34, df = 2; P = 0.009 for association between physical activity engagement and hypertension. It is on this basis that this study was interested in assessing the risk factors for hypertension among the military personnel at the Peter Mweshihange Military Health Centre.

2.4.2.3 Tobacco use and hypertension

Smoking of tobacco is one of the leading factors that compromise human health. Studies have provided evidence that there is an association between smoking tobacco and hypertension. According to Mohammed (2012), tobacco usage was associated with 70.6% of the hypertension cases reported as the main risk factor. Mundan et al, 2013) indicates that about 11% of hypertensive participants were current smokers compared to 4.2% of participants who were normotensives. Thus, more participants who smoked had hypertension compared to fewer participants who smoked and had normal blood pressure.

2.4.2.4 Dietary patterns and hypertension

Dietary habits have been shown to influence some biological pathways, including lipoprotein and cholesterol, which all together result in cardiovascular disease, including hypertension (Stamler et al., 2018). Janet (2011) and Mundan et al., (2013) concur that dietary patterns significantly lead to hypertension if it they are not well managed. These authors reported that a high frequency of red meat consumption results in hypertension. Red meat, such as beef and lamb, has been suggested to increase the risk for hypertension because red meat is saturated with fat and cholesterol and as a result it causes hypertension (Stamler et al., 2018). The fat deposits may clog the blood vessels causing the condition called atherosclerosis. This condition narrows the blood vessels and causes vascular resistance and increased cardiac output which results in high blood pressure (Stamler et al., 2018).

People with a daily high consumption of processed red meat are more at risk of developing hypertension than people who consume less processed red meat. The findings of a prospective cohort study which was conducted among French women to explain how regular consumption of processed red meat could increase blood pressure and to explain the association with cardiovascular disease indicate that processed red meat consumption is associated with cardiovascular disease. Therefore, the findings conclude that there is a 42 % risk of developing hypertension from the consumption of processed red meat (Lajous, Bijon, Fagherazzi et al., 2014). Processed meat contains high quantities of sodium and nitrites for preservation. Excess sodium consumption increases fluid retention which in turn raises blood pressure. Furthermore, It is estimated that about 15- 20 % of sodium are from discretionary (salt added while cooking or on the table), 15% are occurring naturally from unprocessed food and about 65-70% of sodium are from manufactured food, while two groups of food such as meat and fish particularly processed

meat and bread accounts for about more than 50% of salt intake from food (WHA, 2016). The recommended dietary allowance is not more than 2,300 milligrams (mg) per day (that equal to about 1 teaspoon of salt) and an ideal limit is about 1.500 mg per day for most adults (WHA, 2016). Equally, an unhealthy diet which contains high levels of sugar may cause an individual to gain weight and atherosclerosis, both which increase the risk for hypertension (Aliyu et al., 2014). Virtually, without healthy lifestyle habits everyone is at risk of developing hypertension.

2.4.2.5 Overweight/obesity and hypertension

Obesity and overweight are defined as abnormal or excessive accumulation of fat that may present a risk to health for an individual (WHO, 2015). There are three most commonly used measures for obesity and overweight, and they are: body mass index (BMI), waist circumference and waist –to-hip ratio. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres). A person with a BMI of 30 or more is generally considered to be obese. A person with a BMI equal to or more than 25 is considered to be overweight. A normal BMI ranges between 19 and 25 (Fox, 2018). However, Forgoros (2020) states that BMI does not always precise in every individual as it overestimates the body fat in people with a lot of muscle mass and tends to underestimate in elderly people with loose muscle mass.

Another measure for obesity is waist circumference which measures the accumulation of fatty tissue in the belly well known as abdominal obesity (Forgoros, 2020). Studies have shown that a waist circumference of 40 inches and more in men (102cm), and of 35 inches or more (88cm) in women is associated with elevated blood pressure (Forgoros, 2020; Fox, 2018). The idea of using

waist circumference as a risk predictor for primary hypertension implies that abdominal obesity is usually thought to be "worse" than accumulating fat elsewhere such as the buttocks or thighs (Forgoros, 2020).

Studies has confirmed that the waist-to-hip ratio is another way of assessing abdominal obesity which correlates with hypertension (Forgoros, 2020; Fox, 2018). Waist –to-hip ratio is calculated by measuring both the waist and hip circumference, then divide the waist measurement by the hip measurement (Forgoros, 2020; Fox, 2018). In women, the normal ratio is 0.8 0r less, and in men, the normal ratio is 1.0 and less this means the waist for women should be narrower than the hips while in men, the waist should be narrower or similar to the hips (Forgoros, 2020). Therefore, by comparing waist and hip circumference, one can get a better indication of abdominal obesity.

Obesity and overweight are associated with an increase in arterial blood pressure. Various studies have found that overweight and obesity are linked to hypertension (WHO, 2016a; WHO, 2016b). These two factors have been proven to account for 60 to 70 % of hypertension cases (Dusek, Hibberd, Buczynski, et al., 2008).

The Namibia Demographic and Health Survey (NDHS) (2013) discovered that excess body weight was higher in urban populations, compared to rural populations in both men and women. This revelation may apply to the military personnel at the Peter Mweshihange Military Health Centre. Furthermore, a report by the Namibian Ministry of Health and Social Services, (2014) indicates that the proportion of overweight/obese women and men increased with increasing age and wealth

quintile. Therefore, military personnel, some of who are in their middle ages and some of live sedentary lifestyle may be at risk of obesity and as a result, develop hypertension, Hence this study aims to determine if obesity is a risk factor for hypertension among the military personnel at Peter Mweshihange Military Health Centre.

2.5 SUMMARY

This chapter reviewed the literature on the prevalence of hypertension on global, regional and local levels. The current literature on risk factors for hypertension was reviewed. Modifiable and non-modifiable risk factors to hypertension in high- and low-income countries, among military personnel as well as trends of hypertension in Namibia were discussed. The next chapter contains detailed information on the research methodology that was applied in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research methodology outlines the methods and procedures used in the study about the design, population under study, sampling approach and technique, sample size, procedure for data collection and data analyzed as well as ethical considerations that were applied to the study to provide answers for the proposed hypotheses (Brink, Van der Walt & Van Rensburg, 2012; De Vos, Strydom, Fouche & Delport., 2011).

3.2 RESEARCH DESIGN

This study used a quantitative, cross-sectional, analytical approach to assess the risk factors associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek. According to DeFranzo (2011), quantitative research is used to quantify the problem by generating numerical data that can be transformed into usable statistics. Therefore, this study sought to quantify the knowledge, attitudes and behaviors (practices) that are associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre. The study is analytical and cross-sectional since it aims to analyze the relationship of the demographic factors, behavioural factors and hypertension at one point in time (Maninder 2016).

The participants in the cross-sectional study were selected based on the inclusion and exclusion criteria set for the study. In addition, the analysis examined the association between exposure to risk factors (alcohol use, tobacco use, dietary patterns, physical inactivity and excess body weight

and the prevalence of hypertension (hypertension status) among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek.

3.3 STUDY POPULATION

Singleton and Strait (2010) define a study population as the total subjects/elements about which inferences are to be made. The study and target population for this study comprised of 3257 military personnel aged 31 to 60 years, whether hypertensive or not, who receive health services at the Peter Mweshihange Military Health Centre in Windhoek. Studies has shown that blood pressure increases with age and is more prominent from age above thirty (Kaputjaza, 2017; Beigi, et al., 2014; Mundan et al, 2013; Hendriks et al., 2012). This study was conducted among military personnel of age 31 and above because it is not expected that prospect participants below the age of 31 will have hypertension, and one cannot study the whole population due to time and cost constraints.

The Peter Mweshihange Military Health Centre is located in the Suiderhof Military Base, in the Suiderhof suburb, and serves all military personnel in Windhoek. It has a bed capacity of 26 beds and it operates 24 hours, 7 days a week. The Centre may serve the civilian population in cases of health emergencies, emergency treatment and prompt referral to the state hospitals when necessary.

3.4 SAMPLE AND SAMPLING TECHNIQUE

De Vos et al (2011) refer to a sample as a small portion drawn from the target population as representative of the study population. In this study, a simple random sampling method was used

to select the study participants. The simple random sampling method was chosen to ensure an equal chance of participation, while reducing the chance of sampling error (Brink et al, 2012). Epi info (version 7.2.2.6) was used to determine the sample size from the study population stated above, at a 95% confidence interval and a 2.4 margin of errors as outlined below.

The sample size can be calculated using the estimation of the existing literature which is relevant to the study in this case a study on risk factors among Kenyan Defence Force. Based on the literature as proposed by Mundan et al., (2013), the sample size was calculated through the use of Epi info version 7.2.2.6, as follows:

Confidence interval: 95%

Power: 80%

Ratio (Unexposed: exposed): 0.1

% in unexposed group: 48.3 %

Odds Ratio: 0.6

% in exposed group: 72 %

Sample size: **450.**

The sample size estimated for this study was 450 participants at the Peter Mweshihange Military Health Centre. However, 458 sample were distributed to cater for poor responses. The researcher obtained the sampling frame from the military base management and assigned them unique numbers from 0001 to 3257. The researcher used Microsoft Excel to generate a random number table using [=RAND] formula. This allowed the researcher to select 450 participants using the

table and corresponds the number with the sampling frame. The participants would skip the number that was already selected or assigned to another participant.

3.4.1 Inclusion criteria

The inclusion criteria set for this study to ensure that participants are eligible for participation were: being an a member of army personnel who receiving military health services at the Peter Mweshihange Military Health Centre, and being a resident of Namibia aged between 31 and 60 years.

3.4.2 Exclusion criteria.

The study excluded military personnel aged below 30 years and those above 60 years. Military clients/patients, cleaners who work for the Ministry of Defence stationed in Windhoek at Peter Mweshihange Military Base, and military personnel who were not willing to participate were also excluded from the study.

3.5 DATA COLLECTION

Data collection includes data collection instrument, a pilot study and procedure for data collection.

3.5.1 Data collection instrument

The data were collected with an interviewer -administered questionnaire which was developed based on the literature to assess the risk factors associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre**.** This method was chosen given the fact that it is easy, cost and time effective compared to other methods. In addition, the interviewer-administered questionnaire increases the response rate, compared to other methods such as self-administered questionnaires or computer assist methods.

The questionnaire had structured and semi structured questions to get in-depth information from the participants. Section A of the questionnaire contained variables on the demographic features (age, gender, marital status, division, rank, income, education attainment and occupation). Section B contained variables about the risk behaviors, such as alcohol use, tobacco use, physical inactivity, dietary patterns and excess body weight hat are believed to be associated with hypertension. The questionnaire used a 7-point Likert scale, whereby the participants were requested to agree or disagree with statements on a scale of 1 to 7**.**

The questionnaire was in English and the information about data collection was explained to the participants to ensure the quality of the data collected. Military personnel who speak other native languages were also assisted by translating the questions into their own vernacular by the interviewers. In addition, if the need arose, the researcher identified someone who spoke the language which the participants were comfortable or fluent in (please refer to Appendix D for a questionnaire).

3.5.2 Pilot study

Brink et al., (2012) define a pilot study as a small-scale version of the major study, usually completed to test the appropriateness of the research protocols, data collection instruments, sample recruitment strategies, and other research techniques in preparation for a larger study. The questionnaire is the research instrument which provides a way for testing reliability and validity since it ensures a standardized format for all study participants (Brink et al, 2012). After the experts in hypertension had reviewed the questions, the questionnaire was piloted for reliability on forty (40) military personnel with or without hypertension located at the Luiperdsvalley military base during the pilot study period. Participants of the pilot study did not participate in the main study in order to minimize recall bias. The pilot study resulted in the refining of the questionnaire to improve the reliability and validity of the data to be collected in the main study.

3.5.3 Procedure for the data collection

The researcher recruited four (4) combat medics who assisted in data collection during a period of two weeks (10 working days during office hours only). A combat medic is a person responsible for providing emergency treatment to casualties on the battlefield (Preetha et al., 2018). The combat medics were trained on data collection procedures in order to understand the research objectives, research ethics and ways to ask questions in a manner that will not compromise the participants' trust and quality of the data. To conform to the principles outlined in the Helsinki declaration, the combat medics signed a confidentiality clause document, which legally obliged them not to disclose any research information gathered from the participants.

The medics were each expected to interview at least 12 participants per days, which constituted 48 questionnaires per day and 240 questionnaires per week. Therefore, after two weeks the data collection could be over sample size of 450. The army base management organized with the researcher to have the participants at one place where the interviews took place during the reference period. Participants were interviewed after hours. The researcher was available at all time at the military base during the data collection period, to observe the progress, and address the challenges that aroused.

After data collection, participants were debriefed to make sure participants were not psychologically harmed in any way. In order to ensure confidentiality, completed questionnaires were stored in lockable storage and were strictly accessible by the researcher only. A soft copy of the questionnaires was stored on password-protected computer and was only made available to the researcher, the researcher's supervisors, and the data analyst.

3.6 RELIABILITY AND VALIDITY

Reliability and validity are two closely related concepts which are important components in a research study, as they measure/assess the accuracy and relevance of the instruments used for data collection and the Brink et al., 2012; Drost, 2011). For this study, the researcher measured the validity and reliability of the instruments to be used for data collection by applying the procedure described in sub-section 3.6.1 below. Moreover, the different categories of validity that were relevant to the study were applied as explained below.

3.6.1 Reliability of the data collection instrument

Heale and Twycross (2015) define reliability as "the constituency of a measure". This means that the instrument meant to measure a certain variable should have approximately the same response each time it is used (Brink et al., 2012). In this study, reliability was ensured through the assessment of internal consistency-reliability of all the variables coded with the 7-point Likert scale in the questionnaire using Cronbach's alpha coefficient. Cronbach's alpha is a "measure of internal reliability for multi-item summated rating scales, and its values range between 0 and 1, where the higher the score, the more reliable the scale is" (De Vos et al, 2011). At a minimal level, scores ranging from 0.5 to 0.6 are deemed acceptable, while scores above 0.6 mean that the instrument is reliable (Drost, 2011). The questionnaires were reliable with a Cronbach's alpha coefficient of 0.7.

Secondly, in order to determine the reliability of the data collection instrument, a pilot study was conducted among 45 military personnel using the data collection instrument. The military personnel who participated in the pilot study which represent 10 percent of the study population. The findings of the pilot study indicated that adjustments were needed as follows: educational level and educational status were combined, section two added questions on whether military personnel did or did not engage in physical exercise, the type and duration of physical exercise as well as questions on how long soldiers served the force were deleted as they had no relevance on the risk factors for hypertension.

Furthermore, the researcher used the inter–rater reliability test in order to test the reliability of the data collection instrument. This was done by having two individuals or raters to collect data to the same participants in order to evaluate the questionnaire for inter-rater reliability (De Vos, 2011).

The data obtained from inter-rating were compared and had the same results. Therefore, the instrument was considered reliable.

3.6.2. Validity of the data collection instrument.

Validity is the extent to which a set of measured items actually reflects the theoretical latent construct that those items are designed to measure. Validity measures the authenticity, accuracy and truthfulness of data collection instrument (Brink et al., 2012; Drost 2011, De Vos et al., 2011).

In this study, two aspects for validity of the questionnaire were tested, namely content and face validity as explained in the next sessions.

Content Validity

Content validity is an estimation of how well the data collection instrument represents all the variables to be measured (Groove, Burns & Gray, 2013). In this study, all the components that were required to measure the magnitude and frequency on the use of alcohol, use of tobacco, physical activity, dietary patterns and obesity/overweight were well presented for each of the risk factors. By doing so, the study adopted the standardized questions on hypertension and the questions based on the literature review to fill the literature gap. Moreover, external validity was ensured by ensuring adequate sample size of the participants as explained under section 3.4 about sample and sampling.

Face validity

Face validity ensures that the instrument measures the variables that it claims to measure (Brink et al 2012; De Vos et al., 2011). The face validity of the questionnaire was ensured in this study through confirmation of the questions in the questionnaires by the main supervisor of this study and the physicians at the Peter Mweshihange Military Health Centre who are experts in the area of hypertension and its risk factors. Moreover, a pilot study was conducted to assess if all the intended concepts were included in the questionnaire and amendments were implemented based on the input from the pilot study. The questionnaire was then edited and formalized before it was submitted to the University of Namibia's Health Research and Ethical Committee for approval of the study.

3.7 DATA ANALYSIS

Data analysis of quantitative data refers to the conversion of data into numerical forms so that it is interpreted by a researcher (De Vos et al., 2011). The purpose of data analysis is to categorise, order, manipulate and summarise the data and describe them in meaningful terms (Brink et al., 2012). In this study, the data were analysed using the Statistical Package for Social Sciences (SPSS) Version 23 software. After completion of the data collection, a database was generated and the data were entered into an SPSS version 23 sheet. After data entry, the researcher started with data cleaning and validation, to ensure that there was no duplication, typing errors and data incompleteness which could compromise the quality of the data before carrying out descriptive and analytic analyses.

Socio-demographic variables such as age, gender, education, rank, income, division and occupation were summarised by the use of frequency tables in order to calculate frequencies and proportions. Additionally, descriptive statistics (mean, median, standard deviation) were calculated for each of the variables and mean scores were performed to determine whether there was a difference between hypertensive and non-hypertensive participants. Socio-demographic characteristics and potential risk factors were compared by t-test for continuous variables and chi-square test (95% significance) was used to assess associations for categorical variables. Binary logistic regression was performed for the variables (age, gender, marital status, tobacco use, alcohol abuse, obesity/ overweight and diet) which indicated significant associations with hypertension diagnosis to obtain odd ratios in order to evaluate the relationship between each risk factor (exposure) and hypertension (outcome).

Furthermore, multivariate logistic regression analysis was performed for all the factors such as age, income, health seeking, positive lifestyle as well as tobacco use which was found to be significant in binary logistic regression as dependent variables to determine the most significant risk factor by calculating an adjusted odds ratio as well as to control confounding effects (Kaputjaza, 2017; De Vos et al., 2011).

Research that involves humans as participants is required to adhere to ethical principles in order to ensure protection of their human rights and dignity. Brink et al (2012) state that there are three fundamental ethical principles that are required to provide the guidance to the researchers in order to comply with good research ethics. They are: respect for persons, beneficence and justice. These ethical principles were applied in this study as elaborated in the next sections.

3.8.1 Ethical clearance

Permission to conduct the study and ethical clearance were obtained from the Centre for Postgraduate Studies Committee of the University of Namibia, the Human Research Ethics Committee (HREC) of the University of Namibia, the Research and Ethical Committee of the Ministry of Health and Social Services, as well as the Namibian Defence Force (NDF).

The following research ethical principles were observed during the study.

3.8.2 Respect for research participants

The main ethical issues that must be taken into consideration when conducting a researcher-administered questionnaire include ensuring that participants have given informed consent and have agreed to voluntary participation.

Informed consent: Informed consent was obtained from the participants after the purpose, objectives and procedures of the study were explained to them. Signed informed consent was obtained from each participant. Assurance that the study does not incur harm and occupational insecurity were explained to the participants by the interviewer. No child or any vulnerable person participated in the study.

Voluntary participation: The participants were informed about their right to decline to participate in the study, withdraw their consent at any point during interviews or any period, or refuse to answer any question considered personal to them**.**

Privacy: Privacy was ensured during data collection. A private room with a screen was used for data collection in order to ensure the privacy of participants.

Anonymity: Unique numbers / codes were used to identify the participants; no names were used. Report of the findings would not be linked to any participants.

Confidentiality: Information collected from the participants was kept confidential. Completed questionnaires were stored in lockable storage and were strictly accessible to the researcher only. A soft copy of the questionnaire was stored on a password-protected computer which was only accessible to the researcher, the researcher's supervisors, and the data analyst. Medics who collected the data also signed a confidentiality document which legally obliged them not to disclose any information from participants to any third parties.

3.8.3 Beneficence

This principle involves the responsibility of the researcher to ensure that the participants are protected from discomfort and any sort of harm, i.e., physical', psychological, spiritual, emotional, social, economic and / or legal (Brink et al, 2012).

Benefits: The benefits of this research are to assist the Ministry of Defence to develop specific hypertension control strategies to reduce risk factors of hypertension in the military. The research will create awareness among the military personnel under study on the risk factors for hypertension and ways how to mitigate the risks, such as lifestyle modifications. There was no anticipated harm to the participants.

3.8.4 Justice

The principle of justice refers to the fair selection and treatment of the participants for reasons that are directly related to the study objectives (Brink et al, 2012). The study was conducted among the

soldiers at the army base as they are in good position to provide information which can reflect risk factors for hypertension among themselves. Simple random sampling of participants would ensure an equal chance of being selected to participate in the study. The agreement between the researcher and participants was also respected.

3.9 SUMMARY

This chapter presented detailed information on the research methods and procedures used in the study.

A quantitative cross-sectional descriptive-analytic method was used as study design. Considering a 95% confidence interval and a 2.4 margin of error using Epi info 7software, a sample of 450 military personnel was randomly selected to participate in the study. Simple random sampling was used as a sampling technique to ensure that the 3257 military population had an equal chance of being selected to participate in the study. An interviewer-administered questionnaire was used to collect the data. Validity and reliability were ensured. Statistical Package for Social Sciences and Microsoft Excel were used to analyse the data. The research ethics requirements applied to the study were explained. The next chapter presents the study findings obtained from data analysis.

CHAPTER 4

PRESENTATION OF THE RESULTS

4.1 INTRODUCTION

This chapter provides the data analysis and presentation of the study results. Data analysis started with data screening in preparation for subsequent quantitative analyses. The descriptive and reliability tests were performed in relation to the dependent and independent variables. Descriptive statistics were used for analysis of demographic data, data on respondents' behaviour and knowledge about the risk factors for hypertension. Multivariate inferential statistics were applied to analyse the relationship of dependent variable (hypertension) and independent variables (demographic, behavioural and knowledge about the risk factors for hypertension). The logistic regression analysis was used to test the research hypotheses and answer the research question against the original objectives, which were to:

- Determine the risk factors that are associated with primary hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek;

- Determine the association between primary hypertension and demographic factors among the military personnel at the Peter Mweshihange Health Centre in Windhoek; and

- Determine the association between primary hypertension and behavioral risk factors (alcohol use, physical activity, tobacco use, unhealthy dietary patterns and overweight/obesity) among the military personnel at the Peter Mweshihange Military Centre in Windhoek.

4.2 DATA SCREENING: MISSING DATA

The data were examined and screened using SPSS, Version 23. The dataset was searched for missing values, and the questionnaires and variables with substantive missing data or poor-quality responses were removed before the analysis. The missing value analysis (MVA) and the missing values were replaced with zero values. Missing data affects the effectiveness of multivariate analysis, as the missing data reduces the sample size and can introduce biases in the statistical results.

4.2.1 Normality

Tabachnick and Fidell (2007) note that normality is a fundamental assumption in multivariate analysis and it is critical that the data be distributed normally and related to each other to avoid larger distribution, which may result in invalid statistical tests (Hair *et al.*, 2013).

The study used the measures of kurtosis and skewness to test for normality of the data. Hair et al. (2013) posited that the measure for both skewness and kurtosis critical, the values should be within the 'range of ± 2.58' in order for it to be accepted that the data distribution is not far from normal. However, for categorical or nominal variables, as used in this study, there was no valid reason to exclude variables based on skewness, unless they exhibited no variance. Therefore, rather than testing skewness, this study focused on kurtosis measurements, with kurtosis values greater than or less than +/- 2.58, which indicated a potentially problematic kurtosis and therefore, lack of sufficient variance. Ten out of the 37 questionnaire variables had kurtosis issues (above the 2.58). The detailed results of kurtosis values are presented in Table 4.1 and show the items that have been flagged for potential future issues in subsequent analyses.

Table 4.1 Variables flagged due to normality Issues

Variable	N	Min	Max	Mean	Std. Dev	Skewness	Kurtosis
secB_13	458	1	3	2.00	0.09	-5.24	112.25
secB_11	458	1	2	1.99	0.10	-9.44	87.58
secB_18	458	1	3	1.07	0.32	4.87	24.18
secB_7	458	0	30	1.62	5.02	3.57	12.71
secB_21	458	0	2	0.96	0.25	-2.21	11.63
secB_5	458	1	3	1.15	0.39	2.66	6.67
secA_5	458	1	6	1.66	0.77	1.92	6.59
secB_6	458	1	7	6.47	1.45	-2.65	5.43
secC_1	458	1	7	1.72	1.17	1.97	4.49
secA_6	458	0	5	3.66	0.89	-1.37	2.72

Variable	Description
secB_13	Do you eat vegetables?
secB_11	Do you eat fruits?
secB_18	At which facility do you collect your medication?
secB_7	How long have you been smoking?
secB_21	Do you have any other heart related disease?
secB_5	Do you smoke any tobacco products?
secA_5	Marital status
secB_6	How often do you smoke?
secC_1	I am aware of any complication of hypertension
secA_6	Educational status

The results in table 4.1 indicate the ten variables with poor variability. The Section B questions with the highest kurtosis were dropped from further analysis. These include SecB_13 (112.25), secB_11 (87.58), and secB_18 (24.18). The other seven were retained as they were relevant and important in answering the research questions. In addition, outliers were handled by transforming the variables through recoding and cross multiplication of related variables. The transformed variables and the reasons for the changes can be found in Appendix D.

4.3 DESCRIPTIVE STATISTICS

Descriptive statistics (mean, median, standard deviation) were calculated for each of the variables and mean scores were performed to determine whether there was a difference for hypertensive and non-hypertensive participants. Demographic characteristics and potential risk factors were compared by t-test for continuous variables, and chi-square test (95% significance) was used to assess associations for categorical variables.

4.3.1 Non-modifiable risk factors for hypertension

Non-modifiable risk factors include the demographic factors of the respondents. The findings for this study on the demographic and job characteristics from Section A of the questionnaire (see Appendix A) are presented in the following subsections:

4.3.1.1 Demographic characteristics

This section presents the findings from the cross-tabulation of hypertension diagnosis and demographic characteristics of the study sample, which includes age group, marital status and gender. Table 4.2 below presents the descriptive statistics of the respondents' gender, marital status and age.

Table 4.2 Demographic Characteristics of Respondents

Variable		Are you diagnosed with hypertension?		Total		r^s	χ^2	p
Description	**Value**	**no (N=191)**	**yes (N = 267)**	**N**	**%**			
Proportion	**Total (N)**	**41.7%**	**58.3%**	**458**	**100.0%**			
Gender	Male	44.2%	55.8%	319	69.7%	0.082	2.697	0.61
	Female	36.0%	64.0%	139	30.3%			
Age	31 - 35 years	63.6%	36.4%	**118**	**25.3%**	**0.286****	**41.765****	**0.001**
	36 - 40 years	41.0%	59.0%	**117**	**25.5%**			
	41 - 45 years	42.5%	57.5%	**73**	**15.9%**			
	46 - 50 years	29.7%	70.3%	**37**	**8.1%**			
	51 - 55 years	21.4%	78.6%	**56**	**12.2%**			
	56 - 60 years	24.6%	75.4%	**57**	**12.4%**			
Marital status	Never married	46.9%	53.1%	**211**	46.1%	**0.100***	9.571	0.088
	Married	37.7%	62.3%	**215**	46.9%			
	Cohabitating	47.4%	52.6%	**19**	4.1%			
	Divorced	0.0%	100.0%	**7**	1.5%			
	Widow/widower	25.0%	75.0%	**4**	0.9%			
	separated	50.0%	50.0%	**2**	0.4%			

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; r- Spearman's correlation coefficient; χ2– chi-squared test; p – significance level.

The findings from the respondents in Table 4.2 indicate the proportion and associated summary statistics of the demographic characteristics. The results show that the majority of the respondents' gender was predominantly male (69.8%), of which 55.8% were diagnosed with hypertension. Table 4.2 also presents the results for marital status and age of the respondents. The findings shows that hypertension is highest among the divorced cohort (100%) followed by window/widower cohort (75%).The findings indicate an increasing progression of hypertension diagnosis from the 31 – 35 years age group (36.4 %) that peaks at 78.6% for the 50 – 55 years age group.

4.3.1.2 Socio- economic characteristics

Table 4.3 presents the findings on the socio-economic, which include military rank and salary scale of the respondent

Variable		Are you diagnosed with hypertension?		Total		r^s	$\chi 2$	P
Description	**Value**	**no (N=191)**	**yes (N = 267)**	**N**	**%**			
Proportion	**Total (N)**	**41.7%**	**58.3%**	**458**	**100.0%**			
military Rank	Privates	54.8%	45.2%	31	**6.80%**	**0.174****	**14.705****	**0.005**
	Junior NCOs (L/CPL, CPL)	50.9%	49.1%	171	**37.30%**			
	Senior NCOs (WO1, WO2, SGT)	35.0%	65.0%	177	**38.60%**			
	Junior Commissioned Officers (Lt, Capt.)	32.7%	67.3%	49	**10.70%**			
	Senior Commissioned Officers (Maj, Lt. Col, Col)	30.0%	70.0%	30	**6.60%**			
Salary scale	less than 5000	33.3%	66.7%	3	**0.7%**	**0.137****	9.382	0.052
	5000 – 10000	51.3%	48.7%	119	**26.0%**			
	10000 – 20000	41.6%	58.4%	233	**50.9%**			
	20000 – 30000	30.7%	69.3%	88	**19.2%**			
	30000 +	33.3%	66.7%	15	**3.3%**			

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; r- Spearman's correlation coefficient; χ2– chi-squared test; p – significance level

The majority (38.6%) of the participants were senior non- commissioned officers, followed by junior non-commissioned officers (37.3%). On the other hand, senior officers were the smallest group of respondents, accounting for only 6.6% of the participants, followed by privates with 6.80 %. A total of 233 (50.9%) had an average salary scale of N$10 000 and N$20 000. While 3 (07%) of participants has a salary scale of N$ 5000 and below.

4.3.2 Modifiable risk factors for hypertension

Modifiable risk factors to hypertension refer to factors associated with the occurrence of hypertension which can be avoided or changed (Soohyun, Whittemore, Sangchoon Davey-Rothwell., & Latkin. 2016). This section and its subsections provide the cross-tabulated descriptive statistics of the modifiable risk factors and their association to hypertension diagnosis among the army personnel at the Peter Mweshihange Military Base in Windhoek.

The table below indicate results on modifiable dietary patterns and lifestyle behaviors of the respondents.

Table 4. 4 Modifiable Dietary and Lifestyle behaviors of the Respondents

Variable		**Are you diagnosed with hypertension?**		**Total**		r^s	χ^2	**P**
Description	**Value**	**no (N=191)**	**yes (N = 267)**	**N**	**%**			
Proportion	**Total (N)**	**41.7%**	**58.3%**	**458**	**100.0%**			
Physical Activity	No Exercise	40.7%	59.3%	**241**	**52.6%**	-0.1	10.215	0.25
	Walking for 30 minutes	47.1%	52.9%	**17**	**3.7%**			
	Walking for 1 hour	35.0%	65.0%	**20**	**4.4%**			
	Walking for 2 hours	100.0%	0.0%	**1**	**0.2%**			
	Jogging for 30 minutes	45.9%	54.1%	**61**	**13.3%**			
	Jogging for 1 hour	41.4%	58.6%	**29**	**6.3%**			
	Jogging for 2 hours	100.0%	0.0%	**5**	**1.1%**			
	Running for 30 minutes	35.6%	64.4%	**45**	**9.8%**			
	Running for 1 hour	41.0%	59.0%	**39**	**8.5%**			
Fruit-eating patterns	No response	20.0%	80.0%	**5**	**1.1%**	0.013	2.43	0.488
	Once a month	42.2%	57.8%	**192**	**41.9%**			
	Weekly	44.2%	55.8%	**181**	**39.5%**			
	Twice weekly	36.3%	63.7%	**80**	**17.5%**			
Vegetable-eating patterns	Daily	51.8%	48.2%	**110**	**24.0%**	0.058	6.358	0.095
	Twice weekly	36.5%	63.5%	**104**	**22.7%**			
	Weekly	39.1%	60.9%	**192**	**41.9%**			
	Once a month	40.4%	59.6%	**52**	**11.4%**			

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; r- Spearman's correlation coefficient; $\chi 2$– chi-squared test; p – significance level.

The findings above revealed that total of 241 (52.6%) respondents did not perform any physical activities. The respondents who did not perform physical activities, 59.3 % has hypertension. The respondents did physical activities such as jogging for 30 minutes were 61(33.3%), running for 30 minutes were 45 (9.8%) and walking for 30 minutes were 17 (3.7%). This study reviewed that the respondents consumed fruits on a monthly basis were 192 (41.9%), weekly181 (39.5%) and twice weekly 80 (17.5%). While the total of 192 (41.9%) consumed vegetable weekly, on daily basis 110 (24%), twice weekly 104 (22.7%) and monthly 52 (11.4%).

The results for modifiable behaviour risk factor for hypertension for tobacco and alcohol are shown in the table below.

Table 4.5 Tobacco and Alcohol Usage Time and Rate of the Respondents

Variable		**Are you diagnosed with hypertension**		**Total**		**r^s**	***χ2***	**P**
Description	**Value**	**No (N=191)**	**Yes (N = 267)**	**N**	**%**			
Proportion	**Total (N)**	**41.7%**	**58.3%**	**458**	**100.0%**			
Tobacco use	None	42.1%	57.9%	**392**	**85.6%**	0.025	**12.852***	**0.025**
	Only when drinking alcohol	47.1%	52.9%	**17**	**3.7%**			
	Weekly	77.8%	22.2%	**9**	**2.0%**			
	Twice weekly	33.3%	66.7%	**6**	**1.3%**			
	Daily	20.0%	80.0%	**30**	**6.6%**			
	Every two hours	75.0%	25.0%	**4**	**0.9%**			
Number of years smoking	Less than 5 years	51.9%	48.1%	**392**	**85.6%**	**0.284***	6.984	0.222
	5 - 10 years	50.0%	50.0%	**17**	**3.7%**			
	10 - 15 years	37.5%	62.5%	**9**	**2.0%**			
	15 - 20 years	23.1%	76.9%	**6**	**1.3%**			
	20 - 25 years	0.0%	100.0%	**30**	**6.6%**			
	25 to 30 years	33.3%	66.7%	**4**	**0.9%**			

Alcohol use	None	44.4%	55.6%	**142**	**31.0%**	0.067	8.271	0.219
	Only when drinking alcohol	51.6%	48.4%	**31**	**6.8%**			
	Once monthly	35.7%	64.3%	**56**	**12.2%**			
	Weekly	44.1%	55.9%	**118**	**25.8%**			
	Twice weekly	46.0%	54.0%	**50**	**10.9%**			
	Daily	28.3%	71.7%	**60**	**13.1%**			
	Every two hours	0.0%	100.0%	**1**	**0.2%**			
Number of years drinking	Less than 5 years	45.4%	54.6%	**97**	**30.7%**	**0.191****	**21.556****	**0.001**
	5 - 10 years	53.1%	46.9%	**81**	**25.6%**			
	10 - 15 years	40.0%	60.0%	**35**	**11.1%**			
	15 - 20 years	37.5%	62.5%	**56**	**17.7%**			
	20 - 25 years	14.3%	85.7%	**21**	**6.6%**			
	25 to 30 years	10.5%	89.5%	**19**	**6.0%**			
	More than 30 years	14.3%	85.7%	**7**	**2.2%**			

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; r- Spearman's correlation coefficient; $\chi 2$– chí-squared test; p – significance level

The results show that 80 % of the respondents who used tobacco daily developed hypertension while 71.7% who drank alcohol on a daily basis were diagnosed with hypertension.

4.4 HEALTH QUESTIONS RELATED TO HYPERTENSION

Health questions include the facility utilized, taking prescribed medication, having blood relatives with hypertension, going for regular check-ups and maintaining a healthy body weight.

Table 4.6 Health questions about related to hypertension of the respondents

Variable		**Are you diagnosed with hypertension**		**Total**		**r^s**	***$\chi 2$***	**P**
Description	**Value**	**No (N=191)**	**Yes (N = 267)**	**N**	**%**			

	Total (N)	**41.7%**	**58.3%**	**458**	**100.0%**			
At which health facility do you collect your medications?	Military facility	41.5%	58.5%	**434**	**94.8%**	-0.18	2.32	0.313
	Private	56.3%	43.8%	**16**	**3.5%**			
	State	25.0%	75.0%	**8**	**1.7%**			
Are you taking prescribed medication for these conditions?	Hypertension	0.0%	100.0%	**256**	**55.9%**	**-0.983****	**454.401****	**0.001**
	Diabetes mellitus	0.0%	100.0%	**4**	**0.9%**			
	Asthma	12.5%	87.5%	**8**	**1.7%**			
	None	100.0%	0.0%	**190**	**41.5%**			
Do you have blood relatives with hypertension?	No	56.7%	43.3%	**240**	**52.4%**	**0.314****	**46.439****	**0.001**
	Yes	25.2%	74.8%	**218**	**47.6%**			
Do you go for regular check-ups?	No	78.2%	21.8%	**124**	**27.1%**	**0.501****	**93.294****	**0.001**
	Yes	28.1%	71.9%	**334**	**72.9%**			
Do you maintain healthy body weight (5-20 mmHg/10kg)	No	36.20%	63.80%	116	25.30%	-0.100	1.93	0.100
	Yes	43.60%	56.40%	342	74.70%			

**Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level; r- Spearman's corrélations coefficient; $\chi 2$– chi-squared test; p – significance level.

Table 4.5 findings indicated that 74.7% of the respondents maintained a healthy body weight; of these, 56.4% were diagnosed with hypertension. While the proportion of those who do not maintain a normal body was shown to be higher at 63.8%. The findings indicated that 74.8% of the respondents who have blood relatives with hypertension were diagnosed with hypertension, while 56.7% of respondents who did not have blood relatives with hypertension were not diagnosed with hypertension. The majority (78.2 %) who has hypertension of the respondents did not go for regular check-ups.

4.5. KNOWLEDGE OF RISK FACTORS FOR HYPERTENSION

The study used Likert-scale statements in Section C of the questions to determine the respondents' level of awareness about the risk factors contributing to hypertension. The findings are outlined in Table 4.7.

Table 4. 7 Respondents' Knowledge on the risk factors for Hypertension

Statement	Diagnosed with hypertension	Descriptive Statistics			Independent Samples T-Test			
		N	Mean	Std. Deviation	Mean Diff	T	df	Sig. (2-tailed)
Complications of hypertension	No	191	6.26	1.32	-0.05	-0.42	456	0.67
	Yes	267	6.30	1.06				
Vigorous physical activity	No	190	5.59	1.53	-0.07	-0.50	448	0.61
	Yes	260	5.66	1.47				
Regular moderate physical activity	No	190	5.65	1.49	-0.08	-0.58	450	0.56
	Yes	262	5.73	1.41				
Maintaining healthy body weight	No	189	6.08	1.24	0.00	-0.01	445	1.00
	Yes	258	6.09	1.13				
Limiting alcohol consumption	No	190	5.86	1.54	0.03	0.23	452	0.82
	Yes	264	5.83	1.39				
Dietary sodium intake is 2.4g per day	No	190	5.45	1.42	0.01	0.10	451	0.92
	Yes	263	5.43	1.45				
Intake of dietary potassium	No	189	5.39	1.43	-0.03	-0.21	442	0.83
	Yes	255	5.42	1.45				
Diet that is rich in fruits and vegetables	No	190	6.15	1.28	0.25	**2.155***	**454**	**0.06**
	Yes	266	5.90	1.44				
Sedentary hours	No	189	5.03	2.17	-0.01	-0.07	454	0.95
	Yes	267	5.04	1.90				
Activities that cause an increase in breathing	No	190	6.11	1.29	0.35	**2.57*****	**455**	**0.01**
	Yes	267	5.75	1.54				

***T-statistic is significant at the 0.01 level; **T-statistic is significant at the 0.05 level; ***T-statistic is significant at the 0.1 level.

The results above indicate that the non-hypertensive respondents (M = 6.11, S.D = 1.29) were more engaged than hypertensive (M = 5.75, S.D = 1.54) in activities that cause increase in breathing (T = 2.57, p = 0.01), thus leading to a reduced risk of hypertension. Additionally, the

non-hypertensive respondents (M = 6.15, S.D. = 1.28) had a high level of awareness of the benefits of consuming a diet rich in fruits and vegetables (T = 1.908, p = 0.06), compared to the lower mean in hypertensive respondents (M = 5.90, S.D. = 1.44).

4.6 MULTIVARIATE INFERENTIAL ANALYSIS.

In multivariate analysis, it is always important to check for multicollinearity (high intercorrelations) among the predictor (independent) variables. However, there is no formal way in the logistic regression procedure of SPSS to test for multicollinearity. According to Pallant (2013), multicollinearity exists when the independent variables are highly correlated (r =.8 and above). While singularity occurs when one independent variable is actually a combination of other independent variables (e.g. when both subscale scores and the total score of a scale are included) (Pallant, 2013).

Multivariate inferential statistics were performed using Exploratory Factor Analysis (EFA) procedure in SPSS. However, the EFA entailed using Principal Component Analysis (PCA) to see if the observed variables loaded together as expected, were adequately correlated, and met the relevant criteria of reliability and validity (Pallant, 2013).

4.6.1 Principal Component Analysis.

The study carried out a principal component analysis (PCA) on the variables that had significant statistical associations with hypertension diagnosis of the respondents. The Kaiser-Meyer-Olkin (KMO) (0.673) and Bartlett's test for sampling adequacy was significant. The PCA reduced the

12 variables into five components with interrelated variables. The findings are presented in Table 4.8.

Table 4.8 Principal Component Analysis of the Significant Variables

Significant Variable	Age/Time factor	Income Factor	Mitigating factor	Knowledge on HBP risk factor	Smoking Factor
Age	0.743				
Alcohol usage time	0.655				
Marital status	0.595				
Complications of hypertension		0.411			
Rank		0.845			
Salary scale		0.839			
Diagnosis with hypertension			0.815		
Regular check-ups			0.795		
Blood relatives with hypertension			0.506		
Diet rich in fruits and vegetables				0.881	
Activities that cause an increase in breathing				0.875	
Tobacco use					0.885
Total	2.946	1.708	1.457	1.049	1.012
% of Variance	24.55	14.23	12.14	8.75	8.44
Cumulative %	**24.55**	**38.78**	**50.92**	**59.67**	**68.11**

The results in table above indicate that the five factors account for 68.11% of the total variation in the data. These factors are age, income, mitigating factor, knowledge of hypertension risk factors as well as smoking factor. The_findings show that the age of the respondents (0.743) is intercorrelated to how long one has been drinking alcohol (0.655) as well as his/her marital status (0.595). Moreover, this age-related component accounts for 24.55% of the total variation. The five components of age, income, mitigating factor, knowledge on hypertension risk factors, as well as smoking factor, were then used to guide the multivariate logistic regression, with at least one item from each component included in the logistic regression model.

4.6.2 Multivariate Logistic Regression Analysis.

Multiple regressions do not like multicollinearity or singularity, as these seriously affect the regression model, thus the need to address them before analysis (Pallant, 2013). Therefore, the study used the Exploratory Factor Analysis (EFA) procedure in SPSS to first group the variables based on their intercorrelations. The EFA entailed using Principal Component Analysis (PCA) to see if the observed variables loaded together as expected, were adequately correlated, and met the relevant criteria of reliability and validity. In order to achieve the best possible interpretation of the factors within this PCA, the Varimax rotation method was utilised (Pallant, 2013).

The factor loadings equal to or above 0.30 are considered practically significant and to assess the factorability of items, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of sphericity were examined. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA) measures whether or not the distribution of values is adequate for conducting factor analysis, with a sampling adequacy greater than (>) 0.60 considered satisfactory factorability (Tabachnick & Fidell, 2007). In addition, the Bartlett's Test of sphericity (p-values) examines whether the variables in the population are uncorrelated. Therefore, a Bartlett's Test of less than (<) 0.05 suggests satisfactory factorability for all items (Hair et al., 2013).

Multivariate logistic regression analysis was run using the five component factor items that were found to be significant. This was done to eliminate the effect of possible confounders and to determine the true significant factors among all factors with potentially significant associations with hypertension. These factors are age, marital status, tobacco use, blood relatives with hypertension and going for regular checks

The results of the logistic regression analysis are presented in Table 4.9.

Table 4.9 Multivariate logistic regression analysis results

Variables	Multivariate Logistic Regression of Hypertension Diagnosis						Hypothesis supported	
	B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**H1**	**H2**
Constant	-4.82	1.53	9.908**	1.00	**0.002**	0.01		
Regular check-ups (mitigating factor)	2.16	0.28	59.04**	1.00	**0.000**	**8.70**		**Yes**
Blood relatives with hypertension	1.12	0.24	20.92**	1.00	**0.000**	**3.06**	**Yes**	
Age	0.42	0.09	22.245**	1.00	**0.000**	1.51	**Yes**	
Marital status	-0.11	0.17	0.45	1.00	0.504	0.89	No	
Tobacco use (Smoking rate)			9.45	5.00	0.093			No
Only when drinking alcohol	2.12	1.22	3.03	1.00	0.082	8.33		No
Weekly	2.05	1.36	2.28	1.00	0.131	7.80		No
Twice weekly	0.63	1.48	0.18	1.00	0.670	1.88		No
Daily	4.22	2.10	4.04*	1.00	**0.044**	**67.76**		**Yes**
Every two hours	2.88	1.34	4.63*	1.00	**0.031**	**17.90**		**Yes**
Salary scale (Income related)	-0.13	0.17	0.57	1.00	0.450	0.88	No	
Complications of hypertension			6.43	2.00	0.040		No	
Not Aware	1.78	0.95	3.53	1.00	0.060	5.94	No	
Neutral	2.00	0.79	6.37*	1.00	**0.012**	**7.35**	**Yes**	
Diet rich in fruits and vegetables (dietary patterns)	-0.25	0.22	1.33	1.00	0.248	0.78		No

Note: If the ρ value ≤ 0.05, then this indicates that the corresponding variable is significantly associated with changes in the baseline odds of non-hypertensive.

Multivariate logistic regression analysis results of this study indicate that age, having blood relatives with hypertension and tobacco use on a daily basis or every 2 hours were statistically significantly associated with hypertension. However, marital status (0.504) and salary scale/income (0.450) were not statistically significantly associated with hypertension. Similarly, behavioural risk factors such as diet (0.248), tobacco use (0.093), and frequency of tobacco use on a weekly basis (0.067) or when consuming alcohol (0.082) showed no statistically significant association with hypertension.

Hypothesis 2: Primary hypertension is not associated with modifiable risk factors such as alcohol use, physical activity, tobacco use, dietary patterns and overweight/obesity among military personnel at the Peter Mweshihange Military Health Centre in Windhoek.

According to the results indicated in table 4.9 above, this study support the null hypothesis above which state that tobacco use on a daily basis (0.044) or every 2 hours (0.031) is associated with hypertension. This study rejects the null hypothesis which states that hypertension is not associated modifiable risk such as tobacco use. However, the study fail to reject the null hypothesis which state that modifiable risk factors such as physical activity, obesity/overweight, dietary patterns and alcohol use among military personnel is Peter Mweshihange Military Health Centre.

Hypothesis 1: Primary hypertension is not associated with non-modifiable risk factors such as age, gender, rank, education, division and income among military personnel at Peter Mweshihange Military Health Centre.

The *findings in table 4.9 showed* that hypothesis 1 was supported by the findings on age non-modifiable risk factor. The findings indicated that there is a statistically significant relationship between age and hypertension. Older respondents get an increase in their hypertensive risk (p value = 0. 0.000). The study rejects the hypothesis which states that that non modifiable risk factor such as age is not associated with hypertension. However, the study fail to reject the hypothesis which states that hypertension is not associated with non-modifiable risk factors such as gender, rank and division among military personnel.

4.7 SUMMARY.

This chapter presented the treatment and modification of data variables towards testing the research hypotheses and a detailed bivariate and multivariate description of the results obtained. Data on demographic, socio economic, behavioural risk factors as well as health questions on mitigating factors for hypertension were obtained from the participants. Furthermore, the study used a likert scale to assess the knowledge of respondents on hypertension risk factors. Overall, the study found that age (0.000), frequency of tobacco use on a daily basis (0.044) or every 2 hours (0.031), knowledge on complications for hypertension (0.012), and having blood relatives with hypertension were statistically associated with hypertension. While going regular check -ups (0.000) was found to protective against hypertension.

The next chapter deals with the discussion of findings, conclusions, recommendations and limitations of the study

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents a discussion of the findings, controlled by the literature on the risk factors for hypertension among military personnel at Peter Mweshihange Military Health Centre as well as the general / civilian population globally, regionally and locally. Subsequently, conclusions based on the study objectives and assumptions are provided. Recommendations are made based on the findings of the study, and finally, the limitations encountered during this study are also outlined.

5.2 DISCUSSION

The study assessed the risk factors associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek. The study carried out bivariate analyses both by descriptive statistics and multivariate inferential statistics. Principal component analyses were carried out on variables that were significant in cross-tabulation in order to determine the true significant variables. Multivariate logistic regression was then performed using the five component factor items (age, income, mitigating factor, knowledge on hypertension, and smoking) that were found to be significant in order to determine which factors supported the hypotheses outlined in Chapter 1 of this study.

The findings of the bivariate analysis indicated that non-modifiable risk factors such as age (0.001), military rank (0.005) and salary scale (0.052), were significantly associated with

hypertension. Modifiable risk factors such as tobacco use (0.025), and alcohol use (0.001) were found to be significantly associated with hypertension. While health questions related to hypertension such as blood relatives with hypertension (0.001), regular check-ups (0.001), taking prescribed medication (0.001), were significantly associated with hypertension. The results indicated that respondents had knowledge about activities that cause an increase in breathing ($T = 2.57$, $p = 0.01$), thus leading to a reduction of risks of hypertension.

The findings from multivariate logistic regression found age (0.000), the frequency of tobacco use on a daily basis (0.044) or every 2 hours (0.031), blood relatives with hypertension (0.000), knowledge on complications for hypertension (0.012), and having blood relatives with hypertension were statistically significantly associated with hypertension. While going regular check -ups (0.000) was found to be protective against hypertension.

5.2.1 Non-modifiable risk factors for hypertension

The literature has shown that non-modifiable risk factors such as age, marital status, rank and salary are significantly associated with hypertension among military personnel (Beigi, et al., 2014; Mundan et al, 2013; Hendriks et al., 2012). A report by the Namibian Ministry of Health and Social Services indicated that the proportion of overweight/obese women and men increased with increasing age and wealth quintile (MoHSS, 2014). Similarly, the findings of this study suggest that the age, rank and salary levels of the military personnel at the Peter Mweshihange Military Health Centre significantly influence their lifestyles and are directly associated with the non-modifiable risk factors for hypertension. Therefore, it is concluded that military personnel, some of whom are middle-aged, and some who live sedentary lifestyle may be at a risk of obesity and hypertension.

Gender and hypertension

The study indicates that the majority (69.7%) of the respondents were male as compared to 30.3% of females. Similarly, a study conducted by Mundan et al. 2013 among the Kenyan military also found that most of the participants were male. This may indicate that the military is a male-dominant profession.

A majority (64%) of the female respondents were diagnosed with hypertension. However, the findings of this study reflected that there is no statistical significance association between gender and hypertension since the determine p value is 0.61.

Age and hypertension

Older age was found to be among the non-modifiable demographic risk factors hypothesized to be associated with hypertension. The findings of this study indicate an increasing proportional progression of hypertension diagnosis from the 36 – 40 years age group (59 %) that peaks at 78.6% for the 50 – 55 years age group while age group 31- 35 had the lowest 36.4% of hypertension. Similar studies have found older age to be significantly associated with hypertension (Kaputjaza, 2017; Beigi, et al., 2014; Mundan et al, 2013; Hendriks et al., 2012). This because the elasticity of blood vessels decreases with old age, a condition which results in increased peripheral resistance, and subsequent high blood pressure (WHA, 2016; WHO, 2019). Although high blood pressure increases with age, adopting a positive lifestyle such as weight reduction, engaging in physical activity for weight reduction, avoidance or cessation of smoking, and a low sodium diet, may reduce the effect high of blood pressure associated with age (World Heart Federation, 2016).

The findings revealed that the age of the respondents was significantly related to hypertension, indicating a mild positive association ($r = 0.283$, $p < 0.01$) and goodness of fit association ($\chi 2 = 45.145$, $df = 6$, $p = 0.0001$). Thus the findings suggest an increased risk of hypertension as the respondents get older. The indication of increasing age as risk factor for hypertension thus justified the use of the age group variable in the logistic regression analysis.

Marital status and hypertension

This study found that there was significance association between hypertension and marital status ($r = 0.100$, $p < 0.05$). However, this study found the Chi-square p-value ($p = 0.088$) to be greater than the significance level (0.05), suggesting that hypertension and marital status were independent of each other. In addition, the findings indicated that, while the results for the married (46.9%) and unmarried (46.1%) respondents were comparable, the married cohort had a higher proportion of hypertension diagnoses (62.3% than their unmarried (53.1%) or cohabiting (52.6%) counterparts. On the other hand, the divorced respondents (1.5%) indicated the highest proportion of hypertension diagnosis (100%) and those separated (0.4%) showed the least proportion of 50%. Similarly, Kaputjaza (2017) found that being married was significantly associated with increased odds of having hypertension ($P < 0.0005$). This finding could also be linked to age which is a known risk factor for hypertension hence most of married people could be between the age of 31 and above.

Military rank and hypertension.

The findings also indicated that the majority of the respondents fell under the Non-Commissioned Officers (NCOs). Senior NCOs (38.6%) like Sergeants and Warrant Officers and Junior NCOs, such as Lance Corporals and Corporals represented the majority of Namibian military ranks together with Private ranks (6.8%) who are most likely new recruits or just lowly ranked soldiers.

Military rank shows a statistically significant association with hypertension ($p = 0.005$). Similarly, a study by Smoley, Smith and Runkle (2008) found that multivariate logistic regression showed senior rank were independently associated with an increased odds of having hypertension among the service members ($P < 0.01$). The findings of this study also indicated that senior commissioned officers (Major –Colonel) had the highest proportion (70%) of hypertension compared to privates, with a proportion of 45.2 %. The high prevalence of hypertension among senior commissioned officers may be related to age since majority of senior officers could be those who are approaching 50 and 60 years. Therefore, the study which was done by Smoley and others found that rank and age were only moderately correlated with each other at Spearman's rank coefficient of 0.65 (Smoley et al., 2008).

5.2.2 Modifiable risk factors of hypertension.

In this study, modifiable risk factors such as obesity/overweight, tobacco use, alcohol use, physical activity and dietary patterns were evaluated. Modifiable risk factors to hypertension refer to the factors that are associated with the occurrence of hypertension which, however, can be avoided or changed (Soohyun, Whittemore, Sangchoon, Davey-Rothwell., & Latkin. 2016). These factors include behavioural factors such as tobacco smoking, alcohol abuse, excessive salt intake and a

sedentary lifestyle (Cunha & Mark, 2011). This section and its subsections provide cross-tabulated descriptive statistics of the modifiable risk factors and their association to hypertension diagnosis among the military personnel at Peter Mweshihange Military Health Centre in Windhoek.

Obesity and hypertension

Obesity/overweight was assessed by asking the respondents whether they maintained a healthy body weight or not. The findings indicated that 74.7% of the respondents maintained a healthy body weight, while 25.30% of the respondents did not maintain a healthy body weight. The participants who did not maintain a healthy body weight was shown to be a 63, 80% of risk for hypertension. However, the results show no significant association (p value 0.1000) between having a healthy body weight and being diagnosed with hypertension among the military population under study. The study failed to measure variables on obesity and overweight such as weight, height, waist circumference and hip circumference as these measures have implications for hypertension.

On the contrary, WHO studies has shown that obesity and overweight are linked to hypertension (WHO, 2016a; WHO, 2016b).

Tobacco use and hypertension

Several studies have found tobacco use to be associated with hypertension (Mundan et al., 2013; Mohammed, 2012; Cunha & Mark., 2011; WHO, 2015). Mundan et al. (2013) indicated that about 11% of hypertensive respondents were current smokers compared to 4.2% of normotensives. This study also found a correlation between this risk factor and hypertension among the study respondents. Thus, more respondents who smoked had hypertension compared to fewer

respondents who smoked and had normal blood pressure, as indicated by the P value of 0.02 statistical significance of tobacco smoking and hypertension.

Contrary to the findings this study, however, Aripin (2016) and Kaputjaza (2017) found no association between tobacco use and hypertension. These contradictory results from these studies with regard to the relationship between tobacco use and hypertension still need authentication concerning this relationship. However, several studies, support the findings of this study, stating that smoking is one of the risk factors for hypertension as it causes arteriosclerosis, subsequent peripheral resistance and the resultant hypertension (MoHSS, 2014; Mundan et al., 2013; Mohammed, 2012; Cunha & Mark., 2011; WHO, 2015**).** In another study, Mohammed (2012) further noted that tobacco usage was associated with 70.6% of the hypertension cases.

Alcohol use and hypertension

The study findings on bivariate analysis indicated that years of continual drinking ($\chi 2$ = 21.556, df = 6; P = 0.001) were significantly associated with the risk for hypertension. Similarly, previous studies have shown that alcohol is associated with hypertension (Mundan et al., 2013; Soghum et al, 2016, Janet, 2011, Mohammed, 2012). The 2014 World Health Organization global status report on alcohol revealed that 27.7% of Namibians aged 15 years and above consume alcohol, with beer accounting for 97% of all consumed alcohol (WHO, 2014). The Namibia Demographic Health Survey (2014) also reported that about 9.5% and 12.4% of women and men respectively reported that they had consumed alcohol on average five days prior to the survey commencement in 2013 (MoHSS, 2014). In the same report, men were found to consume three or more (52.8%) drinks of alcohol per day than their female (34.1%) counterparts (MoHSS. 2014).

High consumption of alcohol has been related to the rise of blood pressure over the years. A number of studies have shown that excessive alcohol intake can increase the chance of other medical issues, such as obesity, that may lead to an increase in blood pressure and the subsequent hypertension (Soghum et al, 2016; Mundan et al., 2013; Mohammed, 2012; Janet, 2011).

However, this study on multivariate analysis did not find years of continual drinking of alcohol to be statistically significance with hypertension. Similarly, an epidemiological study which was done in the Khomas Region also did not find alcohol use to be associated with hypertension (Kaputjaza, 2017)

Physical activity and hypertension

This study found that total of 241 (52.6%) respondents did not perform any physical activities. The respondents who did not perform physical activities, 59.3 % has hypertension. Studies have shown that people who physically inactive are obese and are at high risk of developing hypertension (Kaputjaza, 2017; Mundan et al., 2013; Soohyun et al., 2016). The finding from the 7 point likert scale of the current study found that the non-hypertensive respondents were more engaged in activities that cause an increase in breathing, leading to a reduced risk of hypertension. However, this study found no significant association between physical inactivity and hypertension ($\chi 2$ =10.215, df = 2; P = 0.25).

Diet and hypertension

In this study the association between dietary patterns were assessed to asking respondents' consumption of fruits and vegetables. This study reviewed that the respondents consumed

fruits mostly on a monthly basis were 192 (41.9%), while vegetable was consumed mainly weekly (41.9%). This study did not find any association between diet and hypertension both on bivariate analysis and multivariate logistic regression analysis.

However, Mundan et al. (2013) found that low intake of fruits were significantly associated with hypertension. Nevertheless, their study focused more on the consumption of red meat than fruits and vegetables, noting that people with daily higher consumption of red meat were more at risk of developing hypertension than people who consume less red meat and more fruits and vegetables.

5.2.3 Health questions on hypertension

Health questions on hypertension include the utilization of health facilities, taking prescribed medication, knowledge of risk factors that cause hypertension, having blood relatives with hypertension, going for regular check-ups and maintaining a healthy body weight. The findings showed that having blood relatives with hypertension, regular check -ups, taking prescribed medications have a significant association with hypertension diagnosis.

The results of bivariate analysis indicated having blood relatives with hypertension and being diagnosed with hypertension were associated since determine p value is 0.001.The findings suggest that respondents with blood relatives with hypertension should be mindful of their health, as they are predisposed to also have hypertension. Therefore, they need to go for regular check-ups in order to get an early hypertension diagnosis ($\chi 2 = 93.294$, df = 1, p = 0.001) to keep their blood pressure under control through taking prescribed medication ($r = -0.983$, $p < 0.001$). Variables such as regular follow- up and blood relatives with hypertension were retained in multivariate logistic regression analysis.

5.2.4 Knowledge of Risk Factors for Hypertension

The study used Likert-scale statements in Section C of the questions to determine the respondents' level of knowledge about the exposure to risk factors contributing to hypertension. The study further used the independent sample T-test to determine whether there was any significant difference between the knowledge of those diagnosed with hypertension and the non-hypertensive. A P-value of less than 0.05 was interpreted as statistically significant. The study used a 7-point likert scale from strongly disagree (1) to strongly agree (7). As such, findings which show mean values above 5 suggest that the respondents mostly agreed with the statements.

The results found that activities that cause increase in breathing and diet that is rich in fruits and vegetables showed significant differences between the hypertensive and non-hypertensive. In this regard, the non-hypertensive had a high level of knowledge of the benefits of consuming a diet rich in fruits and vegetables compared to the lower mean in the hypertensive participants**.** 2.57, p = 0.01), leading to a reduced risk of hypertension. Additionally, the non-hypertensive (M = 6.15, S.D. = 1.28) had a high level knowledge of the benefits of consuming a diet rich in fruits and vegetables (T = 1.908, p = 0.06), compared to the lower mean in the hypertensive respondents (M = 5.90, S.D. = 1.44). Overall, both non-hypertensive (M = 6.26, S.D. = 1.32) and hypertensive (M = 6.30, S.D. = 1.06) had high levels of knowledge of the complications of hypertension. Knowledge about a sedentary lifestyle, such as spending at least 8 hours on the computer, leads to high blood pressure.

5.3. CONCLUSION

The study was carried out in Windhoek to assess the risk factors associated with hypertension among military personnel at Peter Mweshihange Military Health Centre. Interviewer administered questionnaires were used to collect data with simple random sampling. The conclusion of this study is linked and presented according to the objectives of the as follows;

Objective 1: **To determine the risk factors that are associated with primary hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek**

The findings indicated that 55. 8% of the respondents were diagnosed with hypertension for which male gender was predominant. Demographic and socio-economic factors such as gender age, military rank and marital status of the respondents were also evaluated. Behavioural risk factors such as tobacco use, alcohol use, diet, physical in activity and overweight/obesity were explored. Variable such as blood relatives with hypertension, taking prescribed medication and going for regular follow-ups were also evaluated since they were relevant to the study. Lastly, a 7 point Likert scale was used to determine the respondents' knowledge of the risk factors for hypertension.

Non- modifiable risk factors such as age, marital status and military rank were found to be associated with hypertension among the respondents. Modifiable risk factors such as alcohol use and tobacco use were found to be associated with hypertension among the respondents. Furthermore, the findings indicated that the participants had knowledge that risk factors such as physical inactivity, unhealthy diet (lack of fruits & vegetable, salty food) are associated with hypertension.

Objective 2: To determine the association between primary hypertension and demographic factors among military personnel at Peter Mweshihange Health Centre in Windhoek.

Hypertension among the military personnel in Windhoek was associated with older age (> 36 years old), marital status (being married) and higher military rank (Major –Colonel). Furthermore, a salary scale of less than N$ 5000 or equal was found to have an association with hypertension as determined by p value of 0.052. Therefore, hypertension among military personnel at Peter Mweshihange Military Health Centre is prevalent in older male who are married and of low economic status including high military ranked commissioned officers. Older age is the most significant demographic factor found to be associated with hypertension in this study.

Objective 3: To determine the association between primary hypertension and behavioural risk factors (alcohol use, physical inactivity, tobacco use, dietary patterns and overweight/obesity) among military personnel at Peter Mweshihange Military Centre in Windhoek.

The study found that hypertension and behavioural risk factors such as dietary patterns, physical inactivity and obesity were not associated. The results from the 7 point Likert scale assessing the respondents' level of knowledge to the exposure to risk factors of hypertension indicated that military personnel had knowledge of diet and physical activity which can avert the risk of hypertension. Consequently, the non-hypertensive was more engaged in activities that cause an increase in breathing, leading to a reduced risk of hypertension. Additionally, the non-hypertensive had a high level of knowledge of the benefits of consuming a diet rich in fruits and vegetables compared to the lower mean in hypertensive.

This study found that hypertension was significantly associated with continuous alcohol use and frequency of tobacco use. Therefore, reducing alcohol and tobacco use may result in reduced hypertensive cases among the military personnel in Windhoek and as a result, increase the quality of life for the military personnel.

5.4. LIMITATIONS

This study was carried out among the military personnel who were trained to maintain military confidentiality for national security. Therefore, participants may have refrained from providing information which they thought could compromise national security. Due to financial constraints, the study was carried out in Windhoek among military personnel and study results will only be generalized to military personnel who make use of military health facilities. An interviewer administered questionnaire was used to collect the data; therefore interviewer bias could occur due to interpretation differentials. To prevent interviewer bias, the interviewers were trained on how to use data collection tool

The study failed to compare different variables on the basis of educational status of the military personnel, which may have missed critical analysis on which education level is mostly affected by hypertension, an important guide for intervention. The study also failed to measure variables on obesity and overweight such as weight, height, waist circumference and hip circumference as these measures have implications for hypertension. Due to low participation, data collection took over a month instead of two weeks as initially planned.

Finally, this was a cross sectional study. Therefore, due to the design characteristics the causal relationship between the risk factors (exposure) and hypertension (outcome) may not be strongly established.

5.5. RECOMMENDATIONS

The following recommendations were made based on the findings.

5.5.1 Recommendation to the Namibian Defence Force

- Building of free recreational gyms to promote physical activity in the military barracks and garrisons.
-

5.5.2 Recommendations to Peter Mweshihange Military Health Centre Management.

- The study recommends integration of screening for risk factors for hypertension at Peter Mweshihange Military Health Centre for early detection and control.
- Surveillance, educational and awareness programmes on hypertension risk factors be maintained among military personnel at Peter Military Health Centre.
-

5.5.3. Recommendations to health care workers

- Regular screening of military personnel for blood pressure, weight and height.
- Health education on the risk factors for hypertension among the military personnel.
- Health education on modification of lifestyle, such as reduction of alcohol consumption, cessation of tobacco use, eating a healthy diet, avoiding obesity by exercising especially in

order to maintain a healthy body weight especially when above 30 years to be adhered to by military personnel at Peter Mweshihange Health Centre in Windhoek

5.5.4 Recommendations to military personnel

- Military personnel should go for regular blood pressure check-ups especially those who have blood relatives with hypertension whether they are hypertensive or not hypertensive for early detection and control.
- Avoid use of tobacco.
- Reduce alcohol consumption to **not more than** 750 ml of beer, or 300 ml of wine, or 60 ml of whiskey per day.
- Healthy diet of: more fruits and vegetables, reduction of the intake of foods that are high in saturated fats, avoidance of trans fat and sodium intake to not more than 2.3g per day
- Being physical active on the regular basis by exercising regularly reduces the chance of high blood pressure.
- Rest, by having enough sleep because getting enough sleep is important for keeping your heart and blood vessels healthy and for your overall health.

5.5.5 Recommendation for further research.

- Further research is recommended among military personnel with different research design such as case-control studies necessary to assess the disease status (cases and controls) of the respondents at the beginning of the study by measuring their blood pressure.

5.6. SUMMARY

This chapter presented the information on the discussion, conclusions, limitations as well as the recommendations of the findings of the study. The study employed a quantitative cross-sectional analytic study to answer to the question as to whether modifiable and non-modifiable risk factors were or were not associated with hypertension among the military personnel at the Peter Mweshihange Military Health Centre in Windhoek.

The findings of the bivariate analysis indicated that non-modifiable risk factors such as age (0.001), military rank (0.005), and salary scale (0.052) were significantly associated with hypertension. Modifiable risk factors such as tobacco use (0.025) and alcohol use (0.001) were found to be significantly associated with hypertension. Other variables such as regular check-ups (0.001), blood relatives with hypertension (0.001and taking prescribed medications (0.001), were also found to be significantly associated with hypertension. Furthermore, the results indicated that the respondents had knowledge about activities that cause an increase in breathing ($T = 2.57$, $p = 0.01$), thus leading to a reduced risk of hypertension.

Multivariate logistic regression was performed on variables that were found to be significant in the bivariate analysis. The findings from multivariate logistic regression found age (0.000), the frequency of tobacco use on a daily basis (0.044) or every 2 hours (0.031), blood relatives with hypertension (0.000), knowledge on complications for hypertension (0.012), and having blood relatives with hypertension were statistically significantly associated with hypertension. While going for regular check -ups (0.000) was found to be protective against hypertension.

It is recommended that surveillance, prevention, educational and awareness programmes on hypertension risk factors be maintained among military personnel at Peter Military Health Centre. Modification of lifestyle, such as limiting or stopping alcohol consumption, reducing or limiting tobacco use, eating a healthy diet, avoiding obesity by exercising regularly especially when above 30 years need to be adhered to by military personnel at Peter Mweshihange Health Centre in Windhoek. Further research, particularly with a different study design like case control-study, is necessary to assess the disease status (cases and controls) of the respondents at the beginning of the study by measuring their blood pressure. Furthermore, military personnel should go for regular blood pressure check-ups especially those who have blood relatives with hypertension whether they are hypertensive or not hypertensive for early detection and control in order to have a combat-ready defence force.

REFERENCES

Aliyu, S. U., Oyeyemi, A. Y., Udoh, D. G., & Oyeyemi, A.L. (2014). Prevalence of Overweight/Obesity and Undiagnosed Hypertension among military personnel in Maiduguri, Nigeria.J Nov Physiother: 223.doi:10.4172/2165-7025.1000223

Aripin. (2016). Risk Factors of Hypertension among Adults in Banyuwangi: A Case Control Study. Public Health and Preventive Medicine Archive, 3(2), 19690. Retrieved from Http://ojs.unud.ac.id/index.php/phpma/article/view/19690.

Badzri, S. B., Bakar, A. K. B. A., & Clare, V. (2018, April 16). Challenges and Effective Strategy [for Managing Occupational Health and Industrial Hygiene at Onshore Remote Environments of Garraf, Iraq Operation. Society of Petroleum Engineers. Doi: 10.2118/190689-MS.

Beigi, M. A., Zibaeenezhad, M. J., Aghasadeghi, K., Jokar, A., Shekarforoush, S., & Khazraei, H. (2014). The effect of educational programs on hypertension management. *International cardiovascular research journal*, *8*(3), 94-98.

Brink, H., Van der Walt, C., & van Rensburg, G. (2012*). Fundamentals of Research Methodology for Healthcare Professionals*. 3rd Edition, Cape Town: Juta & company Ltd.

Burns, N. and Grove, S. K. (2011). *Understanding nursing research: building an evidence based practice.* 5th edition. Mossouri: Elservier Saunders

Craig, L.S., Gage, A.J, & Thomas, A.M. (2018). Prevalence and Predictors of Hypertension in Namibia: A National- level cross -sectional study: PLoS One.2018 Sep20; 13(9):e0204344.doi: 10.1371/journal.pone.0204344.eCollection2018.Creswell, J. (2014). *Educational Research:*

Planning, Conducting and Evaluating Quantitative and Qualitative research. (4th Ed).England: Pearson Education Limited.

DeFranzo, S. E. (2011, September 16). *What's the difference between qualitative and quantitative research?* Retrieved from Snap Survey: https://www.snapsurveys.com/blog/qualitative-vs-quantitative-research/

De Vos, A. S., Strydom, H., Fouche, C. B. and Delport, C. S.(2011). *Research at grassroots for social sciences and human services professional.*4th edition. Pretoria: Van Schaik.

Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and Perspectives, 38*(1), 105-124.

Dusek, J. A., Hibberd, P. L., Buczynski, B., Chang, B. H., Dusek, K. C., Johnston, J. M., & Zusman, R. M. (2008). Stress management versus lifestyle modification on systolic hypertension and medication elimination: a randomized trial. *Journal of Alternative and Complementary Medicine, 14*(2), 129-138.

Eriksen, E., Mackay, J., Schulger, N., Gomeshtapeh, F. I., & Drope, J. (2015). The Tobacco Atlas (Fifth). Atlanta, Georgia: American Cancer Society, Inc. Retrieved from www.cancer.org

Fox, S.I. (2018). Human Physiology. 4th Edition. New York: McGraw-Hill Education International Edition.

Hair, J. F., et al. 2013**.** *Multivariate Data Analysis.* 7th. USA: Pearson Prentice Hall., 2013.

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-based nursing*, ebnurs-2015.

Hendriks, & Marleen. (2014). *Cardiovascular disease prevention in a health insurance program in rural Nigeria.* Amsterdam: University of Amsterdam.

Hendriks, M. E., Wit, F. W., Roos, M. T., Brewster, L. M., Akande, T. M., de Beer, I. H. & Janssens, W. (2012). Hypertension in sub-Saharan Africa: cross-sectional surveys in four rural and urban communities. *PloS one, 7*(3), 326-338

Janet, O. K. (2011). *PREVENTION AND MANAGEMENT OF HYPERTENSION: A study on knowledge and attitudes of women of childbearing age.* Central Ostrobothnia University of Applied Sciences.

Kaputjaza, D. M. (2017). An epidemiological investigation on risk factors for hypertension in Khomas Region. Windhoek: University of Namibia.

Kasa, A. S., & Shifa, A. K. (2016). Prevalence and Assessment of Knowledge and Practice Towards Hypertension among Bahir Dar City Communities, 2016: A Community Based Cross-sectional Study. *Journal of Hypertension: Open Access, 6*(3), 2167-1095.

Khoshdel, A., Seyed, M. S., & Seyed, T. H. (2012). The Prevalence of Cardiovascular Disease Risk Factors, and Metabolic Syndrome among Iranian Military Parachutists. *International Cardiovascular, 6*(2), 51-55.

Klatsky, A. L., & Gunderson, E. (2016). Alcohol and hypertension: a review. *Journal of the American Society of Hypertension, 2*(5), 307-317.

Lajous, M., Bijon, A., Fagherazzi, G., Rossignol, E., Boutron-Ruault, M-C., & Clavel- Chapelon, F. (2014). Processed and unprocessed red meat consumption and hypertension in women. the

American Journal of Clinical Nutrition, Volume 100, Issue 3, September 2014, pages 948- 952, https//doi.org/10.3945/ajcn.113.080598

Maninder, S. S. (2016, June). *Methodology Series Module 3: Cross-se5ctional Studies*. Retrieved from US National Library of Medicine National Institutes of Health.

Ministry of health and Social Services. (2013). Namibia Demographic Health Survey. Windhoek.

Ministry of Health and Social Services. (2014). *Namibia Demographic and Health Survey 2013*. Windhoek: Namibia Statistical Agency.

Mohammed, J. (2012). Knowledge of, and Attitude to Cardiovascular Disease Risk Factors Among Members Of The Nigerian Armed Forces. *Cardiovascular Disease Risk Factors among Nigerian Armed Forces Servicemen*, 23.

Mundan, V., Muiva, M., & Kimani. S (2013). Physiological, Behavioral, and Dietary Characteristics Associated with Hypertension among Kenyan Defence Forces. *Hindawi Publishing Corporation*.

Pallant, J. 2010. *SPSS survival manual: A step by step guide to data analysis using SPSS.* England: Open University Press, 2010.

Penn State Graduate Training Centre. (2010). Strategies for Writing Literature Reviews. Penn State Graduate Centre.

Preetha, A., Abraham, M. A., Russell, D. W., Huffman, S., Deuster, P., & Gibbons, W. (2018). Army combat medic resilience: The process of forging loyalty. Doi:10.1093/milmed/. Military

medicine, vol.183, March/April supplement 2018. Retrieved from https usx321:// academic.oup.com/milmed/article-abstract/183/suppl-1/364/496000 on 18 September 2018.

Singleton, R. A., & Straits, B. C. (2010). *Approaches to Social Research* (5 Ed.). New York: Oxford University Press.

Smoley, B. A., Smith, N. L., Runkle, G. P. (2008). Hypertension in a Populated of Active Duty Service Members. The Journal of the American Board of Family Medicine November 2002, 21(6) 504-511; DOI: https://doi.org/org/10.3122/jabfm.2002.060070182.

Soohyun, N., Whittemore, R., Sangchoon, J., Davey-Rothwell, M. A., & Latkin, C. (2016). High Blood Pressure and Related Factors Among Individuals at High Risk for HIV/Sexually Transmitted Infections. *Johns Hopkins School of Public Health, 18*(6), 572–580.

Stamler, J., Chan, Q., Daviglus, M.L., Dyer, A.R., Van Horn, L., Garside, D.B., Miura, K., Wuu, Y., Ueshima, H., Zhao, L, & Elliot, P. (2018).Relation of Dietary sodium (salt) to blood pressure and its possible Modulation by Other Dietary Factors Relation of Dietary Sodium (Salt) to Blood Pressure and Its Possible Modulation by Other Dietary Factors: The INTERMAP Study and for the INTERMAP Research Group: https//doi.org/10.1161/HYPERTENSIONAHA.117.00928Hypertension.2018;71:631-637.

Tabachnick, B. G. and Fidell, L. S. 2007. *Using multivariate statistics.* Boston: Pearson/Allyn & Bacon., 2007.

World Heart Federation. (2016). Hypertension and Cardiovascular Disease. Retrieved from http://www.world-heart-federation.org/cadiovascularhealth/cardiovascular-disease-risk-factors/hypertension.

World Heart Federation. (2012). Tobacco: totally avoidable risk factor of cardiovascular diseases.

World Heart Federation. (2012). Tobacco : *totally avoidable risk factor of CVD.* World Health Organization. (2013). A global brief on Hypertension World Health Day 2013. Geneva: World Health Organization.

World Health Organization. (2014).Global status Report on Alcohol and Health. Global Status report on alcohol. Retrieved from http://www.who.int/substance_abuse/publications/global_alcohol/msbgsrupr ofiles.pdf.

World Health Organization. (2011). Global Atlas on cardiovascular disease prevention and control. (S. Mendis; P. Puska, & B. Norrvings, Eds.). Geneva: World Health Organization.

World Health Organization. (2016a). Global Health Observatory (GHO) data overweight and obesity.

World Health Organization. (2019). High Blood Pressure. Global Heath Observatory (GHO) data. Retrieved September 9, 2019, from http://www.who.int/gho/ncds/risk-factors/blood-pressure-prevalence-text/en/.

World Health Organization. (2015). *Non communicable diseases and mental health*. Retrieved fromWorldHealthOrganisation:http://www.afro.who.int/health-topics/noncommunicable-diseases.

World Health Organization. (2016b) Obesity and overweight. Geneva.

World Health Organization. (2008). Part 1: Introduction and Roles Overview. IN WHO STEPS Surveillance Manual.

World Health Organization. (2016c). WHO physical activity Media Centre physical activity. RetrievedSeptember18, 2018, from http://www.who.int/mediacentre/factssheets/fs385/en/#.

APPENDICES

APPENCICES A: INFORMED CONSENT FORM FOR PARTICIPATING IN A STUDY

TITLE: Assessing risk factors that are associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek

Dear participant

My name is **Lilian Njahi Muleya**; a registered post graduate student at the University of Namibia studying towards a master's degree in public health. I am currently in my final year, and as Masters' Degree prerequisite, I am conducting a research project titled: *Assessing risk factors that associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek.* The study will be conducted under the supervision of Dr Kristofina Amakali, school of Nursing, University of Namibia.

The purpose of the study: To explore risk factors are that associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek.

This study is being conducted to understand the risk factors that are associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek. The results will be used by other researchers that want to carry on the topic with the in-depth investigation and by the military facility for decision-making.

Your participation

You are being invited to take part in the study. You are selected randomly to participate in the study because you meet the participation criteria. You will be asked questions about hypertension, and how you try to avoid it.

Confidentiality

Whatever you say will be kept entirely confidential. Completed questionnaire will be stored in a lockable storage and will be strict accessible to the interviewer only. A soft copy of the questionnaire will be stored in the computer with a password and only be available to the researcher, supervisor and data analyst. Your interview will be conducted in a quiet room and

screen will be used to avoid any interruptions. The medic will sign a confidentiality clause to ensure that all information provided will be kept confidential.

Anonymity

Your name will not be written on the questionnaire, which means the questionnaire will not be linked to your name. Codes will be used instead. Moreover, your name or identity will not be shared with anyone when the study is reported or published. We appreciate that you will give honest answers to the questions to help us better understand this issue.

Voluntary participation and withdrawal

Your participation in this study is voluntary therefore you are under no obligation to participate. You are free to choose whether to take part in this study or not. If you choose not to take part, you will not be negatively affected in any way. If you choose to participate, you may stop at any time without any penalty. You are also free to choose to not answer particular questions that are asked during the discussion.

Risks and discomforts

We do not anticipate any major risk or discomfort for taking part in this study. However, if for any reason you think that you may become upset by taking part in the interview, please feel free to not participate. If you choose to take part, and if you feel uncomfortable about any question, or are troubled by things that are asked, I will be happy to provide you with information about where you can receive assistance to discuss this. The interview will take 15 – 20 minutes.

Benefits of the study

Although there are no costs to you for participating in this study other than the time you will spend during this discussion. The information you give will help formulate appropriate strategies for improving hypertension in Namibian military.

Ethical approval

The permission to conduct this study have been sought by the University of Namibia, School of Public Health Post Graduate Study committee, UNAM Research review Committee, the Ethics and Research Committee of the ministry of Health and Social Services (MoHSS). Also permission will be sought from the Ministry of Defence's directorate of health services.

Contacts and Questions

Should you have any questions regarding the study or participating in the study, feel free to contact Ms. Lilian Muleya at telephone number **061 276416**, cell phone number **0816452144** or email address **liliannjahi@gmail.com**. If you have any questions or concerns about the study, you may contact The University of Namibia for Dr Kristofina Amakali Telephone Number: +**264 61 206 3297**.

Agreement to participate (Separate sheets for each participant)

- I have read/heard the information sheet and had the opportunity to have my questions answered.
- I understand that whatever I say will be treated confidentially and will not be linked to my name.
- I understand that I can stop participating at any point and this decision will not affect me negatively.
- I understand that this is a research project and it will not necessarily benefit me personally.
- I am aware of the telephone number of a person I can contact should I have any questions or concerns about this study.
- My signature confirms that I am willing to participate in this study and agree to respect other participants' privacy and confidentiality.

I am signing to confirm that I agree to participate in the study and my questions have been answered.

Signature of participant _____ Date ___/____ / 2019

Signature of interviewer _____ Date___/ ____/ 2019

Signature of researcher _____ Date ___/____ / 2019

APPENCICE B: RESEARCH QUESTIONNAIRE

SURVEY INFORMATION

1	**Military Centre**	Peter Mweshihange Military Health Centre
2	**Location**	Suiderhof Military base Jakaranda street opposite SATCOM
3	Questionnaire number	D / M / Y - H : M
4	**Participant unique 1D**	

Study title: Assessing risk factors that are associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek

Dear participant

This questionnaire aims to explore the risk factors that are associated with hypertension among military personnel. The questionnaire consists of three sections namely: demographic data, risk factors and Likert scale where you are be required to state agree or disagree on the scale of 7. You be asked questions to provide answers and enumerator will enter your answers into the answer sheet.

SECTION A: DEMOGRAPHIC DATA

A 1 Gender

1=male	
2=female	

A 2 Age

Consider last birthday

A 3 Rank

A 4 Division

A 5 Marital status

1=never married	
2=married	
3=cohabiting	
4=divorced	
5=window/widower	
6=separated	

A 6 Educational status

1= never attended school	
2=completed primary school	
3=completed grade 10	
4=completed grade 12	
5= attended tertiary education	

If never go to A7

A 7 what is your salary scale

1= less than 5000	
2= 5000- 10000	
3=10000 – 20 000	
4= 20000- 30000	
5= 30000 and above	
6= information not diverged	

SECTION B BEHAVIOURAL INFORMATION

PHYSICAL ACTIVITY

B1 Do you do you physical activity?

1= yes	
2= No	

B2 Indicate type of physical activity do you perform

1= running	
2= jogging	
3= cycling	
4= walking	

B3 indicate the duration for the physical activity that you perform

1 = 30 minutes	
2= 1 hour	
3= 2 hours	
4= 3hours	

B4 Do you maintain healthy body weight (5–20 mmHg/10 kg?)

1= yes	
2= no	

TOBACCO USE

B 5 Do you smoke any tobacco products such as cigarette, cigars and pipes?

Yes	
No	
Stopped	

If no go to alcohol consumption

B 6 how often do you smoke?

1= every after two hours	
2=daily	
3= twice a day	

4=weekly	
5=once a month	
6=only when consuming alcohol	

B 7 how long have you been smoking?

ALCOHOL CONSUMPTION

B 8 Do you consume alcohol such beer, wine, tombo, ombike, castello?

1= yes	
2= no	
Stopped	

If no go to diet

B 9 how often do you consume alcohol?

1=every after two hours	
2=daily	
3=twice weekly	
4= weekly	
5=once a month	
6=when stressed	

B 10 How long you have been drinking alcohol?

DIET

B 11 Do you eat fruits such as apple, banana, oranges, onyandi, and oombe?

1= yes	
2= no	

If no go to B13

B 10 How often do you eat fruits?

1=daily	
2=twice weekly	
3= weekly	
4=once a month	
5=never	

B 11 Do you eat vegetables such as cabbage, pumpkin, lettuce, cucumber, omboga?

1= yes	
2= no	

If no go to B13

B 12 how often do you eat vegetables?

1=daily	
2=twice weekly	
3= weekly	
4=once a month	

5=never	

B13 does your involve lifting heavy objects?

1= yes	
2= no	

HEALTH QUESTIONS

B 15 Are you diagnosed with hypertension?

1= yes	
2= no	

If no, do not consider the next question

B 16 Do you go for regular check –ups?

1= yes	
2= no	

B 17 Are taking medication of any the following conditions?

1=Hypertension	
2=Diabetes mellitus	
3=Asthma	
4=cholesterol	

B 18 At which health facility do you collect your medications?

1=military facility	
1=private	

3=state	

B 19 Do you have blood relatives with history of hypertension?

1= yes	
2= no	

B 20 Do your work involve lifting heavy objects?

1= yes	
2= no	

B 21 Do you have any other heart related disease? (If yes Please explain)

_____

_____

_____

SECTION C: A LIKERT SCALE

For each of the statements below, please rate your answer and mark with (**x**) the appropriate box as:

STRONGLY AGREE (1); SLIGHTLY AGREE (2); AGREE (3); NEUTRAL (4); DISAGREE (5); SLIGHTLY AGREE (6); STRONGLY DISAGREE (7)

There are no "right or wrong" answers to these questions; so please be as honest and thoughtful as possible in your responses. All responses will be kept strictly confidential.

		1	**2**	**3**	**4**	**5**	**6**	**7**
SECTION C: KNOWLEDGE ON HYPERTENSION RISK FACTORS								
C1	I am aware of any complication of hypertension							
C2	I engage in regular vigorous physical activity (at least 30 minutes per day, most days of the week).							
C3	I engage in regular moderate physical activity (at least 30 minutes per day, most days of the week).							
C4	I am aware of all the recommended steps to maintain normal body weight.							

C5	To prevent hypertension, limit the alcohol consumption to **no more than** 750 ml of beer, or 300 ml of wine, or 60 ml of whiskey per day.							
C6	The preferable dietary sodium intake is no more than 2.4g per day.							
C7	Maintain adequate intake of dietary potassium (more than 3,500 mg per day).							
C8	Consume a diet that is rich in fruits and vegetables and in low-fat dairy products with a reduced content of saturated and total fat.							
C9	Spending at least eight hours on the computers leads to high blood pressure							
C10	Engaging in activities that cause increase in breathing such as; hiking, cycling, running and walking for at least 30 minutes reduces the chance of High Blood Pressure							

Thanks for participating in this study. I wish to remind you that this information will be kept confidential.

APPENCICES C: PERMISSION LETTER TO CONDUCT RESEARCH FROM UNIVERSITY OF NAMIBIA.

CENTRE FOR POSTGRADUATE STUDIES

University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park
☎ +264 61 206 3275/4662; Fax +264 61 206 3290; URL http://www.unam.edu.na

UNAM

RESEARCH PERMISSION LETTER

Student Name: L Muleya
Student number: 200402951
Programme: Master in Public Health

Approved research title: Assessing risk factors that associated with hypertension among military personnel at Peter Mweshihange military health Centre in Windhoek

TO WHOM IT MAY CONCERN

I hereby confirm that the above mentioned student is registered at the University of Namibia for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees.

The proposal adheres to ethical principles as per attached Ethical Clearance Certificate. Permission is hereby granted to carry out the research as described in the approved proposal.

Best Regards

23 Oct 18

Prof Marius Hedimbi — **Date**
Director: Centre for Postgraduate Studies
Tel: +264 61 2063275
E-mail: directorpgs@unam.na

Centre for Postgraduate Studies
Office of the Director
2018 -10- 23
University of Namibia
UNAM

APPENCICES D: PERMISSION LETTER TO CONDUCT RESEARCH FROM MINISTRY OF HEALTH AND SOCIAL SERVICES.

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2562
Fax: 061 – 222558
E-mail: hnangombe@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3 LNM
Enquiries: Dr. H. Nangombe

Date: 05 February 2019

Ms. Lilian Njahi Muleya
PO Box 50965
Bachbrecht
Namibia

Dear Ms. Muleya

Re: Assessing risk factors associated with hypertension among military personnel at Peter Mweshihange Military Health Centre in Windhoek.

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3.1 The data to be collected must only be used for academic purpose;

3.2 No other data should be collected other than the data stated in the proposal;

3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

APPENCICES E: PERMISSION LETTER TO CONDUCT RESEARCH FROM NAMIBIAN DEFENCE FORCE.

NAMIBIAN DEFENCE FORCE

Tel: (061) 204 9111 X 2080
Fax: (061) 204 2124
E-mail Address: cdefence@mod.gov.na
Enquiries: Brig Gen AN Nambahu
Our Ref: CDF/3/2/5/16 Your Ref: ....

Chief of the Defence Force
Private Bag 13307
WINDHOEK

06 December 2018

Lt LN Maleya
P.O. Box 50965
Bachbrecht
WINDHOEK

PERMISSION TO CONDUCT AN ACADEMIC RESEARCH PROJECT AT PETER MWESHIHANGE MEDICAL HEAL CENTRE (PMMHC)

Your letter dated 13 November 2018 regarding the above subject matter has reference.

Permission is granted to conduct research at Peter Mweshihange Military Health Centre on the "Assessing risk factors associated with hypertension among the Military personnel.

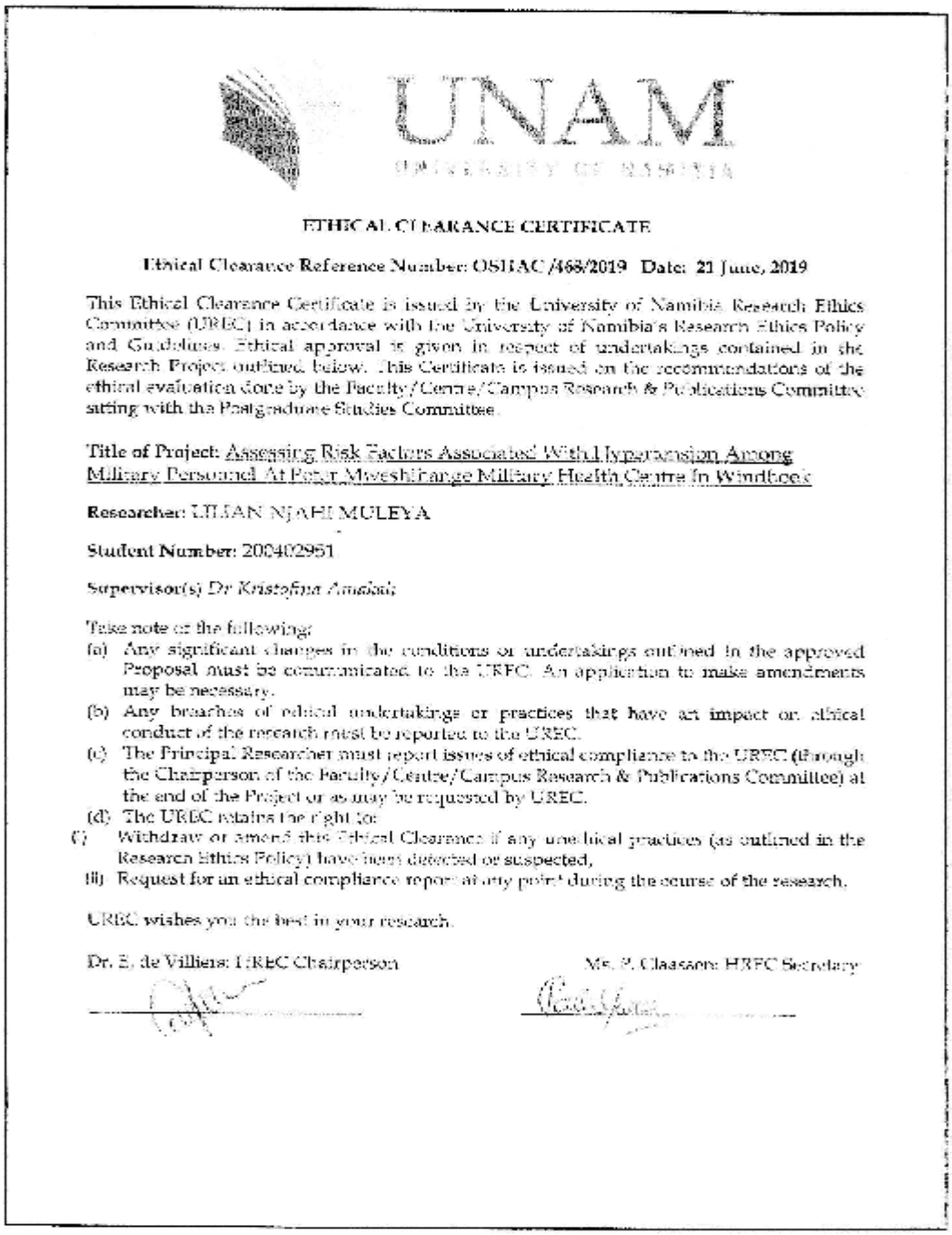
PMO PMMHC will be informed accordingly. However, you should make prior appointment when ready to visit the Health Centre.

REPUBLIC OF NAMIBIA
MINISTRY OF DEFENCE
2018 -12- 06
CHIEF OF THE DEFENCE FORCE
P/Bag 13307
WINDHOEK

BRIG GEN AN NAMBAHU "psc" (Cert Dip PA (Pol), Dip HSS (UNZA) B Tech (NUST)
CHIEF OF THE DEFENCE FORCE: Lt GEN

All official Correspondence must be addressed to the Chief of the Defence Force.

APPENCICES F: ETHICAL CLEARANCE TO CONDUCT RESEARCH FROM THE UNIVERSITY OF NAMIBIA.



UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: OSHAC/468/2019 Date: 21 June, 2019

This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.

Title of Project: Assessing Risk Factors Associated With Hypertension Among Military Personnel At Peter Mweshihange Military Health Centre In Windhoek

Researcher: LILIAN NJAHI MULEYA

Student Number: 200402951

Supervisor(s) *Dr Kristofina Amaluk*

Take note of the following:

(a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.
(b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.
(c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.
(d) The UREC retains the right to:
(i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,
(ii) Request for an ethical compliance report at any point during the course of the research.

UREC wishes you the best in your research.

Dr. E. de Villiers: UREC Chairperson

Ms. P. Claasens: UREC Secretary