NON-COMMUNICABLE DISEASES RISK FACTORS AMONG ADULTS IN OSHIKOTO REGION, NAMIBIA

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ABSTRACT

Non-Communicable Diseases (NCDs) such as cardiovascular disease, cancer, diabetes and chronic respiratory diseases continues to be the major development challenges in the 21st century and causes more than 40 million deaths every year global. NCDs count for 43% of total deaths in Namibia 2014, and in Oshikoto Region they are among top10 causes of mortality. The risk factors for NCDs in Namibia needed to be evaluated, therefore, this study was conducted to determine the NCDs (diabetic mellitus and hypertension) risk factors among adult in Oshikoto region, Namibia.

A quantitative, descriptive, community population-based, cross- sectional survey was conducted using WHO STEPwise approach among 375 adults in Oshikoto region between November 2018 to January 2019. A stratified cluster random sampling method was used to select household. Demographic and behavioral risk factors were obtained using interview administered questionnaire. The researcher measured body weight, height, blood pressure and random blood glucose and calculated Body Mass Index (BMI). Body weight was classified as overweight (BMI 25kg/m^2 – 29.9 kg/m^2), obese (BMI ≥ 30kg/m^2). BP ≥140/90 was classified as hypertension and RBG > 11.1mmol/l as diabetes mellitus. Univariate analysis determines the prevalence of NCDs risk factors. Bivariate and multivariate analysis for Odds Ratio and 95% CI was done to determine the association between risk factors and NCDs based on p-value <0.05.

Out of a total of 375 participants, 279 (74.4%) were female. Mean age was 42.9 ±15.0 standard deviation (SD), range: 18-101. Most participants 244 (65.1%) were residing in rural areas while in urban area were 131 (34.9%) and 8.2 in semi-urban areas. Overall prevalence for risk factors were: physical inactivity (25.3%), unhealthy diet (75.7%), tobacco use (9.1%), harmful use of alcohol (40.8%). Overall, 20.5% were overweight with majority (85.7%) of them females. Obesity was 9.1% in which 91.2% were

females. Hypertension prevalence was 24.3% and for DM was only 3.2%. Four percent individuals were having two multiple risk factors for NCDs, 2.4% with four risk factors and 1.1% with more than four risk factors. Age group (OR=2.48,95%CI=1.44-4.26, P=0.001), Obesity (OR=3.48,95%CI=1.55-7.79, P=0.003), and overweight (OR=2.34,95%CI=1.31-4.19, P =0.004) were significant risk factors for NCDs.

This study revealed a high prevalence and burden of Non-communicable diseases risk factors such as obesity and overweight among adult in Oshikoto region, thus, these results highlight the need to evaluate and strengthen the existing interventions towards the prevention and control of those NCDs risk factors in Oshikoto region, Namibia.

Key words: Non-communicable diseases, risk factors, Oshikoto region, Namibia

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LIST OF ABBREVIATIONS

ALD	Alcoholic Liver Disease
BMI	Body Mass Index
CDR	Crude death rate
CHD	Coronary heart disease
CI	Confident Interval
COPD	Chronic Obstructive pulmonary disease
CVD	Cardiovascular disease
DM	Diabetic mellitus/ Diabetes
DALYs	Disability-adjusted life years
FCTC	Framework Convention on Tobacco Control
Hpt/HTN	Hypertension
IHD	Ischemic heart disease
LMIC	Lower-Middle-Income Countries
MoHSS	Ministry of Health and Social Services
NamFELTP	Namibia Field Epidemiology and Laboratory Training Programme
NCD	Non-Communicable disease
NHRU	National Health Research Unit
OR	Odd Ratio
PHC	Primary Health Care
PSU	Primary Sampling Unit
RBG	Random blood glucose
RMT	Regional Management Team

SDGs	Sustainable Development Goals
SSA	Sub – Saharan Africa
UNAM	University of Namibia
UN	United Nation
UREC	UNAM Research Ethical Committee
WHO PEN	World Health Organization Package of Essential Non-Communicable Disease

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DEDICATION

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DECLARATION

I, Emilia Shiwa Ashipala, hereby declare that an investigation of Non-communicable diseases risk factors among adults in Oshikoto region, Namibia, is a true reflection of my own study, that it has not been submitted for any degree at any other university.

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CHAPTER 1

INTRODUCTION AND BACKGROUND INFORMATION

1.1 INTRODUCTION

Non-Communicable Diseases (NCDs) are the leading causes of premature death (85%) in low- and middle- income countries and continues to be the major development challenges in the 21st century. NCDs results in >40 million deaths every year globally in which 15 million deaths were accounted for people between the ages of 30 and 70 years (1,2). Major NCDs such as Cardiovascular diseases, cancer, diabetes and chronic respiratory diseases are responsible for 71 % of deaths worldwide and share common modifiable behavioral risk factors such as tobacco use, unhealthy diet, lack of physical activity, and the harmful use of alcohol. These risk factors could lead to overweight and obesity, raised blood pressure, raised cholesterol, and ultimately disease (1, 2,3).

The burden of NCDs among low-income and middle-income countries is increasing disproportionately with attendant consequence of premature deaths occur. The epidemic of NCDs is driven by poverty, globalization of marketing and trade of health-harming products, rapid urbanization, and population growth (1,4,6). In 2011 nine global targets of NCDs prevention and control were adapted in the United Nation (UN) General Assembly. The aim was to reduce premature mortality from the four major NCDs such as cardiovascular diseases (hypertension), chronic respiratory diseases, cancer and diabetes to 25% by 2025 (1). The targets identified were salt intake, tobacco use, harmful alcohol use, obesity, raised blood pressure, raised blood glucose and physical inactivity. These risk factors ‘clustering increases significantly the risk of cardiovascular disease morbidity and mortality, but, they are preventable and can be completely eliminated (1). In 2015 World Health Organization (WHO) approach to Surveillance of NCDs Risk Factors (STEPS) was established as a global

surveillance strategy in a response for trends of NCDs at country-level (1,2,6,7). Among targets of the 17 Sustainable Development Goals (SDGs), SDG 3 (Good Health and Well-being) target 3.4 is to ensure a reduction by one third in NCDs premature mortality through prevention and treatment by 2030 (4,6).

Diabetes was one of the leading causes of NCDs death in 2015 responsible for 1.5 million deaths worldwide in which 321 100 deaths were occurred in Africa. Globally more than 80% people with type 2 diabetes are found to be obese and overweight (4). The leading global metabolic risk factor is hypertension (elevated blood pressure) and accounts for 18% of deaths globally. Complications due to hypertension are responsible for 9.4 million deaths worldwide and among this deaths, 51 % are due to stroke and 45% are due to heart failure (6). The International Diabetes Federation reports that the Africa Region has an estimated of 15.5 million adults (aged 20-79 years) living with diabetes in 2017. This accounts for prevalence of 3.3% regionally, found higher among adults (aged 55 to 64 year) in which majority (55.3%) were living in urban areas (4).

Namibia like all other developing countries is experiencing an epidemiological health transition that is characterized by an increasing burden of non-communicable diseases (NCDs). This transition is linked to the high rate of urbanization and development strides that leads to general economic improvement in social and health indicators for the country. At the same time, urbanization has its own consequences including several personal lifestyle habits that ultimately would impact negatively on the health status of the individual. The effect of this is a shift in a spectrum of diseases that were not common in the population to even more dramatic resurgence of many non-communicable diseases (1,4,6). NCDs account for 43% of total deaths in Namibia as of 2014. Hypertension (HTN) and diabetic mellitus (DM) are indicated in the Health facility-based data as first and second causes of disability among adults in Namibia (3,7,9). In Oshikoto Region NCDs are among top10 causes of mortality (with cardiovascular

diseases at second position). The prevalence of Hypertension in Oshikoto region was recorded to be 56.8 - 59.1% in adults aged 18 years and above with 21.4% mortality for the region in year 2017(5).

The main behavioural risk factors for NCDs are physical inactivity, unhealthy diet, obesity, tobacco use and harmful use of alcohol. These modifiable unhealthy behaviors contribute to metabolic changes which could lead to diabetes mellitus and raised blood pressure that cause cardiovascular system damage (11).

I. **Physical inactivity** is defined as less than 5 times of 30 minutes' moderate physical activity per week or less than 3 times of 20 minutes' vigorous physical activity. Physical activities are activities that can cause body skeletal muscles movement which needs energy expenditure such as playing, working (especially intensive work), engaging in recreational pursuits, travelling, carrying out household chores. Therefore, it is a key determinant of energy expenditure and fundamental to energy balance and weight control (7, 9). Physical inactive is the fourth leading risk factor for mortality, causing more than 3.2 million deaths global by increasing the risk of developing DM especially type 2 and hypertension (10,11). Physically inactive people have a 20% to 30% increased risk of all-cause mortality compared to those who engage in at least 150 minutes of moderate intensity physical activity per week as recommended by WHO (11). Physical inactivity responsible for 32.1 million (2.1%) of Disability-adjusted life years (DALYs) globally (1, 7, 10, 11). Globally, the prevalence of physical inactivity among adults (aged 18 years and older) was at 28% with 32% of women and 23% of men in 2016 (11), while, in Namibia it was at 33.4%, higher among women (37.4%) than in men with 37.4 and 28.9% respectively (3,7,8). In Oshikoto region more women are physically inactive then men with 81.0% and 58.4% respectively (9).

II. Unhealthy diet could be high dietary intake of salt, saturated fat and trans fat cholesterol, and low intake of fish, fruit and vegetables. Excess salt/sodium intake are attributed to 4.1 million deaths annually (10,11). A diet that is too high in salt as well as calories, saturated and trans fat and sugar, carries an additional risk of high blood pressure and obesity. About 16 million (1.0%) DALYs and 1.7 million (2.8%) of deaths are attributable to low fruit and vegetable consumptions globally (11). WHO recommends 5 grams of salt intake per person/day. However, variety diverse country data indicates that most populations are consuming much more salt. Some study shows higher unsaturated fatty acids from vegetable sources and polyunsaturated fatty acids reduce the risk of type 2 diabetes (7). In Namibia there is low consumption of fruits and vegetables and the average of fruit and vegetable is one serving per day on one to two days per week among people aged 15 to 49 years and in Oshikoto region consumption of fruit and vegetables is one serving per day on two to > three days per week (8, 9,11).

III. Obesity is an atypical or extreme accumulation of fat that has a negative impact on health and wellbeing of individuals. Being overweight increases the risk for developing cardiovascular disease, diabetes and high blood pressure (7,8,11). Overweight and obesity leads to approximately 3.4 million deaths, 3.8% of DALYs and 3.9% of years of life lost in 2014 worldwide. The prevalence of obesity/ overweight among adults 18 years and above global in 2014 was 39% and 13% respectively. In African region its' prevalence among adult women and men was 15.2% and 5.5% respectively. In Namibia it was 28.2% and 28.1% among women and men respectively 2014 and this is similar to Oshikoto region that women are more obese than men (7, 8, 9,11).

IV. Tobacco and exposure to second-hand smoke account for over 7.2 million deaths every year, and WHO estimates that tobacco or cigarette use will cause 7.5 million deaths annually by 2020 globally (8,11). Over 1.1 billion people smoked tobacco in 2015 (8). Tobacco use

accounts for one in six of all NCD deaths and kills more than 15,000 people daily (8,11), estimated to cause 10% of CVDs deaths. The worldwide trend of tobacco use is on the rise about one in ten of all deaths, despite only fewer people are using it in some countries. In African Region, the tobacco smoking prevalence appears to be increases with 24.7% in men and 2.3% in women in 2013. More men were smoked tobacco than women global (7, 8,11). In Namibia the prevalence of tobacco product smoking among adults aged 15 years and older was more than 20% in 2013 with 37.0% and 11.7% among men and women respectively. In Oshikoto region,16.9% of men and 3.7% of women are tobacco use (9,11).

V. **Harmful use of alcohol** can cause many health problems, including cardiovascular diseases such as heart failure, irregular heartbeat and stroke (1,6,11). Harmful use of alcohol causes 3 million deaths every year globally, represent 5.3 % of all deaths. The percentage of alcohol-attributable to the global burden of disease and injury is 5.1 %**,** as measured in disability-adjusted life years (DALYs). About 13.5% of the total deaths among the age group 20-39 years are attributable to alcohol (6, 7,11). Mortality, morbidity and levels/ patterns of alcohol consumption related to alcohol are different among gender. Globally, alcohol counts for 7.7% and 2.6% of all deaths among men and women respectively (7,11). Total alcohol per capita consumption among male and female drinkers was on average 19.4 liters and 7.0 liters of pure alcohol respectively global in 2010 (7). In Namibia was 10 liters of pure alcohol among adults aged 15 years and older as at 2010. In Oshikoto region more males are consuming alcohol then females (6,7,8,9,11).

1.2 PROBLEM STATEMENT

Non-communicable diseases remain the leading cause of high morbidity and mortality in Oshikoto region with high prevalence of cardiovascular diseases accounting for over 30% morbidity in 2016. The prevalence of hypertension in Oshikoto region was recorded to be 56.8

- 59.1% in adults aged 18 years and above with 21.4% mortality for the region in 2017(5). Namibia health care system for NCDs surveillance is mainly hospital - centered rather than on prevention and control measures, therefore, a large proportion of people at risk are poorly assessed and remain undiagnosed. Delayed diagnosis implies exacerbation of morbidity, mortality and disabilities. Therefore, this study would provide baseline data on NCDs risk factors among adults in Oshikoto Region and this would be useful for regional and national public health interventions for NCDs prevention and control strategy planning.

1.3 PURPOSE AND RESEACH OBJECTIVES

1.3.1 Purpose of the study

The purpose of the study is to determine the risk factors for NCDs among the adult population in Oshikoto region, Namibia using STEPS survey.

1.3.2 Research objectives

1**.** To determine behavioral risk factors for NCDs such as physical inactive, unhealthy diet, tobacco use and alcohol consumption.

2. To determine biological risk factors such as high blood pressure, overweight/central obesity, high blood sugar.

3. To determine the association between the risk factors (biological, behavioral, demographic and socio-economic factors) and NCDs.

1.4 SIGNIFICANCE OF THE STUDY

The planning of prevention and control programs requires the key information of distribution for NCDs risk factors among population. There is dearth of research on epidemiological population-based study on NCDs prevalence and combined risk factors conducted in Oshikoto region. Though the 2013 Namibia Demographic and Health Survey looked at risk factors, it was not epidemiological. Therefore, this study will provide informed decision to health

policy/decision- makers on developing health promotion interventions to prevent and control rising epidemic of non-communicable diseases in Oshikoto region (and the country in general), and, it can also be used as a baseline to develop policies, plan of action and strategies against NCDs in a region.

1.5. OPERATIONAL DEFINITIONS

1.5.1 Prevalence

Prevalence in study is refers to the proportion of a particular population found to be affected by a risk factor/s or disease/s. It is expressed as a percentage, fraction or number of cases per 10 000 0r 100 000 people by comparing the number of people found to have the condition with the total number of people studied (10).

1.5.2 Risk Factors

A risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury. In this study, the focus will be on modifiable risk factors for diabetes and hypertension as both share similarity, such as physical inactivity, tobacco use, harmful use of alcohol and unhealthy diet (1, 2, 4 & 11).

1.5.3 Socio-demographic factors

This refers to background information about the population of interest, such as age, sex, level of educational, marital status, ethnicity, employment status, total number of people older than 18 years living in the household, average household income, and geographic location (12).

1.5.4 Behavioural factors

These are the lifestyle, modifiable factors that affect personal risk for NCDs. They include factors such as diet, alcohol and tobacco use, and level of physical activity (1, 11).

1.5.5 Diabetic mellitus (DM)

DM is a chronic, metabolic disease which characterized by elevated blood sugar level. This can lead to serious damage of the heart, kidneys, eyes, blood vessels and nerves. In adults, the most common is type 2 diabetes which occurs when the body does not produce enough insulin (4).

1.5.6 Hypertension

It is defined as systolic blood pressure of equal to or greater than 140 mmHg and/or diastolic blood pressure equal to or greater than 90 mmHg (1, 6).

1.5.7 Non-communicable disease (NCD)

NCD refers to a non- infectious and non-transmissible (not spread from person to person) chronic disease which last for long period of time and caused by combination of genetic, physiological, environmental and behavioural factors (1, 12).

1.5.8 Unhealthy diet

Unhealthy diet in this research is refers to high dietary intake of salt, saturated fat and trans fat cholesterol, and low intake of fish, fruit and vegetables (4).

1.5.9 Physical inactivity

Physical inactivity is defined as less than 5 times of 30 minutes; moderate physical activity per week as or less than 3 times of 20 minutes' vigorous physical activity. Physical inactivity is the fourth leading factor for NCDs mortality, causing more than 3.2 million deaths global (1, 13).

1.5.10 Tobacco use

Tobacco use in this study refers to any habitual use of the tobacco plant leaf and its products either by smoke inhalation of cigarettes, pipes and cigars or by either sniffed, sucked or chewing (15).

1.5.11 Harmful use of alcohol

Harmful use of alcohol is one of the main factors contributing to premature deaths and disability and has a major impact on public health. It refers to regular consumption of large volume of alcohol or heavy episodic drinking (16).

1.5.12 Overweight and obesity

Obesity is defined as an atypical or extreme accumulation of fat that has a negative impact on health and wellbeing of individuals (17).

1.5.13 Body Mass Index (BMI)

BMI refers to an approximate measure of a person's weight in kilograms (kg) divided by his or her height in meters squared to find out whether someone is overweight or obese. Individual with BMI of over 25 kg/m^2 is classified as overweight and with BMI of over 30 kg/m^2 is obese (2,11).

1.6 LAYOUT

The layout of this thesis is as follows:

Chapter 1: Introduction

Chapter 2: Literature Review

Chapter 3: Methodology

Chapter 4: Data analysis and study results

Chapter 5: Discussions, conclusion and recommendations

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this literature review is to explain the burden and the public health importance of NCDs risk factors globally, regionally (Africa) and locally (Namibia), as well as to provide a solid background for NCDs risk factors from what has been already studied and to establish a basis for the current study based on knowledge gaps. The researcher identifies the research problem and refine the research question through conducting a literature review (15, 19).

2.2 GLOBAL BURDEN OF NCDs

Non-communicable diseases are responsible for 71% (41 million/56million) of all deaths globally (1,6). Fifteen million people between the ages of 30 and 70 years die from NCD annually, and over 80% of these deaths occur in low- and middle-income countries. It has been projected by the WHO that NCDs will exceed communicable, maternal, perinatal and nutritional disease on leading causes of death globally by 2030 (6,7). There are four major NCDs; cardiovascular diseases, chronic respiratory diseases, cancer and diabetics, and they account for about 80% of all NCDs deaths. Cardiovascular diseases account for 17.7 million deaths, followed by cancer with 8.8 million deaths, respiratory diseases with 3.9 million and then diabetes accounts for 1.6 million deaths annually (15). These NCDs all share common risk factors like tobacco use, harmful use of alcohol, physical inactive and unhealthy diet. Therefore, “the risk factors of today are the diseases of tomorrow” (4) thus it is of importance to identify these risk factors in populations through public health strategies and in different settings.

2.3 THE BURDEN OF NCDs IN AFRICA

African countries are undergoing epidemiological transition due to industrialization, urbanization and life style changes as a result of the adoption of western culture and lifestyle. This transition is causing shift from communicable to NCDs in many African countries with increasing prevalence over the last three decades. In SSA, CVDs, diabetes and cancer are on the raise thus doubling the burden of disease with crippling burden on health services (13,15,16). Sub-Saharan African countries losses 21 million productive years due to Cardio-vascular diseases (7). WHO estimates that about 4 million NCD-related deaths will occur by 2020 in African region. WHO also estimates that by the year 2030 NCDs will cause 46% of all deaths in SSA showing that their burden will succeed the burden of communicable diseases (mortality and morbidity) as compare with 2004 whereby half (50%) of all deaths were caused by infectious conditions. Namibia has the second highest rate of deaths attributed to diabetes and cardiovascular disease (6,7,13,15,16).

Studies on Global Burden of Disease indicated that the age – standardized death rate from NCDs is higher in some Sub-Saharan Africa countries such as Democratic Republic of the Congo, Ethiopia, Nigeria and South Africa than in higher-income countries. Another study that was conducted in Tanzania also shows that NCDs death rates are higher among all age groups between 15 and 59 years when compared higher-income countries (13).

2.4 THE BURDEN OF NCDs IN NAMIBIA

NCDs accounted for 43% of total deaths in Namibia in 2014. With the distribution of burden of diseases at 10.02 percentage of total Disability- adjusted life-years (DALYs) in 2012. In 2012, WHO age-standardized death rate per 100 000 to non-communicable diseases was 594 males and 572 females in Namibia. In the African, Namibia has the second highest rate of deaths attributed to diabetes and cardiovascular disease (1, 6,7). There are not many

comprehensive studies done in Namibia on NCDs risk factors, those conducted only looked at one or two risk factors.

Non-communicable diseases remain the leading cause of high morbidity and mortality in Oshikoto region with high prevalence of cardiovascular diseases accounting for over 30% morbidity in 2016 (4). According to Namibia Demographic and Health Survey 2013 report, the prevalence of hypertension in Oshikoto region was 41% (9). However; current data on NCDs obtained from District Health Information System2 (DHIS2) shows a prevalence of 80.1% cardiovascular diseases in 2016 and 70.1% in 2017, followed by chronic respiratory disease at 20.5% among 18 years of age and above. The prevalence of hypertension in Oshikoto region was recorded to be 56.8 - 59.1% in adults aged 18 years and above with 21.4% mortality for the region in year 2017(5).

2.5 BURDEN AND PREVALENCE OF NON-COMMUNICABLE DISEASES RISK FACTORS

There have been trends increasing of the NCDs burden in low and middle income countries (LMIC) and this has linked to increasing of the risk factors' levels. NCDs has four key risk factors which include behavioral risk factors (physical inactivity, unhealthy diet, tobacco use and harmful use of alcohol). However, there are also four intermediate risk factors known as biological risk factors such as raised/high blood pressure, central obesity, raised blood sugar and high cholesterol. At both individual and population levels, these risk factors have been increasing and they are all increase the risk of dying from a NCD (7,15,16).

Physical inactive is the fourth leading risk factor for mortality, causing more than 3.2 million deaths global. Physical inactivity prevalence among adults aged 18 years and older in 2016 was 28% globally; 23% and 32% of men and women respectively. Insufficient activity level did not improve over the past 15 years because in 2001 it was at 28.5% and 27.5% in 2016. Therefore,

over 60% of the global population did not achieve the minimum WHO recommendation of 30 minutes of moderate intensity physical activity daily (1, 7, 8, 9, 10, 11).

Globally, 1.7 million deaths are attributable to diets low in fruits and vegetables (7,11). Coronary heart disease, gastrointestinal cancer, and stroke due to low intake of fruits and vegetables is estimated to be 31%, 19% and 11% respectively worldwide. While, the prevalence of average salt intake in adults was 10g/day in 2016 global (7,16). Overweight and obesity leads to approximately 3.4 million deaths, 3.8% of DALYs and 3.9% of years of life lost in 2014 worldwide with 11% among male and 15% in female (6,7,11,15). A study conducted in Ethiopia (7) found that 60 402 deaths were associated with dietary risks and 88% (nine in every ten diet-related deaths) of this deaths were cardiovascular disease, however, 44% were associated with below-optimal diet quality (2,11,12).

Tobacco use and exposure to second-hand smoke account for over 7.2 million deaths every year, and WHO estimates that tobacco use will cause 7.5 million deaths annually by 2020 (11). Over 1.1 billion people smoked tobacco in 2015. Tobacco use accounts for one in six of all NCD deaths and kills more than 15,000 people daily, estimated to cause 10% of CVDs deaths. The worldwide trend of tobacco use is on the rise about one in ten of all deaths. In African Region, the tobacco smoking prevalence appears to increases with 24.7% (men) and 2.3% (women) in 2013 (7,8,11).

Harmful use of alcohol causes 3 million deaths every year globally, representing 5.3 % of all deaths. The percentage of alcohol-attributable to the global burden of disease and injury is 5.1 %**,** as measured in DALYs (7, 11). Globally, alcohol consumption attributes to 7.7% and 2.6% of all deaths among men and women respectively (7,8,11).

A study in India (14) found out a high prevalence of tobacco use (66.2%) among rural men than urban men. Another study in Ghana showed, alcohol consumption was highest among the study population, followed by physical inactive and obesity. Tobacco use was only count 4.8% of respondents while, 62% of participants had combination of three or more risk factors (2). Another study done in Uganda, the prevalence of hypertension (≥140/90) among men and women were 22.5% and 20.5% respectively. Only < 10% of participants ate five or more combined servings (3-9) of fruits and vegetables per day (7). Among adults aged 55 to 64 were found the highest prevalence of diabetes in Africa, where by 62.2% of adults are undiagnosed. However, majority (55.3%) of those with diabetes are live in urban areas (4).

The prevalence of tobacco product smoking among adults in Namibia was above 20% in 2013 with 37 males and 11.7 females (9). Alcohol consumption per capital in Namibia was above 10 liters of pure alcohol among adults aged 15 years of age and above in 2010 (9). Prevalence of raised fasting blood glucose raised blood pressure and raised total cholesterol in Namibia 2014 found to high among adult female 10.5%-34.5% than male10.5%-31.1% (7,8). Insufficient physical activity prevalence among adults aged 18 years and older in Namibia 2010 is 30-39.9%, while in 2016 was 33.4% and it was found higher among women than in men with 37.4 and 28.9% respectively (8,9). Adults aged 18 years or older who are obese in Namibia2014 was 10-19.9% while South Africa was above 20%. However, there is no difference between male and female who are obese (7,8). Namibia has fourth highest prevalence (9.2%) of raised blood glucose in Africa and the eighth highest prevalence (49.1%) of raised blood pressure globally (4,7,11). In Oshikoto region more women are physically inactive then men with 81.0% and 58.4% respectively in 2013 (9).

2.6 OVERVIEW OF RISK FACTORS AND NON-COMMUNICABLE DISEASES

The burden of NCDs have increased tremendously in low and middle income countries (LMIC) due to increasing levels of the modifiable risk factors like physical inactivity, unhealthy diet,

tobacco use and harmful use of alcohol (7). All these risk factors are preventable even thou they have been increasing at individual and population levels. However, there are non-modifiable risk factors for NCDs such as age, gender/sex, race and family history (genetics/ Heredity) (7). Below is how each risk factor contribute to development of NCDs such as Cardiovascular diseases, Chronic respiratory diseases, cancer and diabetes.

2.6.1 Physical inactivity and NCDs

Physical inactivity is one of the major risk factors for NCDs globally and it has attributed to about 9% of all NCDs deaths (11). Physical inactivity can cause individuals to gain weight, which can lead to metabolic risk factors such as raised blood pressure, increased blood glucose, elevated blood lipids and obesity (10,11). Individuals who are physical inactive are more at risk of developing heart attack and stroke than those physical active and they are 20-30% times high at risk of death compared to active individuals. By doing physical activity regularly assists in lowering blood pressure, reduce stress and controls weight. It is also a protective factor for the prevention and treatment of heart disease, stroke, diabetes and cancers (breast and colon). The global efforts to decrease the prevalence of physical inactivity by 10% by a year 2025 is to increase the levels of activity through walking and cycling, recreation and sports. Increasing physical activity is not only having health benefits but, have also social and economic benefits which can contribute to the 2030 Sustainable Development Goals (SDGs) achievement (7,10,11,12,17).

2.6.2 Unhealthy diet and NCDs

Unhealthy diet is also one of the major risk factors for a range of conditions related to obesity and chronic diseases including cardiovascular diseases, cancer, diabetes (especially type 2). Any food that rich in salt (sodium), calories and saturated fats is unhealthy (11). Most of cardiovascular disease deaths (about 59 %) in LMICs are due to hypertension which linked to high salt intake, while, other deaths are associated with rising blood glucose caused by

unhealthy diet (11). Heart disease is associated with high consumption of saturated fats and trans-fatty acids. Low fruits and vegetables intake is estimated to cause about 31% of coronary heart disease, 19% of gastrointestinal cancer and 11% of stroke global. Furthermore, individuals consuming diet containing too high sodium (mostly found in restaurant and processed foods) and too low potassium (found in beans, bananas, potatoes and yogurt) are at risk of high blood pressure (1,6,7,11,12,17).

2.6.3 Tobacco use and NCDs

Tobacco use increases individuals' risk for developing NCDs such us cardiovascular diseases, chronic respiratory diseases and cancer. Various studies support that tobacco smokers have relative risk of 2-3 times higher for coronary heart disease (CHD), 12 times risks for lung cancer, 1.5 times for stroke and 1.4 times for chronic obstructive pulmonary disease (COPD) (11,12). Tobacco use can temporarily increase blood pressure especially cigarette smoking and can damage heart and arteries (blood vessels). This is attributed to nicotine and carbon monoxide found in tobacco products. Nicotine increase blood pressure, while carbon monoxide degreases the required amount of oxygen in the blood. However, individuals' exposure to tobacco smoke known as secondhand smoke, are also at great risk of cardiovascular diseases for non-smoker, especially hypertension and risk of developing and progression of atherosclerosis. A study conducted in India found that those at higher risk for chronic obstructive pulmonary disease (COPD) was among men, while, risk of exposure to second hand smoke was among women (11,12,17).

About 16 different types of cancers such as lung cancer (which is the most leading cause of cancer deaths globally accounting for one in every five cancer deaths); throat cancer; oral cavity cancer; Cervical cancer; uterine cancer; stomach cancer as well as kidney and bladder cancers are caused by and/ associated with tobacco use (11,12). Oral cancers are mostly linked to

smokeless tobacco. However, smokeless tobacco also causes hypertension and other heart diseases. The risk of stroke and heart disease are increases two to four times by smoking (16). In United State about 12% of diabetes incidence was attributed to smoking, therefore it is categorized as diabetes' independent risk factor. Risk of death and complications such as amputations and poor vision are increasing among individuals who are diabetic and also smoking (12).

2.6.4 Harmful use of Alcohol and NCDs

Globally, alcohol consumption is estimated to cause more than 10% of the burden of non-communicable diseases and this include cirrhosis of the liver, pancreatitis, cancers (oral and pharynx, larynx, esophagus, liver, colorectal and breast), haemorrhagic stroke and hypertension (7). Among the population consuming alcohol, hazardous patterns of drinking are noted with heavy episodic drinking – known to be more harmful than regular light-to-moderate drinking. Also, recent data indicate that alcohol consumption is on the rise among adolescents and young adult (6,7). Harmful use of alcohol is a causal factor in more than 200 disease and injury conditions, including liver disease, cancers, cardiovascular disease. Alcohol accounted for 5.9% of death and 5.1% of disability adjusted life years lost in 2012. Men (7.6%) are nearly twice as likely as women (4%) to suffer from deaths attributable to alcohol (6,7,13)

A causal link has been found between alcohol and cancer of the oral cavity, pharynx, larynx, esophagus, liver, colon, rectum, and female breast (11.12). For all of these cancers, the risk of cancer increases steadily with greater volume of alcohol consumption. Chronic, heavy alcohol use has been associated with adverse cardiac outcomes including ischemic heart disease (IHD), dilated cardiomyopathy, cardiac dysrhythmias, and haemorrhagic strokes (12). It has been estimated that the detrimental effects of alcohol in terms of CVDs outweigh the beneficial effects by a factor of 2.4 (for deaths) and 3.5 (for DALYs), and these benefits typically only occur with low to moderate alcohol consumption (less than 20 g per day) and then only for

selected cardiovascular outcomes (e.g. ischemic heart disease and strokes). Alcoholic liver disease (ALD) is associated with various kinds of liver disease, with fatty liver, alcoholic hepatitis and cirrhosis being the most common. The likelihood of developing ALD is a function of both the duration and the amount of heavy drinking (6,7,11,12,13).

2.6.5 Overweight/ Obesity and NCDs

Overweight was defined as Body Mass Index (BMI) (a measure of weight relative to height) between 25 and 29.9 kg/m^2 and Obesity refers to BMI which is ≥30kg/m^2(6,7). Increasing body mass index result in adverse metabolic effects on blood pressure, insulin resistance, cholesterol and triglycerides. It increases the risk of cardiovascular diseases (coronary heart disease and ischemic stroke), diabetes mellitus (type 2) and cancer (breast, colon, endometrium, gall bladder, kidney and prostate) (6). Overweight and obesity increasing mortality rates. About 2 billion of adults (aged ≥18 years) were overweight in which more than half billion were obese globally (7). Overweight was 39% in males and 39% in females, while obese was 11% (males) and 15% (females) in 2016 (6).

2.6.6 Non-modifiable risk factors and NCDs

Non-modifiable risk factors include age, gender/sex, race and family history (genetics/ heredity). Aging is linked to the development of NCDs in sense that, the older a person get, the higher risk of developing coronary heart disease or a cardiac condition (angina, heart attack or stroke) (11,17). Race/ethnicity also plays a role in the development of some NCDs especially cardiovascular disease. For instance, within UK people from South Asian background are twice likely to develop coronary heart disease compared to others (ref). Moreover, those from African Caribbean backgrounds have higher risk of developing high blood pressure (11,16). Some NCDs are hereditary like diabetes, cancer and some cardiovascular diseases such as coronary heart disease, hypertension. Individuals with family history of diabetes, cancer, their risk of

developing same disease is higher and this can be determined by age and sex (6,14). For example, if ones' mother or sister was diagnosed with disease under the age of 65, while father or brother diagnosed with disease under the age of 55, the chance of a child or sibling to develop same disease increases. Some lifestyle habits that linked to being overweight, can be passed on from one generation to the next, however, risk of developing conditions such as high cholesterol level and high blood pressure which causes coronary heart disease are passed on by genes (11,15,16).

2.6.7 Socio-economic factors and NCDs

Individuals are predisposed to NCDs by poverty because, being socially disadvantaged put individuals at higher risk of exposed to tobacco products, unhealthy dietary practice (including low fruits and vegetables intake) and harmful use of alcohol (11). But on the other hand, as individuals (at household level) become financially stable, their life style changes and then their exposure to NCDs increases and this is because higher incomes may promote risky behaviours like higher level of physical inactivity, smoking and consumption of processed foods with high salt/ fat content. This statement also applies to urban setting lifestyles (15,16). A study conducted in Kenya found out an 5.42% association between living in Urban setting and NCDs (15).

2.7 GLOBAL INTERVENTIONS TO PREVENT AND CONTROL NCDs RISK FACTORS

The WHO has adapted three strategies to prevent and control the risk factors for NCDs include promotion of physical activity and healthy diet, reduction of Tobacco use and harmful use of alcohol. These global strategies are implemented through the Framework Convention on Tobacco Control (FCTC) and Diet, Physical Activity and Health (DPAS) (1,6,11).

The United Nation General Assembly declaration 2011 targets as part of strategy towards reduction of premature mortality due to NCDs by 25% by the year 2025 with focus on the risk factors: reduce physical inactivity by 10%; reduce sodium intake by 30%; reduce tobacco use by 30%; reduce harmful use of alcohol by 10%; reduce raised blood pressure by 25% and reduce obesity. Sustainable Development Goal (SDG) target 3.4 is about NCDs includes strategy for meeting its goal toward 30% reduction in premature mortality from NCDs through prevention by 2030. Its' progress was reviewed and renewed (global and national) in the third UN High-Level Meeting on NCDs that was held 27 September 2018 included the enhancement of political commitment towards NCD mortality reduction (6,11).

2.8 CONCEPTUAL FRAMEWORK OF THE STUDY

A conceptual framework is defined as the result of bringing together a number of related concepts. It is as constructed map to show the characteristics of causal relationship between a problem and its' contributing factors. It predicts a given event by giving a broader understanding of the phenomenon of interest or simply of a research problem. Conceptual framework outlines the plan of the research conduction (16,17).

The WHO model of causes (risk factors) of NCDs provide a framework for this study. The underlying concept of this model is that due to globalization, rapid urbanization and Western lifestyle adoption, individuals, populations, and communities are adopting unhealthy lifestyles that predispose to NCDs. Socioeconomic and demographic factors such as household income, level of education, marital status, employment status, age, sex were used as the control variables (16,17). Developing countries is experiencing an epidemiological health transition that is characterized by an increasing burden of non-communicable diseases (NCDs). This transition is linked to the high rate of urbanization and development strides that leads to general economic improvement in social and health indicators for the country. At the same time,

urbanization has its own consequences including several personal lifestyle habits that ultimately would impact negatively on the health status of the individual. The effect of this is a shift in a spectrum of diseases that were not common in the population to even more dramatic resurgence of many non-communicable diseases (1,4,6). Below is Table 2.1 shows the WHO Model of causes of NCDs.

Table 2.1: Conceptual Framework model adapted from WHO model of causes/ risk factors for NCDs with modifications (16).

Underlying socioeconomic, cultural, political and environmental determinants	**Behavioral (modifiable) risk**	**Biological (intermediate) risk factors**	**Disease Outcome (NCDs)**
-Globalization -Urbanization -Population ageing	-Physical inactivity -Unhealthy diet -Tobacco use -Alcohol consumption **<u>Non Modifiable risk factors</u>** -Age -Heredity	-Raised blood pressure -Overweight/central obesity -Raised blood glucose	-Cardiovascular diseases -Chronic respiratory diseases -Cancer -Diabetes

Demographic and socio-economic status underlie socioeconomic, cultural, political and environmental determinants as globalization, urbanization and population ageing represents the mother body of behavioral risk factors of NCDs. Physiological factors are known as intermediate risk factors because they are developed due to lifestyle changes and they direct lead to NCDs (14,15,16,17).

In summary, this chapter reviewed the literature in the areas of global, regional and local burden and prevalence of NCDs risk factors among adults, as well as comparison of studies done on NCDs risk factors. Based on knowledge gaps, there is dearth of research on epidemiological population-based study on NCDs prevalence and combined risk factors conducted in Oshikoto region, therefore, this study will provide informed decision to health policy/decision- makers on developing focused health promotion interventions to prevent and control rising epidemic of non-communicable diseases and their risk factors in Oshikoto region and the country in general.

CHAPTER 3

METHODOLOGY

3.1 RESEARCH DESIGN

A research design refers to the overall plan, structure and strategy of investigations to answer the research questions, in order to collect relevant evidence with minimal expenditure of effort, time and money (21). The study design used was a quantitative, descriptive, population-based, cross- sectional survey to determine the non-communicable diseases risk factors among the adult population in Oshikoto region, Namibia.

The quantitative approach focuses on describing a phenomenon across a larger number of participants thereby providing the possibility of summarizing characteristics across groups or relationships. It generates numerical data or information that can be converted into numbers (21).

Descriptive design refers to the statistical method that are used to organize and summarize data in a meaningful way which serves to enhance the understanding the data. Descriptive design depends on observation as a way of data collection and it is used to investigate a phenomenon and the way it appearing (22). It can predict what can happen under the same situation. It involves the analysis of disease patterns according to the characteristics of person, place and time (21). Observation in this design can be in any form such as interview, distribution of questionnaire as well as recording, depends on the type of information to obtained (23). In this study researcher used an interview-administered questionnaire.

Population-based, cross- sectional survey describes the frequency of a health related event in a sample of a population at a given point in time. In another word, a cross-sectional design assessed the exposure and disease status simultaneously among individuals in a well-defined

population. Cross-section population surveys are relatively less expensive to conduct, thus way sometimes used as the primary data source because of its generally larger sample size which can cover more health disorders, collect large amount of data at one point in time and produce results more available (21,22). This study design determines the strength of the association between specific risk factors and a health outcome (NCDs) exists among adult population within Oshikoto region at a particular time (2018). Therefore, the researcher recorded the information that emerged from a population without manipulating the variables.

3.2 STUDY POPULATION

The study population is defined as the entire group of persons or objects that is of interest to the researcher and meet the criteria of researcher's study interest (21). In this study, the study population was entire population for Oshikoto region. Oshikoto region has a population of 195 860 people, (102 480 females and 93 418 males,) with a sex ratio of 93 males per 100 females. Of this population, 109 478are 18years of age and above. The annual growth rate is 1.4%. It has population density of 5.0 people per sq. km, 84% rural and 16% urban and Oshiwambo is a main language spoken with 87% of household. Oshikoto region has five regions borders: Ohangwena at north, Kavango at east, Otjozondjupa at southeast, Kunene at southwest and Oshana at west. Its' largest age group population is 15 – 59 years with 54% of total regional population. Unemployment rate in a region is 26.4%, and literacy rate is 88%. Mining and cattle rearing are the main economic activities in southern part of a region and agricultural in northern part. Crude death rate (CDR) is 11.8% per 1000 in which more than 50% is NCDs (3).

3.2.1 Inclusion criteria

All adults (18 years and above) will be included in the study.

3.2.2 Exclusion criteria

Vulnerable people example mental retarted.

3.3 SAMPLING

3.3.1 Definition

Sampling refers to the statistical process of selecting a number for a study, or a representative part of a population for the purpose of determining parameters or characteristics of the whole population. Sampling allows inferential statistics which enables a researcher to determine a population`s characteristics by directly observing only a sample of the population (24).

3.3.2 Sampling method

Oshikoto region's 2018 population distribution (for18 years and older) is 109 478 (3). The region is divided into 11 constituencies and 3 health districts. Each constituency comprises of Primary Sampling Units (PSU). We used a stratified cluster random sampling method to select households randomly from each PSU**.** In selected household, all adults (18 years and above) are to be sampled, and if no consent was obtained, the neighboring household was approached.

The focus was the entire population for Oshikoto region

First stage =Constituencies

Second stage =Clusters/PSUs

Third stage = households

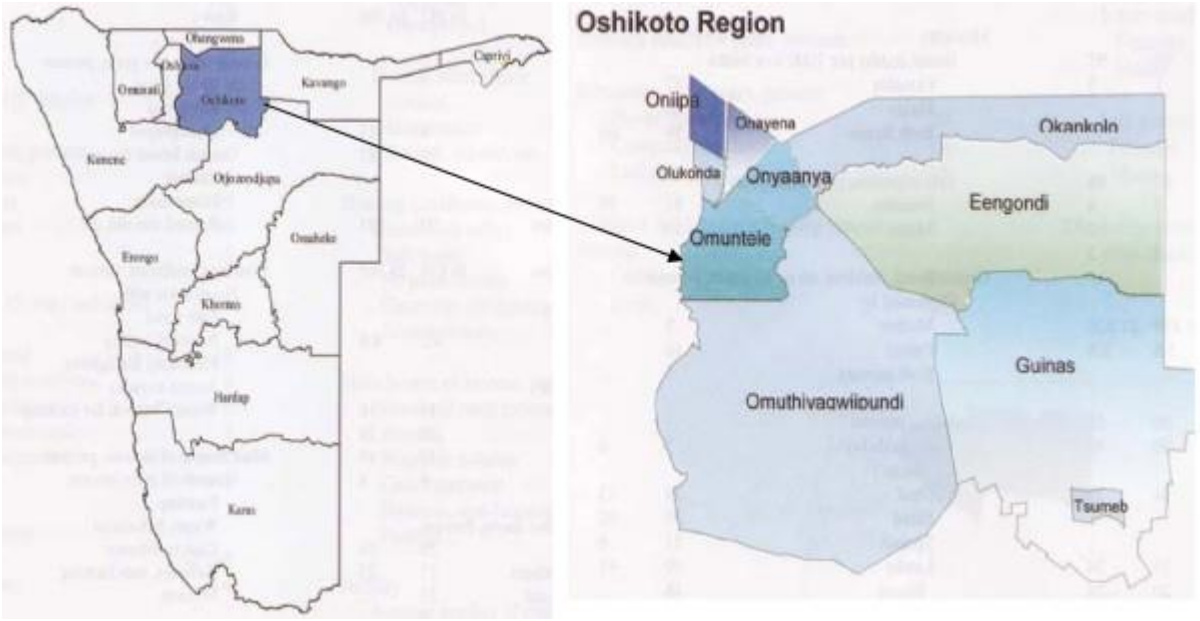

Figure 3.1: Shows a map of study area – Oshikoto Region, Namibia (*one constituency is not appearing in a map*). **http://en.wikipedia.org/wiki/Oshikoto-Region demographic.**

3.3.3 Sample size and criteria

Sample size was calculated using software Epi Info 7.2 version (table 3.1). The precision level in which the true value of the population was estimated to 95% Confidence interval. The Prevalence of hypertension plus diabetes for Oshikoto region 2017 was 41% (4), then the number of subjects in this study were estimated to be 370 individuals. One (1) clusters was used in order to balance considerations of cost, resources and time without compromising the representatives of the sample. In order to achieve the study objectives within limited resources and time, the design effect (DE) of 1 was considered, so, the final sample size (n) was still 370 (1 x 370). The average household size for 18 years and above was 2.55 persons, therefore 178 households was approached. Below is a table 3.1 shows how the sample size for the study was calculated using Epi Info statistical calculation for population survey.

Table 3.1: Sample size calculation using Epi Info statistical calculation for population survey.

Population survey or descriptive study
For simple random sampling, leave design effect and clusters equal to 1.

opulation size:	109478	Confidence Level	Cluster Size	Total Sample
		80%	159	159
xpected frequency:	41 %	90%	261	261
cceptable Margin of rror:	5 %	95%	370	370
		97%	454	454
esign effect:	1	99%	638	638
		99.9%	1038	1038
lusters:	1	99.99%	1446	1446

Starting words that were cut: Population size, Expected frequency, Acceptable Margin of Error, Design effect, Clusters.

3.4 RESEARCH INSTRUMENTS

Data collection tool was developed and modified based on the WHO STEPwise Approach as follows:

1. Questionnaire (demographic characteristics such as: age, sex, years at school, ethnicity; Socio-economic factors: employment, household income, and behavioral factors like tobacco use, alcohol consumption, physical inactivity, fruit and vegetable consumption)

2. Physical body/Anthropometric measurements (blood pressure, weight, height (to calculate BMI) and waist circumference)

3. Biochemical measures (random blood glucose)

3.5 DATA COLLECTION METHODS/ PROCEDURE

The interviewer administered the questionnaire face to face to participants to capture data on demographic and behavioral risk factors. After interview, the participants' anthropometric and biochemical measurements were taken. Blood pressure (Bp) was measured using battery-powered digital Bp machine (Omron Bp785N 10 Medical Equipment India) and Bp was taken on site on participant with uncrossed legs and resting for at least 5minutes. Three readings were taken from each participant three minutes apart and the average of the second and third readings were used to see if there is any different. Digital weighing scale was used to measure weight in kilograms (kg). Height board was used to measure height in meters (m) and measurement tape to measure waist circumference in centimeters (cm). Accu-Chek Active by Beijing HMD Biomedical Inc.) was used to measure blood glucose on finger prick in mmol/l. The equipment, materials and supplies used in the study were provided by the Ministry of Health and Social Services Epidemiology Division through FELTP programme. Materials that were used for blood glucose level test used (lancets in sharp container, gloves and alcohol swabs) were incinerated at three hospitals within the Oshikoto Region (Onandjokwe Intermediate hospital, Omuthiya district hospital and Tsumeb district hospital).

3.5.1 Validity of the data collection instrument

Instrument validity ascertains that the instrument accurately measures what it is designed to measure. Content and face validity methods were used to verify the validity of the data collection instrument for this study. Content validity evaluates/measures whether all the components of the variables to be measured are fully represented by the instrument. While, Face Validity of instrument is verified by an expert on the research subject who evaluate its' intent and concludes that it measures the characteristic of interest (21,22,26). The WHO STEPwise Approach questionnaire designed as a data collection tool for prevalence of risk factors for non-communicable diseases was adapted and modified for this study. All

components required to measuring the frequency and magnitude of NCDs risk factors were well presented and defined accordingly. The questionnaire was modified according to Namibia' lifestyle context, so that the participants would understand and respond well to all questions. Research supervisor reviewed the draft questionnaire for content and face validity. Then the questionnaire was edited and refined based on supervisors' comments before submission to UNAM Research Ethical Committee (UREC). Questionnaire was translated to local language which is mainly Oshiwambo and then back to English, and, face - to - face interviews was administered. Pilot study was conducted in Oshana region among similar target population prior to actual data collection to assess for the questions' acceptability, relevance and sensitivity as well as to determining the time required per individual participant.

3.5.2 Reliability for data collection instruments

Reliability means the magnitude of consistency and accuracy with which an instrument measures a variable. It is a degree to which a questionnaire produces the same results on repeated trials either on the same participant or when used by different researchers (21, 22,26). The WHO STEPwise Approach questionnaire adapted for this study is used by many different researchers. The research instruments' reliability was tested by stability, internal consistency and equivalence. Before the main study, the interviewer-administered questionnaire was tested and retested to the same individuals from pilot area on different occasions, and then, their responses reviewed for similarities.

3.6 DATA ANALYSIS METHODS

Data analysis includes categorizing, ordering, manipulating and summarizing the data so that they can be described in meaningful terms (21). Data was entered in computer by a researcher, cleaned, coded, edited for inconsistencies and then analyzed using Epi Info 7.2version to: generate frequencies and proportions. WHO guideline for blood pressure and blood glucose was used to classy the BP and BG results as normal or abnormal. Data of socio-demographic

characteristics and risk factors was summarized using descriptive statistics and presented as tables, charts and graphs. Mean, range and standard deviation was calculated for quantitative variables. In this study, the risk factors were independent variables, while, NCDs were dependent variables. Bivariate analysis to determine the association between major risk factors and NCDs has performed. Chi-square test was used to test association between major risk factors and NCDs and statistical significance has accepted at p-value <0.05. Multivariate logistic regression analysis was used to estimate the strength of association for all risk factors (exposure variables) that were statistically significant in bivariate analysis.

3.7 ETHICAL CONSIDERATIONS

Ethical principles of respect for person, beneficence, justice, and confidentiality l from the research were maintained before and after the study. The ethical clearance was obtained from the University of Namibia School of public Health, school of Postgraduate Committee and then UNAM Research Ethical Committee (UREC). Permission to collect data from human participants was sought from the Ministry of Health and Social Services (MoHSS) National Health Research Unit (NHRU) through the Permanent Secretary and then from the Regional Management Team (RMT) for Oshikoto Region Health Directorate and Regional Governor. Meeting with traditional leaders, church leaders and women organization of Oshikoto Region was done to explain the essence of the study. Interviewer introduced themselves to participant before they start collecting data. Participants consented to the study by completing a written consent form before enrolling in the study**.** Therefore, survey was conducted on a consensual or voluntary basis. Participants may withdraw at any time. Privacy was ensured throughout. Anonymity was guaranteed as participants were not required to identify themselves. Survey questionnaire coded with a unique number and all were locked in a cabinet whereby no an

unauthorized person could access to them in order to ensure confidentiality. Below are the detailed ethical principles.

3.7.1 Respect for Persons

Autonomy refers to the right of an individual to determine what activities they will or will not participate in (21, 27-29). Individuals (participant) were treated as autonomous. Interviewers introduced themselves to participant before they start collecting data. Participants were given a written consent form before enrolling in the study**.** Participants were presented with relevant information in a comprehensible format about the nature of the study, benefits, the risk and alternatives, have been given opportunity to ask questions and then have voluntarily agree to participated or not.

3.7.2 Beneficence

This refers to the responsibility of the researcher to maximize benefits of individual participant and/or society, while minimizing risk of harm to the individual (21, 27, 28,29). The researcher provided biometric measurement results to participants and those with abnormalities (high BP and BG) were advised to go the nearest health facilities for further management. Therefore, this study was of more benefits to the community members.

3.7.3 Justice

The principle of justice addresses the distribution of the burdens and benefits of research. It emphasis on equitable selection of participants. This implies that the research benefits and harms are distributed fairly to the population. Issues of justice arise around questions related to the selection of participants (21, 27-29).

3.7.4 Confidentiality

The researcher has protected the subjects' privacy and confidentiality by ensuring anonymity. Anonymity was guaranteed as participants were not required to identify themselves. Survey questionnaire requires case number for filing purposes, so, unique codes was used and all questionnaires were locked in a cabinet whereby no unauthorized person had access to them in order to ensure confidentiality. The electronic data was stored in a computer with password and only the researcher and supervisor had access to them. Information obtained about participant during research when published, will be delinked to participants (27,28,29).

3.7.5 Withdrawal from the research

Participants have a right to withdraw from the research any time they want and this was explained to them at the beginning of the research (21, 24).

3.8 DIAGNOSIS OF NCDs AND ANTHROPOMETRIC CLASSIFICATION

Normal blood pressure was <120 systolic and <80 diastolic. Prehypertension was diagnosed if systolic blood pressure was 120-139 mmHg and diastolic blood pressure of 80-89 mmHg and these individuals were at risk of developing hypertension, therefore, they need regular blood pressure check-ups. Hypertension was diagnosed if systolic blood pressure was ≥140 mmHg and diastolic pressure ≥90 mmHg**,** or currently taking medication for hypertension. Among those were not on hypertension treatment, hypertension was classified in to two stage such as stage 1 and stage 11 whereby stage 1 were those with hypertension but did met the stage 11 definition, and stage 11 were those with systolic blood pressure ≥ 160 mmHg and / diastolic blood pressure of ≥ 100 mmHg (2,25,31).

Normal random blood glucose was <11.1mmol/l. Diabetes was diagnosed if random blood glucose (RBG) was ≥ 11.1mmol/l or currently on diabetic medication. However, individuals with a random blood glucose (sugar) of ≥7mmol/l were advised to visiting their nearest health facility for a fasting blood glucose within a week as they were at high risk of diabetes (31). Normal heart rate was between 60 – 100 beats per minute (bpm). Heart failure was diagnosed as heart rate < 60 bpm (known as bradycardia) and >100 bpm(tachycardia) (31,35).

Body Mass Index (BMI) was classified as overweight was BMI 25-29.9 kg/m2, and obesity was BMI ≥30 kg/m**.** Waist circumference of ≥94 cm in men and ≥80 cm in women was classified as central obesity (25,31)**.**

3.9 DISSEMINATION OF RESEARCH FINDINGS

Findings from the study will be disseminated to The University of Namibia, The Ministry of Health at national level, and Oshikoto Regional Health Directorate.

CHAPTER 4

RESULTS

4.1 DESCRIPTIVE ANALYSIS

4.1.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION

Sample size was 370, however, a total number of 375 individuals participated in a study (shows an increase of 1.3%). Majority of participants 279 (74.4%) were female while males were only 96 (25.6%). The mean age of study population was 42.9 ± 15.0 years (male respondents: 45.5 ± 16.2 years; female respondents: 42.0 ± 14.5 years) with representation of participants from all the age groups. Among participants 268 (81.6%) were from age group of 18 - 55 years in which majority were age group of 26 – 35 years with 27.2%, while 69 (18.4%) were 56 and above years of age in which 6.9% were over 66 years. Most participants 244 (65.1%) were residing in rural area and 100 (26.7%) in urban area and this finding was higher in both males and female. This is presented in Table 4.1.

The distribution of the study participants by their education levels showed that 216 (57.6%) had acquired at least a secondary education while 31 (8.3%) respondents had no education. Only 27 (7.2%) of participants had tertiary education. Concerning marital status, most of participants were single 209 (55.7%), married 119(31.7%). Cohabitation was found higher in males 13 (52.0%) than females 12(48%). Widowed and divorced in female participants 17(100%) and 4 (100%) males respectively. Out of 375 participants, majority were Wambos 314 (83.7%) and were single 209 (55.7%) and more than a half (65.3%) were female. Unemployment was the highest among participants with 167 (44.5%) and founded more among age group of 46 – 55 years with 46 (12.3%) while equally distributed between age group 26 –

35 and 36 – 45 with 42 (11.2%) each. Socio-demographic characteristics of the participants are shown in Table 4.1 and Figure 4.1.

Table 4.1 Socio-demographic characteristics of the study population by sex, Oshikoto region, 2018 (N=375).

CHARACTERISTICS	CATEGORIES	MALE (%)	FEMALE (%)	TOTAL (%)
Age in years				
	18 - 25	7 (18.4)	31 (81.6)	38 (10.2)
	26 - 35	22 (21.6)	80 (78.4)	102 (27.2)
	36 - 45	26 (29.2)	63 (70.8)	89 (23.7)
	46 - 55	18 (23.4)	59 (76.6)	77 (20.5)
	56 - 65	12 (27.9)	31 (72.1)	43 (11.5)
	66 +	11 (42.3)	15 (57.7)	26 (6.9)
Residential area				
	Rural	53 (21.7)	191 (78.3)	244 (65.1)
	Semi - urban	13 (41.9)	18 (58.1)	31 (8.3)
	Urban	30 (30.0)	70 (70.0)	100 (26.7)
Level of Education				
	Illiterate	14 (45.2)	17 (54.8)	31 (8.3)
	Primary education	26 (25.7)	75 (74.3)	101 (26.9)
	Secondary education	48 (22.2)	168 (77.8)	216 (57.6)
	Tertiary education	8 (29.6)	19 (70.4)	27 (7.2)
Marital status				
	Cohabiting	13 (52.0)	12 (48)	25 (6.7)

	Divorced	0 (0)	4 (100)	4 (1.1)
	Married	44 (37.0)	75 (63.0)	119 (31.7)
	Separated	0 (0)	1 (100)	1 (0.3)
	Single	39 (18.7)	170 (81.3)	209 (55.7)
	Widowed	0 (0)	17 (100)	17 (4.5)
Ethnic group				
	Caprivian	8 (61.5)	5 (38.5)	13 (3.5)
	Herero/Himba	5 (33.3)	10 (66.7)	15 (4.0)
	Kavango	2 (50.0)	2 (50.0)	4 (1.10
	Nama/Damara	4 (44.4)	5 (55.6)	9 (2.4)
	San community	6 (30.0)	14 (70.0)	20 (5.3)
	Wambo	73 (23.2)	241 (76.8)	314 (83.7)
Employment status				
	Government employed	16 (42.1)	22 (57.9)	38 (10.1)
	Non-government employed	20 (35.1)	37 (64.9)	57 (15.2)
	Pensioner	19 (36.5)	33 (63.5)	52 (13.9)
	Self employed	15 (26.3)	42 (73.7)	57 (15.2)
	Student	2 (50.)	2 (50.0)	4 (1.1)
	Unemployed	24 (14.4)	143 (85.6)	167 (44.5)

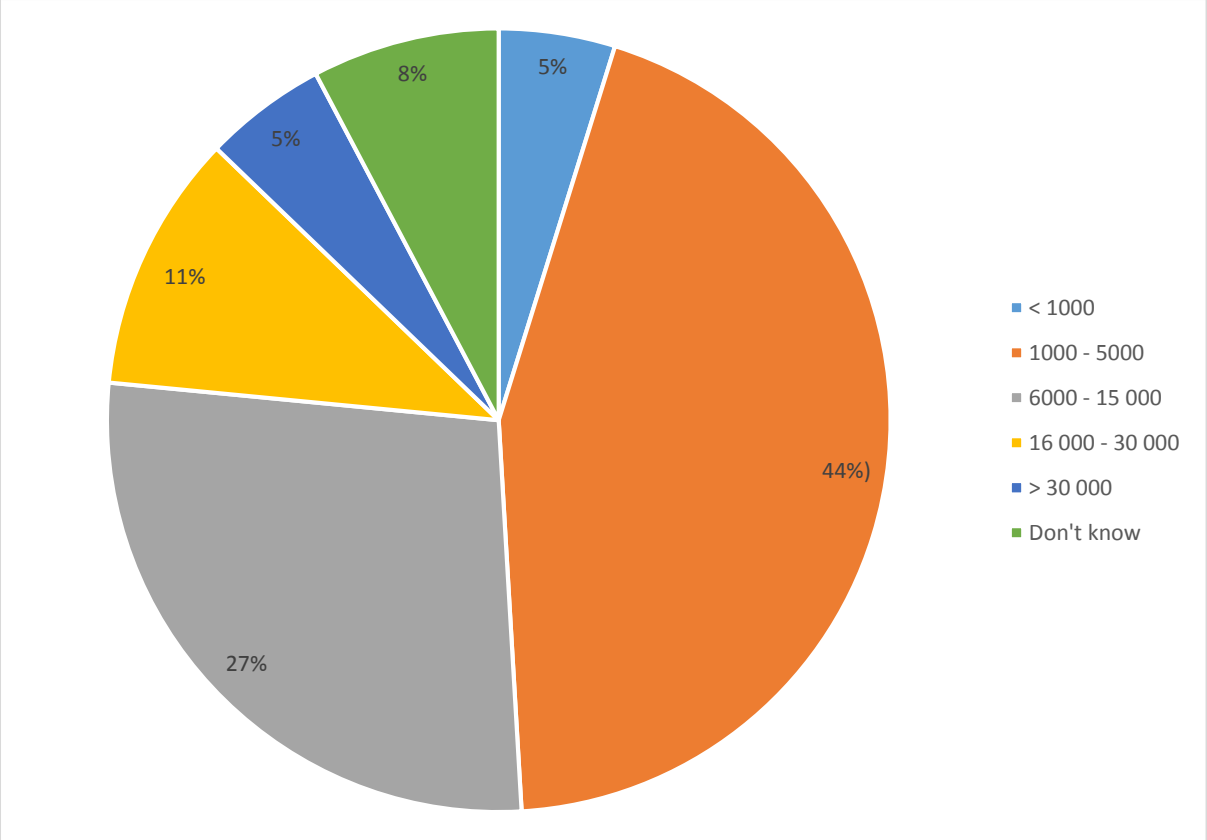

Figure 4.1: Proportion of participants by monthly average household earning in Namibia dollar (N$), Oshikoto region, 2018 (N=375).

Forty-nine percent of the participants had a monthly average household earning of less than N$ 6000 and only 19 (5.1%) had more than 30 000. Therefore, majority of the participants belonged to lower socio-economic status (Figure 4.1 above).

4.1.2 BEHAVIORAL RISK FACTORS OF THE STUDY POPULATION

Table 4.2 presents behavioral risk factors for males and females in the study. Among 375 study participants 278 (74.1%) reported performing physical activity of more than 30 minutes daily, in which 78.4% were females and 60 (21.6%) were males. Most 95 (25.3%) participants were not performing physical activity. Few 56 (14.9%) were being sedentary as estimated by the duration of time spend reclining or sitting on a typical week and it was found higher among males 26 (27.1%) (n=96) than females 30 (10.5%) (n=279). Walking as a measure for physical

activity was a better habit among participants, with majority 319 (85.1%) walking at least 10 hours/ more per week (Table 4.2). However, 68 (18.1%) of participants (60.3% females and 39.7% males) were not even walking daily for 10 minutes as recommended by WHO, this was found higher (55.5%) among age groups between 18 and 45 years and majority 48 (70.6%) were living in urban areas.

Among study participants, none of the 183 (48.8%) consumes any fruit per week (females 75.4%% and males 24.6%). However, 186 (49.6%) participants consume vegetables at least once a week (females 138(74.2%) and males 48(25.8%)). All participants 375 had salt intake. Most of participants 332 (88.5%) responded that they only ate processed food with high salt and 165 (44.0%) were eating food that not prepared at home in past 14 days. On other hand, vegetable oil was used by majority 362 (96.5%) as type of kitchen oil. This data is presented in table 4.2.

About 30 (8%) of participants reported being current smokers, and this was found higher in men than in women 16 (53.3%) and 14 (46.7%) respectively, and it was distributed equally among rural and urban males. Alcohol consumption rate when relates to current use was 132 (35.2%) more among females 80 (60.6%) compared to males 52 (39.4%) and among all 132 participants 90.1% were accustomed to home brews (Tombo and Katokele) as well as beer (Table 4.2).

Table 4.2: Frequency distribution of the behavioral risk factors for NCDs of study participants by sex, Oshikoto region, 2018 (N=375).

VARIABLES	CATEGORIES	MALE (%)	FEMALE (%)	TOTAL (%)
Frequency of physical activity per day in minutes				
	0 minutes	35 (36.8)	60 (63.2)	95 (25.3)
	10 - 30 minutes	1 (50.0)	1 (50.0)	2 (0.5)
	> 30 minutes	60 (21.6)	218 (78.4)	278 (74.1)
Frequency of sedentary lifestyle per week in hours				
	0 hours/week	70 (21.9)	249 (78.1)	319 (85.1)
	> 10 hours/week	26 (46.4)	30 (53.6)	56 (14.9)
Frequency of walking per day/ week in hours				
	0 hours/week	20 (43.5)	26 (56.5)	46 (12.3)
	> 10 hours/week	76 (23.1)	253 (76.9)	329 (87.7)
Frequency of taking fruits per week				
	Zero a week	45 (24.6)	138 (75.4)	183 (48.8)
	Once a week	23 (26.7)	63 (73.3)	86 (22.9)
	Twice a week	18 (27.7)	47 (72.3)	65 (17.9)
	Thrice a week	6 (20.7)	23 (79.3)	29 (7.8)
	> three times a week	4 (33.3)	8 (66.7)	12 (3.2)
Frequency of taking vegetables per week				
	Zero a week	44 (25.4)	129 (74.6)	173 (46.1)

	Once a week	48 (25.8)	138 (74.2)	186 (49.6)
	Twice a week	4 (25.0)	12 (75.0)	16 (4.3)
Frequency of salt consumption				
	Always	96 (25.6)	279 (74.4)	375 (100)
Frequency of eating processed food high in salt				
	Always	0 (0.0)	1 (100)	1 (0.3)
	Often	4 (44.4)	5 (55.6)	9 (2.4)
	Sometimes	81 (24.4)	251 (75.6)	332 (88.5)
	Never	11 (33.3)	22 (66.7)	33 (8.8)
Frequency of eating food that not prepared at home past 14 days				
	yes	60 (36.4)	105 (63.6)	165 (44.0)
	No	36 (17.1)	174 (82.9)	210 (56.0)
Type of kitchen oil				
	Animal fat	2 (22.2)	7 (77.8)	9 (2.4)
	Butter/margarine	1 (33.3)	2 (66.7)	3 (0.8)
	Traditional marura oil	1 (100)	0 (0.0)	1 (0.3)
	Vegetable oil	92 (25.4)	270 (74.6)	362 (96.5)
Tobacco use				
	Current smoker	16 (53.3)	14 (46.7)	30 (8.0)
	Never smoker	77 (22.6)	264 (70.4)	341 (90.9)
	Previous smoker	3 (75.0)	1 (25.0)	4 (1.1)
Alcohol consumption				

Current use	52 (39.4)	80 (60.6)	132 (35.2)
Never use	35 (15.8)	187 (84.2)	222 (59.2)
Previous use	9 (42.9)	12 (57.1)	21 (5.6)

4.2 NCDs BIOLOGICAL RISK FACTORS OF THE STUDY POPULATION

4.2.1 Anthropometric and Biochemical measurements

These measurements including height, weight, body mass index (BMI can be calculated as ratio of weight(kg) and height square (m), blood pressure, heart rate (Anthropometric) and blood glucose (levels). Mean height for males was 168 ± 9.3 SD and range between 130 – 185 cm, while mean height for females was 16 ± 8.7 SD and range On average males were 168cm tall while females were 161cm tall. Considering their weight, on average females had 62 kg as compared to 61 kg for males. Among all study participants 111 (29.6%) had higher BMI (females 87.4%, male 12.6%) with mean (BMI) of 23.3 ± 4.5 SD and range between 14.0 to 46.0. Females had relatively higher BMI than males (Females = 46, Males = 36).

Among participants with high blood pressure, proportion of 39 (44.8%) were currently on hypertension treatment (see page 47 for classifications). All participants had their heart rate checked and recorded in which 4 (10.9%) were having abnormal heart rate (bradycardia = 3 (7.3%), tachycardia = 38 (92.7%)) and it was found higher among female than male with 71.7% and 29.3% respectively. Among all study participants 375, only 12 (3.2%) were diagnosed with diabetes mellitus (DM) in which 50% were already on treatment. Table 4.3 shows the prevalence summary of biological risk factors by sex.

Table 4.3: Prevalence of NCDs biological risk factors among participants by sex, Oshikoto region, 2018 (N=375).

	Population prevalence (%)	**Male (%)**	**Female (%)**
Overweight	77 (20.5)	11 (14.3)	66 (85.7)
Obesity	34 (9.1)	3 (8.8)	31 (91.2)
Blood pressure	87 (23.2)*	26 (29.9)*	61 (70.1)*
Heart rate	41 (10.9)	12 (29.3)	29 (71.7)
Blood glucose	6 (1.6)*	0 (0)	6 (100)*

*Values with * are participants with high blood pressure, abnormal heart rate and high glucose.*

High blood pressure (classified as hypertension) was recorded the highest biological risk factor with 87 (23.2%) participants, followed by overweight 77 (20.5%) participants. The least was high blood glucose (classified as DM) with 6(1.6%) (refers to 3.9 on page 47 for classification). The most affected population per sex was females with 193 (78.8%).

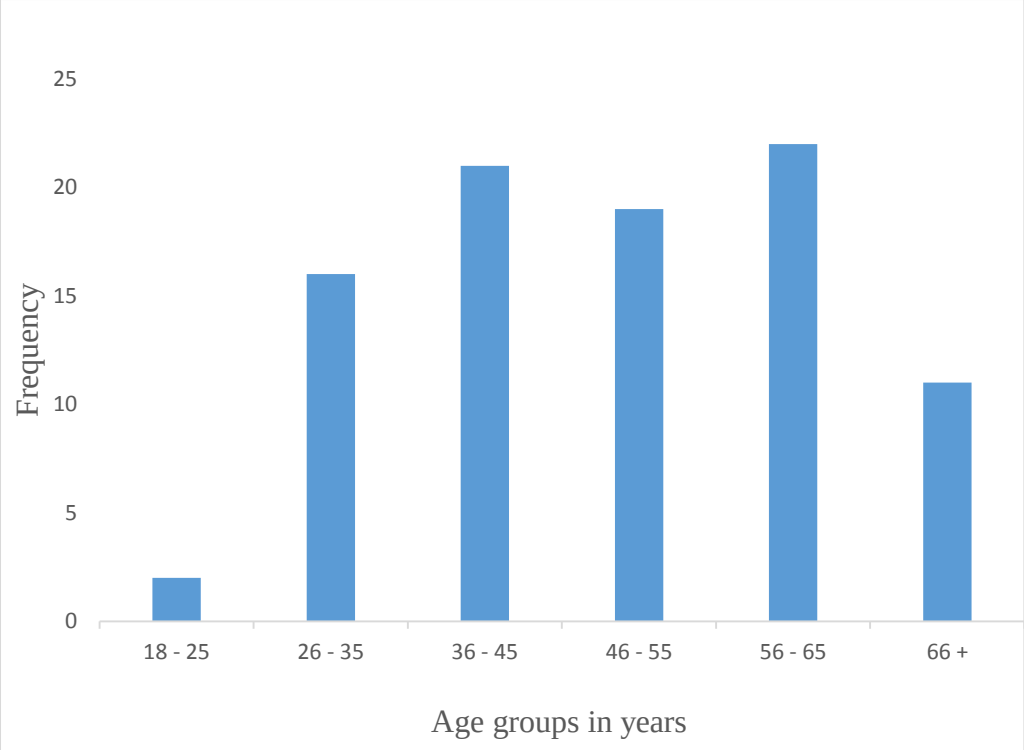

Figure 4.2: Prevalence of Hypertension by aged group in years, Oshikoto region, 2018.

Among all study population 91 (24.3%) were hypertensive predominantly among age-group 56 – 65 years (22 (24.2%)), followed by 36 – 45 and 46 – 55 years with 21 (23.1%) and 19 (20.9%) respectively while 18 – 25 years was least with less than three percent. Figure 4.2. More females 64 (70.3%) were affected compare to males 27 (29.7%). Note with 43 (47.3%) were already on treatment. According to high blood pressure classifications, hypertension was the highest at 57 (62.6%) while almost ten percent (9.9%) were found with stage 11 hypertension (see page 47 for classification).

In addition, 16 (4.3%) of study participants had two combination risk factor of NCDs such as physical inactivity and unhealthy diet. However, 9 (2.4%) participants were having both four behavioural risk factors, while 4 (1.1%) were having combination of both behavioural risk factors plus one biological risk factor.

4.3 ASSOCIATIION BETWEEN RISK FACTORS AND NON-COMMUNICABLE DISESES (DM AND HPT)

Diabetic mellitus (DM) and Hypertension (Hpt) are the leading NCDs in Oshikoto region based on the sample size for the study. Two by two analysis results to determine the association between major socio-demographic and risk factors and NCDs are presented in Tables 4.4 (DM) and 4.5 (Hpt). Logistic regression was used to estimate the strength of association for all exposure variables that were statistically significant in bivariate analysis. Results for multivariate logistic regression analysis are presented in Table 4.6 and 4.7.

Table 4.4: Bivariate Analysis of diabetic mellitus Exposure Variables of adults in Oshikoto region, 2018.

Exposure variables	Diabetic mellitus		OR	95%CI	P-value
Sex	Yes	No			
Male	1	95			
Female	11	268	0.26	0.03 - 2.01	0.31
Age Group (years)					
18 - 45	6	223			
46+	6	140	0.63	0.19 - 1.99	0.55
Residential area					
Rural	4	240			
Urban	8	123	0.26	0.08 - 0.87	**0.03***
Level of Education					
Illiterate	0	31			
Literate	12	332	0.00	Undefined	0.61
Marital status					
Single	7	224			
Married	5	139	0.27	0.27 - 2.79	1.00
Ethnic group					
Wambo	8	307			
Others	4	56	0.36	0.11 - 1.25	0.11
Employment status					
Employed	5	147			
Unemployed	7	216	1.05	0.33 - 3.37	1.00
Physical Inactive					
Yes	2	75			
No	10	288	0.77	0.16 – 3.58	1

Unhealthy Diet					
Yes	7	158			
No	5	205	1.82	0.57 – 5.83	0.38
Tobacco use					
Yes	2	28			
No	10	335	2.39	0.49 – 11.46	0.25
Alcohol use					
Yes	3	150			
No	9	213	0.47	0.13 – 1.78	0.37
Overweight					
Yes	3	78			
No	9	285	1.22	0.32 – 4.61	0.73
Obesity					
Yes	6	28			
No	6	335	11.96	3.62 – 39.54	**0.00***
Elevated BP					
Yes	6	81			
No	6	282	3.48	1.09 – 11.09	**0.04***

*Values in bold and * are statistically significant at P-value < 0.05 95 % Confidence Interval, OR=Odds Ratio.*

There was a significant association between residential area (OR=0.26, 95%CI=0.08 – 0.87, P-value=0.03); Obesity (OR=11.96, 95%CI=3.62 – 39.45, P-value=0.00); elevated blood pressure (OR=3.48, 95%CI=1.09 – 11.09, P-value=0.04) and DM. All this three risk factors were statistical significant, therefore, there is an association between those risk factors and DM. The other exposure variables were not found to be statistically significant.

Table 4.5: Bivariate Analysis of hypertension Exposure Variables of adults in Oshikoto region, 2018.

Exposure variables	Hypertension		OR	95%CI	P-value
Sex	Yes	No			
Male	27	69			
Female	64	215	1.31	0.78 - 2.22	0.33
Age Group (years)					
18 - 45	39	190			
46+	52	94	0.37	0.23 - 0.60	**0.000***
Residential area					
Rural	55	189			
Urban	36	95	0.77	0.47 - 1.25	0.31
Level of Education					
Illiterate	10	21			
Literate	81	263	1.55	0.69 - 3.42	0.28
Marital status					
Married	46	98			
Single	45	186	1.94	1.20 – 3.13	**0.009***
Ethnic group					
Wambo	73	242			
Others	18	42	0.7	0.38 - 1.297	0.25
Employment status					
Employed	39	113			
Unemployed	52	171	1.14	0.70 - 1.83	0.62
Physical Inactivity					
Yes	24	53			
No	67	231	1.56	0.89 – 2.72	0.14
Unhealthy Diet					
Yes	36	129			
No	55	155	0.79	0.46 – 0.27	0.34
Tobacco use					
Yes	9	21			
No	82	263	1.37	0.61 – 3.12	0.51
Alcohol use					
Yes	37	116			
No	54	168	0.99	0.13 – 1.60	1
Overweight					
Yes	29	52			
No	62	232	2.09	1.22 – 3.56	**0.008***
Obesity					
Yes	15	19			
No	76	265	2.75	1.34 – 5.67	**0.01***

High blood glucose					
Yes	4	2			
No	87	282	6.48	1.17 – 35.9	**0.03***

*Values in bold and * are statistically significant at P-value < 0.05 95 % Confidence Interval, OR=Odds Ratio.*

There was no significant association between sex and hypertension (OR=1.31, 95%CI=0.78 - 2.22, P-value=0.33). The odds of developing hypertension were 0.37 times more in participants of age group 46 + than those in 18-45 age group (OR=0.37, 95%CI=0.23 - 0.60, P-value=0.000*). Furthermore, hypertension was associated with marital status (OR=1.94, 95%CI=1.20-3.13, P-value=0.009); Overweight (OR=2.09, 95%CI=1.22-3.56, P-value=0.008); obesity (OR=2.75, 95%CI=1.34-5.67, P-value=0.01); and, high blood glucose (OR=6.48, 95%CI=1.17 – 35.9, P-value=0.03). The other exposure variables were not found to be statistically significant (Table 4.5).

4.4 MULTIVARIATE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS ASSOCIATED WITH NCDS

In order to find independent associations and confounder, multivariate logistic regression analysis was performed for common risk factors that were statistical significant in bivariate analysis versus outcome variables such as diabetes mellitus and hypertension as reflected in Table 4.6 and 4.7.

Table 4.6: Multivariate analysis risk factors associated with diabetes mellitus among adult, Oshikoto region, 2018.

	Diabetes Mellitus		
Variables	**AOR**	**95% CI**	**P-Value**
Residential area (Yes/No)	0.35	0.09 - 1.23	0.10
Obesity (Yes/No)	8.20	2.36 - 28.57	**0.000***
Presence of elevated Blood Pressure (Yes/No)	2.3972	0.69 - 8.21	0.16

Table 4.7: Multivariate analysis risk factors associated hypertension among adult, Oshikoto region, 2018.

	Hypertension		
Variables	**AOR**	**0.95 - C.I.**	**P-Value**
Age Group (46 +/18 - 45)	2.48	1.44 - 4.26	**0.001***
Marital status (Yes/No)	1.26	0.73 - 2.17	0.39
Overweight (Yes/No)	2.34	1.31 - 4.19	**0.004***
Obesity (Yes/No)	3.48	1.55 - 7.79	**0.003***
Presence of Elevated blood Glucose (Yes/No)	4.44	0.67 - 29.26	0.12

Obesity was a significant risk factor for both conditions (DM and Hpt) with an adjusted odd ratio (AOR) of 8.20 (DM) and 3.48 (Hpt). However, age group and overweight were also found to be significantly association with hypertension (AOR=2.48, 95%CI=1.44 - 4.26, P-value=0.001*) and (AOR=2.34, 95%CI=1.31 - 4.19, P-value=0.004*) respectively, therefore, older age, overweight and obesity were factors that strongly associated with NCDs.

CHAPTER 5

DISCUSSION OF STUDY FINDINGS

Non- communicable diseases (NCDs) are the main causes of morbidity and mortality in Namibia (4,7). In fact, the risk factors of today are the diseases of tomorrow and, the public health interventions/ strategies addressing NCDs risk factors in population should be informed by accurate and reliable data from different settings. There are not many comprehensive studies done on NCD risk factors in Namibia, therefore, this study is the first comprehensive epidemiological survey of various NCD risk factors, including random blood glucose in Oshikoto region of Namibia. This WHO STEPS survey has great importance on providing valuable baseline information needed to develop policies, strategies and plan of action against those risk factors. This study addressed common NCDs risk factors such as physical inactive, unhealthy diet, tobacco use, alcohol consumption (behavioral risk factors); obesity, overweight, blood pressure and random blood glucose (biological risk factors). The study findings are discussed with Limitations and implication of the study.

5.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION

This study found that most of males mostly unavailable at homes during daytime, (74.4% of our study participants are females with only 25.6% males). This is probably because females are mostly confined at home as housewives. This finding is almost the same with the studies conducted in Afghanistan (66.5%), Zimbabwe (75%) and Malawi (67.5%) (38, 43). According to our findings, more participants are from middle age group (26 – 35). This finding is similar to study that was conducted in Uganda (35). By rural – urban stratification, most of the participants were residing in rural areas than in urban areas, 84% of Oshikoto region is rural and only 16% urban (30). Studies that were conducted in some of Sub-Saharan African countries, Afghanistan, and India also shared same findings as our study. This study finding

could be also due to the fact that most of urban residents are at work during the day than those are resided in rural areas (16, 38, 38).

There was high unemployment rate among participants (aged 26 – 45 years). Namibia is ranked at second position in Africa with 33.4% (19.5 – 37.6%) by December 2018 (9). Therefore, this high unemployment rate could be associated with the current high unemployment rate in the country at the time of the study.

5.2 BEHAVIORAL RISK FACTORS OF THE STUDY POPULATION

The main behavioural risk factors for NCDs are physical inactivity, unhealthy diet, Obesity, tobacco use and harmful use of alcohol. Individuals are predisposed to NCDs by poverty, unhealthy dietary practice (including low fruits and vegetables intake) and harmful use of alcohol. But on the other hand, as individuals (at household level) become financially stable, their lifestyle changes and then their exposure to NCDs increases and this is because higher incomes promote risky behaviours like higher level of physical inactivity, smoking and consumption of processed foods with high salt/ fat content including Westernization of dietary habits (15,16). And this was proven by a study that was conducted in Kenya which found out an 5.42% association between living in urban setting and NCDs (16).

5.2.1 Physical inactivity

Physical inactivity is the fourth leading risk factor for mortality, causing more than 3.2 million deaths global (11), Physical inactivity among study participants was 25.3% and this was highest among those residing in urban areas than rural areas and majority were females. These results are almost similar to the overall WHO African regions figures (22%) and less than global data (28%) for year 2016 (1,7,9,10) Mali, Mauritania, Democratic Republic of the Congo, Cameroon, and Côte d'Ivoire are the five countries with the highest prevalence of physical inactivity for both sexes (8,11). However, current results are not similar to the national figures

as Namibia physical inactivity prevalence was at 33.4% in 2016, but, when compared by sex, similarity is there (higher among females than males) (1,3,6,8). The physical and social environment such as industrialization, urbanization and economic development, social norms and motorized transport are the factors that contribute to physical inactivity (10,11). About 15% of our study participants reported living sedentary lifestyle which is higher among males especially those in urban areas. Even though walking is a vital for physical activity and a protective factor against obesity and other NCDs, this current study found out that some (18%) of participants are not even walking daily for 10 minutes as recommended by WHO, this prevalence found higher among younger and middle age group (18 and 45 years) females living in urban areas and those belonging to middle-high income groups. Therefore, physical inactivity trends need to be closely monitored and interventions such as community awareness, sport centers and jogging lots establishment which is lacking in Oshikoto regions' urban settings, should be encouraged and discussed with relevant sectors.

5.2.2 Unhealthy diet

This study found out that majority of the study participants consumed inadequate amount of fruit and vegetables, (almost half do not consume any fruit per week) and about half participants consume vegetables at least once a week with high female respondents. Globally, 2.7 million deaths are attributable to diets low in fruits and vegetables (7). Coronary heart disease, gastrointestinal cancer, and stroke are attributed to low intake of fruits and vegetables with estimated to mortality of 31%, 19% and 11% respectively worldwide (7,17). All the study participants were always adding salt in their meals. This finding was almost similar to study conducted in Bangladesh with 80% of study participants were added salt in their meals (51). Most participants responded that they ate processed food high in salt sometimes and less than half ate food not prepared at home within past 14 days. Any food that rich in salt (sodium), calories and saturated fats is unhealthy (11). Global report on prevalence of NCDs risk factors

indicated that the prevalence of average salt intake in adults was 10g/day in 2016 (11,). Study conducted in Ethiopia found that 60 402 deaths of NCDs were associated with dietary risks and 88% (nine in every ten diet-related deaths) of this deaths were cardiovascular disease, however, 44% were associated with below-optimal diet quality (44).

5.2.3 Tobacco use

About 8% of participants reported being current smokers and higher in males than females, and was equally distributed equally among rural and urban males. The national prevalence of tobacco product smoking among adults in Namibia was above 20% in 2013 whereby 37% were males and 11.7% female. Unsimilar findings with study conducted in India in 2013 found high prevalence of tobacco use among rural men than urban men (39). Another study done in Ghana, tobacco use was 4.8% of respondents (2). In other study done in Georgia, the prevalence of current smoking was 42.2% more than five times higher than these study findings (40).

Tobacco use increasing individuals' risk for developing NCDs such us cardiovascular diseases, chronic respiratory diseases and cancer (11). Various study indicated that tobacco smokers have relative risk of 2-3 times higher for coronary heart disease (CHD), 12 time risks for lung cancer, 1.5 times for stroke and 1.4 times for chronic obstructive pulmonary disease (COPD) (11,12). Tobacco use can temporarily increase blood pressure especially cigarette smoking and can damaged heart and arteries (blood vessels). This problem/conditions occurred because of nicotine and carbon monoxide found in tobacco products (6,11). Nicotine increase blood pressure, while carbon monoxide degreases the required amount of oxygen in the blood. However, individuals' exposure to tobacco smoke known as secondhand smoke, are also at great risk of cardiovascular diseases for non-smoker, especially hypertension and risk of developing and progression of atherosclerosis (39). A study conducted in India found high risk for chronic obstructive pulmonary disease (COPD) due to tobacco smoking was among men, while, risk of exposure to second hand smoke was among women (14).

5.2.4 Alcohol use

According to study results, current alcohol consumption rate was less than 50% and more among females than males. This results might be due to females predominantly in study. However, Studies in other countries found high proportion of alcohol consumption among males (7,31, 34,39,42). Alcohol consumption per capital in Namibia in year 2010 was above 10 liters of pure alcohol among adults aged 15 years of age and above (8,9). Study done in Ghana, shows that alcohol consumption was the highest among study population. (2).

Harmful use of alcohol causes 3 million deaths every year globally, represent 5.3 % of all deaths (7). The percentage of alcohol-attributable to the global burden of disease and injury is 5.1 %**,** as measured in disability-adjusted life years (DALYs) (7, 11). Globally, alcohol counts for 7.7% and 2.6% of all deaths among men and women respectively. The data extracted from WHO African regions shows 45 percent of women and 38 percent of men consumed 1-2 drinks per day, 28 percent of men and 24 percent of women consumed 3-4 drinks per day, and, 27 percent of men and 22 percent of women consumed 5 or more drinks per day (7,8,11).

5.3 NCDs BIOLOGICAL RISK FACTORS OF THE STUDY POPULATION

5.3.1 Anthropometric and Biochemical measurements

The results from this regional population-based study found gender differences in the prevalence of the measurements. On the average height of study population, males were taller than females. Findings also shows high body mass index (BMI) in females than males. However, study conducted in Lebanon does not support this (51). Weight gain and higher-than-normal BMI are the risk factors for diabetes and hypertension. The substantial proportion of population was overweight, found higher among females compared to males. Study finding is congruous with previously published studies and this established a warning sign that need urgently consideration before reaching drastic levels (31,38). In addition, the prevalence of obesity based on BMI of ≥30 was higher in females than males. This was attributed by the

physical inactivity, unhealthy diet (caloric intake) and sedentary lifestyle especially among urban residents. These result was similar to findings of a study conducted in sub-Saharan Africa countries reported that increasing rise of overweight and obesity was associated with genetic, physical inactivity and caloric intake and other underlying causes such as globalization, urbanization, occupation and perceptions of weight in some cultures (11,16). Previous published studies have demonstrated that changing lifestyle could prevent overweight and obesity, which in long run prevent NCDs especially diabetes and hypertension in selected adult groups at high risk (9,16, 38,51). Overweight and obesity are major risk factors for the number of health outcomes, morbidity, mortality and NCDs related conditions. Overweight and obese people may greatly suffer from discrimination as well as stigmatization (8,11). Therefore, our findings suggested that overweight and obesity should be addressed concurrently with focused health promotion strategies.

The study found higher prevalence of high blood pressure among females and many were undiagnosed. Approximately quota of adult population (18 and above) in Oshikoto region has hypertension with almost half currently on treatment and majority were females. Most participants on hypertension treatment Bp was not controlled. Results of an Afghanistan and Iranian study support these findings, in which the overall prevalence rate of hypertension was 27.1%, however, this study reported higher prevalence of hypertension in males than females (38). Hypertension is more among older age groups even though less proportion of participants under 25 years of age has hypertension. This finding was similar to studies done in Tanzania and Uganda (11,31). Worldwide, hypertension is a leading public health burden, with more deaths attributable to heart disease and stroke (6). It is also associated with eclampsia in pregnancy and renal disease (8,11). The study found about ten percent of study population has abnormal heart rate, with higher proportion of tachycardia. Study conducted in Tanzania had support this findings (11,31).

The current study results show low prevalence (less than 5%) diabetes among study participants in which half was newly diagnosed and other half was already on treatment. All participants with high blood glucose level were females. This finding was low when compare to the national average, unlike other study done elsewhere which reported higher diabetes prevalence among the study population than of national average (51). High prevalence of diabetes mellitus was among adults aged 55 to 64 in Africa, with 62.2% undiagnosed. However, majority of those with DM were living in urban areas (5,7). Change in BMI at the population level anticipate changes in DM prevalence as indicated in some studies **(**11,15,16). The high prevalence of NCDs risk factors and the fact that the diabetes prevalence is still relative low in Oshikoto region provide a window of opportunity and call for urgent introduction at population and inter-sectorial interventions for risk factors exposures reduction.

A study found some study participants with two or more combination risk factor of NCDs. And majority were urban residents. This finding was similar to study conducted in Afghanistan which reported that participants residing in urban areas were more likely to have two or more risk factors than those in rural areas. This also concur with other study (cited in) found urban residence as primary risk factor for NCDs impacting the health of population (38). Therefore, these findings suggested that the interventions are needed to target a group of risk factors and the control strategy to address urbanization and warrants gender-sensitive strategies specifically aiming women.

5.4 ASSOCIATIION BETWEEN RISK FACTORS AND NON-COMMUNICABLE DISEASES

Diabetic mellitus (DM) and Hypertension (HTN) as the leading NCDs in Oshikoto region were used to estimate the sample size for the study, therefore, association was determined between risk factors and this two NCDs (DM and HTN). In order to find independent associations and

confounder, multivariate logistic regression analysis was performed in this study for common risk factors that were statistical significant in bivariate analysis versus outcome variables such as diabetes and hypertension

5.4.1 Association between risk factors and diabetes mellitus

The bivariate analysis among socio-demographic variables, residential area was independently associated with diabetes. Diabetes prevalence increased significantly higher among urban residents than rural residents. Other studies in SSA support this finding (31). The study reveals no any significant association between behavioral risk factors and DM, like other studies elsewhere (2,11,31,35). However, among anthropometric factors, obesity, and elevated blood pressure were found to be associated with DM and this finding was evident by other study (51).

5.4.2 Association between risk factors and hypertension

The bivariate analysis among both variables, age, marital status, overweight, obesity and raised blood glucose were found to be associated with hypertension independently. The prevalence of hypertension significantly increased with age when comparing those ≥46 years old with those ≤45 years old. With being married compared with those single, hypertension prevalence was significantly high among married participants. Furthermore, this study reveals the odds of being hypertensive increased by existence of overweight and obesity. Other published studies conducted in Afghanistan, Angola, China, Tanzania and Uganda were in agreements with these findings that older age and higher BMI were significantly associated with hypertension (31,34,35,38,52).

Bivariate analysis: the prevalence of raised blood glucose, overweight and obesity was affecting the level of blood pressure, therefore, managing hypertension needs comorbidity consideration. For this reason, this study suggests the screening program to be established to prevent the development of hypertension.

5.4.3 Multivariate logistic regression analysis risk factors associated with NCDs

The study findings clearly listed out older age, overweight and obesity as a leading risk factors for NCDs by which obesity found to be strongly associated with NCDs (DM and Hpt). Age and overweight were significant with hypertension. Generally, aging is linked to the development of NCDs in sense that, the older a person get, the higher risk of developing coronary heart disease or a cardiac condition (angina, heart attack or stroke) (11,16). This finding was narrated to other studies especially association between older age and obesity, however, those studies have other risk factor which were found with strongly significant like education and alcohol consumption (38,39). Therefore, the intervention at population level should target a group of risk factors in order to reduce the growing burden of Non-communicable diseases.

5.5 LIMITATION OF THE STUDY

The ethical clearance came bit late that cause change in topic wordings (from prevalence of risk factors for diabetes and hypertension to an investigation of NCDs risk factors), however, all were talking the same thing as diabetes and hypertension are part of NCDs. This study was conducted at household level; therefore, population in institutions such as school's hostels, hospitals, military bases, and police barracks at the time of the study were excluded. Low sample size may affect the external validity of results. Result of this study may not represent all regions in Namibia because we targeted only Oshikoto region. The main limitation of our study was financial resources for covering cost, which might have affected the result of the study. There was a cut down to number of regional constituency due to cost and time implications. We could not measure waist circumference, but we used BMI as a viable to determine overweight and obesity. We could not perform fasting blood glucose samples and cholesterol level test due to lack of fund, unlike other studies which had their participants tested for fasting blood glucose and cholesterol levels (2,42). Interviewer were trained on how to use

the data collection tool and interviews were carried out in unbiased manner, therefore, interviewer bias occurrence was prevented, similarly

5.6 IMPLICATION OF THE STUDY FINDINGS

The study finding has numeral of implications for policy and practice in Oshikoto region and nationwide. The introduction of NCDs active case detection and in-depth health education for risk factors is urgently needed in the general population, and this can be successfully achieved through a Multisectoral approach and contextual integrated NCD control program implementation in region.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This study revealed a high prevalence and burden of Non-communicable diseases risk factors among adult in Oshikoto region, directing to changing disease epidemiology of NCDs. The researcher concluded that this increased in the burden of these risk factors could be due to rapid growth of urbanization in Oshikoto region which responsible for lifestyle changes and this was likely to inflict a major public health in future. In both males and females, these risk factors were found to be prevalent as well as across all socio-economic classes with high prevalent in middle age groups. However, study results show gender differences in distribution of some NCDs risk factors. The findings also indicating the age- standardized NCDs risk factors generally higher than the observed population prevalence for many risk factors, demonstrating that their prevalence increases with age of Oshikoto region population. Therefore, the interventions like regular exercise, reducing body weight, eating well-balanced diet with less salt, abstain from tobacco use and alcohol consumptions, reducing blood pressure and blood glucose have demonstrated to have positive impact on population health regarding NCDs risk factors especially cardiovascular diseases and diabetes.

Furthermore, study reveal that DM was less common than hypertension among adult in the region and majority were not aware of their conditions. The researcher concludes that probability of having two or more risk factors were higher among participants residing in urban areas than those in rural areas. Moreover, our study showed that risk factors associated with NCDs are escalating resulting in the burden of progressive risk factors presented by an individual, which multivariate analysis revealed higher age (≥46), overweight and obesity are

significantly affecting diabetes and hypertension among the adult population in Oshikoto region.

Finally, researcher's conclusion absolutely assumed that the risk factors measured influence NCDs risk in Namibian population as they do in other SSA, Asia and European population where most studies have been conducted. Therefore, our findings can serve as baseline epidemiological data which aid policymakers to develop suitable NCDs risk factors prevention and control strategies.

6.2 RECOMMENDATIONS

The following recommendations have been made for the Ministry of Health and Social Services (at regional and national level) including all policy makers and stakeholders.

6.2.1 Recommendations to the Ministry of Health and Social Services (MoHSS), all policy makers and Stakeholders

National level and stakeholders:

There is a need to strengthen the existing efforts towards the prevention and management of NCDs in Namibia as follows:

- There is a need for establishment and implementation of Emerging national NCDs programs as an inter-sectoral preventive measures according to United Nations and WHO recommendations.
- There is a need for the National Program for Prevention and Control of Cardiovascular disease, Diabetes and Stroke launching focusing on health promotion among general population and disease prevention among high-risk population.
- There is a need for implementation of World Health Organization Package of Essential Non-communicable diseases (WHO PEN) Interventions for primary health care (PHC).

- There is a need for modification of existing legislation and taxation direct to unhealthy diet and beverages, tobacco and alcohol consumption reduction (ban on tobacco advertising; promotion and sponsorship, taxation on alcohol; cigarettes and other tobacco products; development of Alcohol and Deity Policy).
- In collaboration with Ministry of Education, physical activity and traditional diets need to be promoted and actively practiced at schools.
- There is need for health care worker training on NCDs and their risk factors.
- There is urgent need for implementation of NCDs risk factors screening at PHC settings for early identification of individuals at or with high risk for major NCDs.
- There is a need of enough budget allocation on NCDs prevention and control in order to reduce this pandemic.
- There is also a need for increasing capacity for health system research and training.

Oshikoto Regional Health Directorate:

- There is a need for NCDs risk factors screening in community level in order to identify individuals at high risk of NCDs. And this can be successfully achieved through focused regular outreach services.
- Intensifying of NCDs management system to provide regular supervision, training and reporting.
- Establishing sufficient Knowledge and experience about NCDs and their risk factors among health care workers. This can be done through in-service training and/ continues education.
- In collaboration with other stakeholders (e.g. Local and Traditional authorities, Municipalities, office of Governor, NGOs), there is a need of community awareness and establishment of jogging lots and sport centers especially in urban settings particularly for women.
- Intensifying health education regarding NCDs and their risk factors at individual and population level, and encouraging walking to prevent obesity.

- There is a need to update the statistics at the regional level and can be effectively achieved through registration of basic demographic and clinical data when individuals present with NCDs in PHC or during outreach services.
- There is urgent need of community-based interventions at different levels including health promotion, prevention, early diagnosis, treatment, and rehabilitation.

6.2.2 Future studies

- This study provides a baseline data, but due to study limitations, further studies with more in-depth analysis for better planning of strategies against NCDs and risk factors in Oshikoto region are needed.
- Is important for Namibia to invest in conducting STEPwise surveys nationwide every 3–5 years, in order to obtain meaningful trend data that will indicate the direction of NCDs pandemic in the country.
- Total salt intake was not measured in this study, therefore, there is a need for further study to determine the amount of salt intake in population of Oshikoto region.

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APPENDIX

ANNEXURE A: ETHICAL CLEARANCE CERTIFICATE

ANNEXURE B: UNAM RESEARCH PERMISSION LETTER

ANNEXURE C: MoHSS PERMISSSION LETTER

ANNEXURE D: PARTICIPANT CONSENT FORM

UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: SON /431/2017 **Date: 15 October, 2017**

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: Prevalence Of Risk Factors For Diabetes Mellitus And Hypertension Among Adults In Oshikoto Region, Namibia

Researcher: EMILIA SHIWA ASHIPALA

Student Number: 9815139

Faculty: School of Nursing

Supervisors: Prof O. O. Azu (Main) Dr L. Lukolo (Co)

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. J.E de Villiers: UREC Chairperson

Ms. P. Claassen: UREC Secretary

CENTRE FOR POSTGRADUATE STUDIES

University of Namibia, Private Bag 13301, Windhoek, Namibia
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UNAM
UNIVERSITY OF NAMIBIA

RESEARCH PERMISSION LETTER

Centre for Postgraduate Studies
Office of the Director
2018 -10- 05
University of Namibia
UNAM

Date: 25/09/2018

Student Name: Ashipala S

Student number: 9815139

Programme: Masters in Field epidemiology

Approved research title: An investigation of non-communicable diseases risk factors among adults in Oshikoto region, Namibia

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

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

05/10/18
.....
Date

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
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Windhoek

Tel: 061 – 203 2537
Fax: 061 – 222558
E-mail: btjivambi@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3 **EA**
Enquiries: Mr. B. Tjivambi

Date: 21 November 2018

Ms. Emilia Ashipala
University of Namibia
Windhoek

Dear Ms. Ashipala

Re: An investigation of Non-Communicable Diseases risk factors among adults in Oshikoto Region, Namibia.

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;

3.4 A quarterly report to be submitted to the Ministry's Research Unit;

3.5 Preliminary findings to be submitted upon completion of the study;

3.6 Final report to be submitted upon completion of the study;

3.7 Separate permission should be sought from the Ministry for the publication of the findings.

4. All the cost implications that will result from this study will be the responsibility of the applicant and **not** of the MoHSS.

Yours sincerely,

PERMANENT SECRETARY
MINISTRY OF HEALTH & SOCIAL SERVICES

MR. B.T. NANGOMBE
PERMANENT SECRETARY

ANNEXURE D: CONSENT FORM

PARTICIPANT INFORMATION

Title of Study: An investigation of Non-Communicable Diseases risk factors among adults in Oshikoto region, Namibia

Aim of study: This study will determine the risk factors for Non-Communicable Diseases among adult population of Oshikoto region.

Information will be gathered through three steps of data collection:

Step 1: Interview questions

Step 2: Physical measurement of blood pressure, weight height and waist circumference

Step 3: Blood sugar test

We will now describe what is involved in this study in more detail. You may ask any questions you have. We will ask you to sign a consent form.

Step 1 of the survey will involve the interviewer asking you some questions about your:

Age and education

Employment and income

Tobacco and alcohol use

Fruit and vegetable intake

Physical activity

Step 2 of the study will involve the interviewer taking some simple measurements of your:

Blood pressure

Weight

Height

Waist circumference

Step 3 of the study will involve the interview prick you on tip of one of your finger with a small lancet to get a small amount of your blood to test your:

Blood sugar level

Timeframe: It is estimated that step 1 to 3 of the study will take approximately 40 minutes.

Community benefits: The results of this study will used as a baseline to develop strategies and plan of action against Non- Communicable Diseases risk factors in Oshikoto region health sector.

Your rights: It is you right to

Decline to take part in this study

Withdraw your consent at any time

Decline to answer any questions in the interview that you do not wish to answer

Confidentiality: Your responses will remain confidential and anonymous. Your name will not be used in any report of the study.

Results: The result of this study may be published in research publications, media briefings and reports and can be made available to you through the researcher.

Ethical approval: This study had received ethical approval from the Research ethics review committee of the University of Namibia (UNAM) and MoHSS

CONSENT FORM

Dear Participant

Random selection:

You have been randomly selected to be part of this survey and this is why we would like to interview you. This survey is conducted by a trainee field epidemiologist of the MoHSS and UNAM and will be carried out by professional interviewers from MoHSS.

Confidentiality:

The information you provide is totally confidential and will not be disclosed to anyone. It will only be used for research purposes. Your name, address, and other personal information will not be recorded on the instrument. A code will be used for the questionnaire with your answers without identifying you.

Voluntary participation:

Your participation is voluntary and you can withdraw from the survey after having agreed to participate. You are free to refuse to answer any question that is asked in the questionnaire. If you have any questions about this survey you may ask me or contact me at +264 812865330 or emiliashiwa29@gmail.com

Consent to participate:

Signing this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

Read by: Participant Interviewer

Agreed Refused

Signatures: …….

Statement by the researcher/person taking consent

I/the participant has accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands. I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily. A copy of this consent form has been provided to the participant. Name of Researcher/person taking the consent: _____

Signature of Researcher /person taking the consent: _____

Date: _____ (Day/month/year)

ANNEXURE E: DATA COLLECTION TOOL

Survey Information

Location and date

QA_1 Region _____

QA_2 Constituency _____

QA_3 Interviewer _____

QA_4 Date of completion of instrument (dd/mm/yyyy) _____

QA_5 Participant ID_____

Step1 Questionnaire/Interview

Demographic Information

Q1 Sex (record male/female as observed) Male ☐

Female ☐

Q2 What is your date of birth? (dd/mm/yyyy) __ __/__ __/__ __ __ __

Q3 What is the highest level of education you have

Completed?

- Less than primary school ☐
- Primary school completed ☐
- Secondary school completed ☐
- Undergraduate degree completed ☐
- Post graduate degree ☐

Refused ☐

Q4 What is your marital status

Single ☐

Currently married ☐

Separated ☐

Divorced ☐

Widowed ☐

Cohabitating ☐

Refused ☐

Q5 What is your ethnic group?

Damara ☐

Caprivian ☐

Colored ☐

Baster ☐

Himba ☐

Herero ☐

Wambo ☐

Kavango ☐

Nama ☐

San ☐

Tswana ☐

White

Others ☐

Q6 Which of the following best describes your main work status

Over the past 12 months?

Government employee ☐

Non-governmental employee ☐

Self employed ☐

Student ☐

Retired ☐

Unemployed ☐

Others_____

Q7 How many people older than 18 years, including yourself, live

In your household?

_____

Q8 Taking the past, can you tell me what the average

earning of the household have been per month? <N$5,000.00 ☐

>N$5,000.00<N$10, 000.00 ☐

>N$10,000.00<N$20,000.00 ☐

>N$20,000.00<N$30,000.00 ☐

>N$30,000.00 ☐

Do not know ☐

Refused ☐

Behavioral measurement

Physical activities

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

Question	Response
P1 Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like *carrying or lifting heavy loads, digging or construction work* for at least 10 minutes continuously?	Yes ☐ No ☐ *If No, go to P4*
P2 In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days ☐
P3 How much time do you spend doing vigorous-intensity activities at work on a typical day?(Hours: Minutes)	Hours : minutes ☐ ☐ hrs. mins
P4 Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking *[or carrying light loads]* for at least 10 minutes continuously?	Yes ☐ No ☐ *If No, go to P 7*
P5 In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days ☐
P6 How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours : minutes ☐ ☐ hrs. mins

Travel to and from places	
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship.	
P7 Do you walk or use a bicycle *(pedal cycle)* for at least 10 minutes continuously to get to and from places?	Yes ☐ No ☐ *If No, go to P 10*
P8 In a typical week, on how many days do you walk or bicycle for at least 10 minutes	Number of days ☐
P9 How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes ☐ : ☐ hrs. mins

Recreational activities	
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure),	
P10 Do you do any vigorous-intensity sports, fitness or recreational *(leisure)* activities that cause large increases in breathing or heart rate like *[running or football]* for at least 10 minutes continuously?	Yes ☐ No ☐ *If No, go to P 13*
P11 In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational *(leisure)* activities?	Number of days ☐
P12 How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes ☐ ☐ hrs. mins
P13 Do you do any moderate-intensity sports, fitness or recreational *(leisure)* activities that cause a small increase in breathing or heart rate such as brisk walking, *[cycling, swimming, volleyball]* for at least 10 minutes continuously?	Yes ☐ No ☐

P14 In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational *(leisure)* activities?	Number of days ☐
P15 How much time do you spend doing moderate-intensity sports, fitness or recreational *(leisure)* activities on a typical day?	Hours : minutes ☐ ☐ hrs mins

Behavioral Measurements

Diet

The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions please think of a typical week in the last year.

Question (use a Showcard)	**Response**
D1 In a typical week, on how many days do you **eat fruit**?	Number of days ☐ Don't Know ☐ *If Zero days, go to D 3*
D2 How many **servings** of fruit do you eat on **one** of those days?	Number of servings ☐
D3 In a typical week, on how many days do you **eat vegetables**?	Number of days ☐ *If Zero days, go to D 5* Don't Know ☐
D4 How many **servings** of vegetables do you eat on one of those days?	Number of servings ☐

Dietary salt

With the next questions, we would like to learn more about salt in your diet. Dietary salt includes ordinary table salt, unrefined salt such as sea salt, iodized salt, salty stock cubes and powders, and salty sauces such as soy sauce or fish sauce (see Showcard). The following questions are on adding salt to the food right before you eat it, on how food is prepared in your home, on eating processed foods that are high in salt such as *[insert country specific examples]*, and questions on controlling your salt intake. Please answer the questions even if you consider yourself to eat a diet low in salt.

D5 How often do you **add salt or a salty sauce such as soy sauce** to your food right before you eat it or as you are eating it? *(SELECT ONLY ONE)*	Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never ☐ Don't know ☐
	Always ☐

D6 How often is **salt, salty seasoning or a salty sauce added** in cooking or preparing foods in your household?	Often ☐ Sometimes ☐ Rarely ☐ Never ☐ Don't know ☐
D6 How often do you eat **processed food high in salt**? By processed food high in salt, I mean foods that have been altered from their natural state, such as packaged salty snacks, canned salty food including pickles and preserves, salty food prepared at a fast food restaurant, cheese, bacon and processed meat. E.g. Luncheon roll, Vines, Russian, Canned fish.	Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never ☐ Don't know ☐
D7 How much salt or salty sauce do you think you consume?	Far too much ☐ Too much ☐ Just the right amount ☐ Too little ☐ Far too little ☐ Don't know ☐

D8 What type of oil or fat is most often used for meal preparations in your household?

Select only one

- Vegetable Oil ☐
- Lard / suet (Pig or bee/mutton fat) ☐
- Butter ☐
- Margarine ☐
- Non in particular ☐
- None used ☐
- Don’t know ☐
- Others ☐

D9 On average, how many meals per week do you eat that were not prepared at home? I mean breakfast, lunch, and dinner.

☐

Behavioral measurement

Tobacco use

Now I am going to ask you some questions about tobacco use.	
Question	**Response**
T1 Do you **currently** smoke any **tobacco** products, such as cigarettes, cigars or pipes?	Yes ☐ No ☐ *If No, go to T 8*
T2 Do you currently smoke tobacco products **daily**?	Yes ☐ No ☐
T3 How old were you when you **first started** smoking?	Age (years) ☐ Don't know ☐ *If Known, go to T5*
T4 Do you remember how long ago it was? *(RECORD ONLY 1, NOT ALL 3)*	In Years ☐ *If Known, go to T5* OR in Months ☐ *If Known, go to T5* OR in Weeks ☐
T5 On average, **how many** of the following products do you smoke **each day/week?** *(IF LESS THAN DAILY, RECORD WEEKLY)*	Manufactured cigarettes ☐ Hand-rolled cigarettes ☐ Pipes full of tobacco ☐

(RECORD FOR EACH TYPE)	Cigars, cheroots, cigarillos ☐
	Number of Shisha sessions ☐
	Don't know ☐
	Other (please specify): ☐
T7 During the past 12 months, have you tried to **stop smoking**?	Yes ☐ No ☐
T8 In the past, did you **ever smoke** any tobacco products?	Yes ☐ No ☐ *If No, go to T12*
T9 In the past, did you **ever** smoke **daily**?	Yes ☐ *If T1=Yes, go to T12, else go to T10* No ☐ *If T1=Yes, go to T12, else go to T10*

Question	**Response**
T10 How old were you when you **stopped** smoking?	Age (years) ☐ Don't Know ☐ *If Known, go to T12*
T11 How **long ago** did you stop smoking? *(RECORD ONLY 1, NOT ALL 3)*	Years ago ☐ *If Known, go to T12* OR Months ago ☐ *If Known, go to T12* OR Weeks ago ☐ Don't Know
T12 Do you **currently use** any **smokeless tobacco** products such as *[snuff, chewing tobacco, betel]*?	Yes ☐ No ☐ *If No, go to T15*

T13 Do you **currently use smokeless tobacco** products **daily?**	Yes ☐ No ☐ *If No, go to T14*	
T14 On average, how many **times a day/week** do you use …. *(IF LESS THAN DAILY, RECORD WEEKLY)* *(RECORD FOR EACH TYPE)* *Don't Know*	Snuff, by mouth	
	Snuff, by nose	
	Chewing tobacco	
	Betel, quid	
	Other	*If Other, go to T14other, if T13=No, go to T16, else go to T17*
	Other (please specify):	*If T13=No, go to T16, else go to T17*
T15 In the **past**, did you **ever use** smokeless tobacco products such as *[snuff, chewing tobacco, or betel]*?	Yes ☐ No ☐ *If No, go to T17*	
T16 During the past 30 days, did someone smoke **in your home**?	Yes ☐ No ☐	
T17 During the past 30 days, did someone smoke in closed areas **in your workplace** (in the building, in a work area or a specific office)?	Yes ☐ No ☐ Don't work in a closed ☐	

Behavioral Measurement

Alcohol consumption

The next questions ask about the consumption of alcohol.	
Question	**Response**
A1 Have you **ever** consumed any alcohol such as beer, wine, spirits, Vambo liquor ,tombo (and other home brews) or others?	Yes ☐ No ☐ *If No, go to A16*
A2 Have you consumed any alcohol within the **past 12 months**?	Yes ☐ *If Yes, go to A4* No ☐
A3 Have you stopped drinking due to health reasons, such as a negative impact on your health or on the advice of your doctor or other health worker?	Yes ☐ *If Yes, go to A16* No ☐ *If No, go to A16*
A4 During the past 12 months, **how frequently** have you had at least one standard alcoholic drink?	Daily ☐ 5-6 days per week ☐ 3-4 days per week ☐ 1-2 days per week ☐ 1-3 days per month ☐ Less than once a ☐ Never ☐
A5 Have you consumed any alcohol within the **past 30 days**?	Yes ☐ No ☐ *If No, go to A13*
A6 During the past 30 days, on how many **occasions** did you have at least one standard alcoholic drink?	Number ☐ Don't know ☐ *If Zero, go to A13*
A7 During the past 30 days, when you drank alcohol, how many **standard drinks on average** did you have during one drinking occasion?	Number ☐ Don't know ☐

A8 During the past 30 days, what was the **largest number** of standard drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest number ☐ Don't Know ☐
A9 During the past 30 days, how many times did you have **six or more** standard drinks in a single drinking occasion?	Number of times ☐ Don't Know ☐
A10 During each of the **past 7 days**, how many standard drinks did you have each day?	Monday ☐
	Tuesday ☐
	Wednesday ☐
	Thursday ☐
	Friday ☐
	Saturday ☐
	Sunday ☐
	Don't know ☐

History of Raised Blood Pressure

Question	**Response**
H1 Have you ever had your blood pressure measured by a doctor or other health worker?	Yes ☐ No ☐ *If No, go to H6*
H2a. Have you ever been told by a doctor or other health worker that you have raised blood pressure or hypertension?	Yes ☐ No ☐ *If No, go to H6*
	Yes ☐

H2b Were you first told in the past 12 months?	No ☐
H3 In the past two weeks, have you taken any drugs (medication) for raised blood pressure prescribed by a doctor or other health worker?	Yes ☐ No ☐
H4 Have you ever seen a traditional healer for raised blood pressure or hypertension?	Yes ☐ No ☐
H5 Are you currently taking any herbal or traditional remedy for your raised blood pressure?	Yes ☐ No ☐

History of Diabetes

H6 Have you ever had your blood sugar measured by a doctor or other health worker?	Yes ☐ No ☐ *If No, go to H12*
H7a Have you ever been told by a doctor or other health worker that you have raised blood sugar or diabetes?	Yes ☐ No ☐ *If No, go to H 12*
H7b Were you first told in the past 12 months?	Yes ☐ No ☐
H8 In the past two weeks, have you taken any drugs (medication) for diabetes prescribed by a doctor or other health worker?	Yes ☐ No ☐
H9 Are you currently taking insulin for diabetes prescribed by a doctor or other health worker?	Yes ☐ No ☐
H10 Have you ever seen a traditional healer for diabetes or raised blood sugar?	Yes ☐ No ☐
H11 Are you currently taking any herbal or traditional remedy for your diabetes?	Yes ☐ No ☐

History of Cardiovascular Diseases

H17 Have you ever had a heart attack or chest pain from heart disease (angina) or a stroke (cerebrovascular accident or incident)?	Yes ☐ No ☐
H18 Are you currently taking aspirin regularly to prevent or treat heart disease?	Yes ☐ No ☐
H19 Are you currently taking statins (Lovastatin/Simvastatin/Atorvastatin or any other statin) regularly to prevent or treat heart disease?	Yes ☐ No ☐

Step 2 Physical Measurements

Blood Pressure

Question	Response
M1 Interviewer ID	
M2 Device ID for blood pressure	
M3 Cuff size used	Small ☐ Medium ☐ Large ☐
M4 Reading 1	Systolic (mmHg)
	Diastolic (mmHg)
M5 Reading 2	Systolic (mmHg)

	Diastolic (mmHg) ☐
M6 Reading 3	Systolic (mmHg) ☐
	Diastolic (mmHg) ☐
M7 During the past two weeks, have you been treated for raised blood pressure with drugs (medication) prescribed by a doctor or **other** health worker?	Yes ☐ No ☐
Height and Weight	
M8 For women: Are you pregnant?	Yes ☐ *If Yes, go to M 16* No ☐
M9 Interviewer ID	☐
M10 Device IDs for height and weight	Height ☐ Weight ☐
M11 Height	in Centimetres (cm) ☐
M12 Weight	in Kilograms (kg) ☐
Waist	
M13 Device ID for waist	☐
M14 Waist circumference	in Centimeters (cm) ☐

Heart Rate

M15 Heart Rate	
M15a Reading 1	Beats per minute ☐
M15b Reading 2	Beats per minute ☐
M15c Reading 3	Beats per minute ☐

Step 3 Biochemical Measurements

Blood Glucose

Question	Response
B1 During the past 12 hours have you had anything to eat or drink, other than water?	Yes ☐ No ☐
B2 Technician ID	☐
B3 Device ID	☐
B4 Time of day blood specimen taken (24 hour clock)	Hours : minutes ☐ : ☐ hrs mins
B5 Random blood glucose	mmol/l ☐
B6 Today, have you taken insulin or other drugs (medication) that have been prescribed by a doctor or other health worker for raised blood glucose?	Yes ☐ No ☐