AGE AND SEX-SPECIFIC RISK FACTORS FOR NON-COMMUNICABLE DISEASES AMONG ADULTS IN NAMIBIA: A CASE STUDY OF DIABETES AND HYPERTENSION

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Abstract

Non-communicable diseases (NCDs) have become a major public health concern in both developed and developing countries. In Namibia, NCD-attributable deaths are increasing; estimated at about 43% of all the deaths. Mapping context-specific risk factors of NCDs is critical for public health interventions. This study aimed to determine the age and sex-specific prevalence and associated factors of NCDs, particularly diabetes and high blood pressure among the adult population in Namibia. Using the 2013 Namibia Demographic and Health Survey (NDHS) data, we generate age-related charts for both women and men, and fitted separate multiple logistic regression models for men and women, controlling for age. Our findings show that, for both women and men, the risk of diabetes and high blood pressure increased by age. However, older men were more likely to have high blood pressure than women. Equally, for both women and men, the risk of diabetes and hypertension disease increase with body mass index and wealth index. Evidently, implementation of gender and age-specific interventions may accelerate reduction of disparities in non-communicable diseases burden. These may include interventions that encourage change of lifestyle like engaging in physical activities, eating healthy and regular check-ups.

Keywords: non-communicable diseases, high-blood pressure, diabetes, Namibia

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Non-communicable diseases (NCDs) have become a major public health concern both in developed and developing countries (Population Reference Bureau, 2012). They are the leading causes of death globally, killing more people each year than all other causes combined. According to the World Health Organization (WHO), it is estimated that almost two thirds of deaths that occurred globally in 2008 were due to NCDs, comprising mainly cardiovascular diseases, cancer, diabetes mellitus and chronic lung diseases (WHO, 2011). In the sub-Saharan African region, much attention has been given to communicable diseases, yet, there is evidence that shows that the burden of NCDs is increasing rapidly in most parts of the region (Ekpenyong, Udakang, Akpan & Samson, 2012).

Reports from several studies show a very strong association between diet and development of non-communicable diseases (Negin, Cumming, de Ramirez, Abimbola & Sachs, 2011). In this regard, poor diet and unhealthy lifestyle have been identified as major risk factors of cardiovascular diseases and other NCDs. In particular, Du, Mroz, Zhai, and Popkin (2004) and Zhai et al (2014), reported that unhealthy diets have contributed to the rising patterns in obesity and diabetes. The rising prevalence of diabetes in the sub-Saharan African region has largely been ascribed to changes in lifestyle and urbanisation, resulting in greater levels of obesity and physical inactivity (Gong et al., 2012; Phaswana-Mafuya et al., 2013). The report noted that overweight and obesity are the fifth leading risk factors for global deaths (WHO, 2014). Emphatically, the World Health Organization reported that about 44% of diabetes burden, 23% of ischemic heart disease burden and between 7% and 41% of certain cancer burdens are attributed to overweight and obesity.

In Namibia, NCDs account for about 43% of all the deaths (NDHS, 2013). Data from the Health Information System, captured by the Ministry of Health and Social Services (MoHSS) (2010), recorded that heart failure, hypertension, and stroke collectively were responsible for 8 percent of all health facility deaths while WHO estimated that in 2008, diabetes caused 4 percent of adult deaths in Namibia.

Globally, much of the research on non-communicable diseases show evidence of disparities in disease burden across age, and between women and men (Xu, Zhu, Liu & Han, 2015). This variation has been established in various cancers, stroke, cardiovascular diseases and diabetes. Concurrent to the changing life styles, much older women and men tend to manifest high levels of NCDs, attributed to individual behaviour like smoking or lack of physical activity (Ng et al., 2014). In other studies, socio-economic differences

have been observed; for instance, those from poor neighbourhoods have been reported to have elevated risk of diabetes and hypertension (Li, Ding, & Zhai, 2012; Dong, Ma, Wang & Wang, 2013; Xu et al., 2015).

Comparatively, less research has been done in Namibia. However, in their study, Guariguata, I de Beer, Hough, Mulongeni, Feely and De Wit (2015), concluded that despite the increasing awareness of chronic conditions in sub-Saharan Africa, knowledge among formal sector workers in Namibia is poor. They noted that opportunities exist for improving the knowledge and risk perception of NCDs and HIV among formal sector employees in this country, and recommended for more research to ascertain prevalence of these conditions and to determine the most effective strategies for management and prevention. We do not know how wide the gap is between men and women, and how does this burden grow with increasing age. Moreover, little is known of the urban-rural disparities and what socio-economic and behavioural factors are contributing to the expanding burden of NCDs in Namibia.

The aim of this paper is to determine the age and sex specific prevalence, and associated risk factors for non-communicable diseases (diabetes and high blood pressure) in the adult population in Namibia. The results will help unfold the required interventions necessary to reduce incidence and hence morbidity and mortality associated with NCDs in Namibia.

Methodology

Context and Study Design

The data used for this paper are based on the 2013 Namibia Demographic and Health Survey (NDHS). These data were used to generate age-related charts for both women and men, and fitted separate multiple logistic regression models for men and women, controlling for age. The 2013 NDHS is part of the worldwide Demographic and Health Surveys (DHS) programme funded by the United States Agency for International Development (USAID). The 2013 NDHS is the fourth nationally representative, comprehensive DHS survey conducted in Namibia. It was implemented by the Ministry of Health and Social Services in collaboration with the Namibia Statistics Agency and the National Institute of Pathology (NIP).

DHS surveys are designed to collect data on fertility, family planning, and maternal and child health; assist countries in monitoring changes in population, health, and nutrition; and provide an international database that can be used by researchers investigating topics related to population, health, and nutrition. The overall objective of the survey is to provide demographic, socioeconomic, and health data necessary for policymaking, planning, monitoring, and evaluation of national health and population programmes. In addition, the survey measured the prevalence of anaemia, HIV, high blood glucose, and high blood pressure among adult women and men; assessed the prevalence of anaemia among children aged 6-59 months; and collected anthropometric measurements to assess the nutritional status of women, men and children.

The sample for the 2013 NDHS was a stratified sample selected in two stages. In the first stage, 554 Enumeration Areas (EAs) — 269 in urban areas and 285 in rural areas — were selected with a stratified probability proportional to size selection from the sampling frame. Stratification was achieved by separating every region into urban and rural areas. Therefore, the 13 regions were stratified into 26 sampling strata (13 rural strata and 13 urban strata). Samples were selected independently in every stratum, with a predetermined number of EAs selected. A complete household listing and mapping operation was carried out in all selected clusters.

In the second stage, a fixed number of 20 households were selected in every urban and rural cluster according to equal probability systematic sampling. Due to the non-proportional allocation of the sample to the different regions and the possible differences in response rates, sampling weights were required for any analysis using the 2013 NDHS data to ensure the representativeness of the survey results at the national as well as the regional level.

Three questionnaires were administered in the 2013 NDHS: The Household Questionnaire, the Woman's Questionnaire, and the Man's Questionnaire. In half of the survey households (the same households selected for the male survey), the Household Questionnaire was also used to record information on anthropometry and biomarker data collected from eligible respondents. For the purpose of this paper, all eligible women and men aged 35-64 years had their blood pressure and blood glucose measured during the 2013 NDHS.

Data Collection

The methods of data collection used during the 2013 NDHS comprised of personal interviews and physical assessments (anthropometric and blood pressure measurements). A standardised structured interview administered questionnaire was used to obtain information on the socio-demographic characteristics of the study participants. The 2013 NDHS is the first national survey in Namibia to include biomarker measurements of blood pressure and fasting blood glucose. These biomarkers were collected to provide information on the prevalence of high blood pressure and elevated fasting blood glucose among a subsample of women and men aged 35-64 in half of the survey households (the same households selected for the male survey). Blood pressure and blood glucose levels were measured among consenting respondents. NDHS respondents were asked several questions to determine their history of hypertension, including whether they had ever been told by a doctor or other health worker that they had high blood pressure and, if so, whether they had been told that on two or more occasions. If they reported being told once or more times that they had high blood pressure, they were asked additional questions about specific actions they were taking at the time of the survey to lower their blood pressure. In addition to the NDHS blood pressure measurement, women and men aged 35-64 years were asked questions related to their experiences with blood pressure measurement and treatment or advice received to lower their blood pressure.

Respondents were further asked if they had eaten or drunk anything at all (except water) from the time they had awakened in the morning until the time of the glucose testing. If respondents were fasting at the time of the interview, a capillary blood sample was obtained from their middle or ring finger. If they were not fasting at the time of the interview, an appointment was made for the next morning to collect and test a fasting capillary blood sample. Blood glucose was measured using the HemoCue 201+ blood glucose analyser in capillary whole blood obtained from the adults' middle or ring finger after an overnight fast. The finger was cleaned with a swab containing 70 percent isopropyl alcohol, allowed to dry, and pricked with a retractable, non-reusable lancet. The first two drops of blood were wiped away, and the third drop was drawn into the glucose microcuvette by capillary action after placing the tip of the microcuvette in the middle of the blood drop. The outside of the microcuvette was wiped clean with gauze and placed in the

HemoCue 201+ analyser to obtain a glucose measurement. The analyser displayed blood glucose measurements in millimoles per litre (mmol/L).

Operational Definition of Terms

To measure blood pressure, the survey interviewers were provided with a fully automatic, digital device with automatic upper-arm inflation and automatic pressure release. Interviewers were trained in the use of this device according to the manufacturer's recommended protocol. Three measurements of systolic and diastolic blood pressure (measured in millimetres of mercury [mmHg]) were taken during the survey interview, with an interval of at least 10 minutes between measurements. The average of the second and third measurements was used to classify individuals with respect to hypertension, following internationally recommended categories (WHO, 1999). Individuals were classified as hypertensive if their systolic blood pressure was 140 mmHg or higher or if their diastolic blood pressure was 90 mmHg or higher. Elevated blood pressure was classified as mild, moderate, or severe according to the cut off points recommended by the World Health Organization and the National Institutes of Health (WHO, 1999).

The WHO cut off points for measuring fasting plasma glucose were used (WHO, 2006a; 2006b). These cut off points correspond to the clinical classifications of normal fasting plasma glucose levels, prediabetes, and diabetes. Fasting plasma glucose values between 3.9 and 6.0 mmol/L were considered to be normal. A fasting plasma glucose value of 6.1 to 6.9 mmol/L were classified as prediabetes, and values of 7.0 mmol/L or above were considered to be diabetes.

Body mass index (BMI) was calculated as weight (kg) divided by height^2 (m^2) and used as marker for nutritional status. Underweight was defined as BMI less than 18.5 kg/m^2; normal weight was defined as BMI of 25.0 to 29.9 kg/m^2; while obesity was defined as BMI of 30.0 kg/m^2 and above (Wijnhoven, van Raaij, Sjöberg, Eldin, Yngve, & Kunešová, 2014).

Data Analysis

The outcome variable was the self-reported diagnosis of chronic NCDs (high blood pressure or diabetes) which was previously made by a

health professional. These were assessed by self-reporting through answers to the questions:

'Have you ever been told by a doctor or other health worker that you have high blood pressure or hypertension?'

'Have you ever been told by a doctor or other health worker that you have high blood sugar or diabetes?'

Data was analysed using statistical package for social sciences (SPSS) version 22 statistical software. Frequency distribution tables were constructed and crosstabulations were done to examine relationship between categorical variables. The Chi-square test was used to compare differences between proportions. Multivariate analysis using multiple logistic regression model which incorporated all possible risk factors and while adjusting for the effect of possible confounders such as employment status and marital status was also applied – the presence of NCDs (presence of blood pressure or diabetes was coded 1 = yes; otherwise = 0). We combined the two health conditions because of small sample sizes if these were fitted separately. This analysis was done separately for men and women. Based on the results of multiple logistic regression models, odds ratios and its corresponding 95% confidence intervals were estimated. All statistical analysis was set at 5% level of significance.

Results and Discussion

Prevalence of NCDs by Sociodemographic Factors

The sample included 1561 men and 2115 women. Of these 814 (22.1%) had been told that they have high blood pressure while 152 (4.1%) had been told that they have diabetes (Table 1). Overall, the prevalence of adult men and women with non-communicable diseases is higher in urban areas than in rural areas; and this is also depicted when regional distribution is considered. The Khomas, Erongo, Hardap and Karas regions are more urbanised regions and showed high prevalence of persons with high blood pressure and diabetes. The proportion of adult men and women with high blood pressure and diabetes also increases with wealth status. More than 60% of adult men and women with high blood pressure are in the wealthier category. The proportion of wealthier persons is even higher among those with diabetes (more than 80%). Table 1 further shows that working men compared to working women are highly likely to have been told that they have high blood pressure and diabetes. Similarly, Wong, Ofstedal, Yount and Agree (2008), reported that NCD risk factors are associated with urban living.

They further reported that the challenge for countries is to minimise or avoid the negative impact of lifestyle changes that accompany modernisation and urbanisation. There is evidence that countries may go through a "lifestyle transition" as people adopt and then later abandon unhealthy behaviours, with richer and better educated people at the fore front of changes. Results for Namibia differ from the results of earlier researchers who analysed an older population in 70 low and middle-income countries and found a trend towards increasing markers of NCDs among people of lower socio-economic status. In Namibia, it is evident that adults with higher levels of education and who are financially well off are more likely to be overweight or obese and hence an increasing trend of NCDs among them.

Table 1

Distribution of NCDs Risk Factors by Gender

Variable	**High Blood Pressure (n=814)**		**Diabetes (n=152)**	
	Men	**Women**	**Men**	**Women**
Place of residence				
Urban	169 (59.5)	293 (55.3)	47 (72.3)	63 (72.4)
Rural	115 (40.5)	237 (44.7)	18 (27.7)	24 (27.6)
Wealth Index				
Poorest	17 (6.0)	50 (9.4)	1 (1.5)	2 (2.3)
Poorer	36 (12.7)	88 (16.6)	3 (4.6)	5 (5.7)
Middle	50 (17.6)	102 (19.2)	5 (7.7)	10 (11.5)
Richer	78 (27.6)	154 (29.1)	17 (26.2)	34 (39.1)
Richest	103 (36.3)	136 (25.7)	39 (60.0)	36 (41.4)
Education Level				
No education	41 (14.4)	84 (15.8)	2 (3.1)	9 (10.6)
Primary	78 (27.5)	179 (33.8)	12 (18.5)	24 (28.2)
Secondary	124 (43.7)	219 (40.8)	36 (55.4)	41 (48.2)
Higher	41 (14.4)	47 (8.9)	15 (23.1)	11 (12.9)
Smoking habit				
Non-smoker	208 (73.2)	451 (85.1)	46 (73.0)	70 (81.4)
Smoker	57 (20.1)	67 (12.6)	17 (27.0)	16 (18.6)
Working status				
Not working	98 (34.5)	305 (57.5)	21 (32.8)	48 (55.2)
Working	182 (64.1)	218 (41.1)	43 (67.2)	39 (44.8)
Body Mass Index				
Thin	18 (6.3)	19 (3.6)	2 (3.1)	1 (1.1)

Normal	112 (39.4)	133 (25.1)	13 (20.0)	12 (13.8)
Overweight	83 (29.2)	138 (26.0)	26 (40.0)	25 (28.7)
Obese	71 (25.0)	240 (45.3)	24 (36.9)	49 (56.3)
Blood Sugar				
Normal	208 (73.2)	399 (75.3)	23 (38.3)	34 (43.0)
Prediabetes	16 (5.6)	41 (7.7)	4 (6.7)	8 (10.1)
Diabetes	30 (10.6)	46 (8.7)	33 (55.0)	37 (46.8)

In Figure 1, age is positively associated with high blood pressure. The proportion of men and women with high blood pressure rises as age increases; while diabetes is more prevalent among men and women when they reach 50 years. This is consistent with what was observed in other studies done in Africa (Namusisi et al., 2011; Awosan, Ibrahim, Essien, Yusuf, Okoro, 2014). Other studies (Negin et al., 2011) revealed that more than half of those aged 50 and older had two or more NCD risk factors and this suggests that there is need for urgent action to address NCDs.

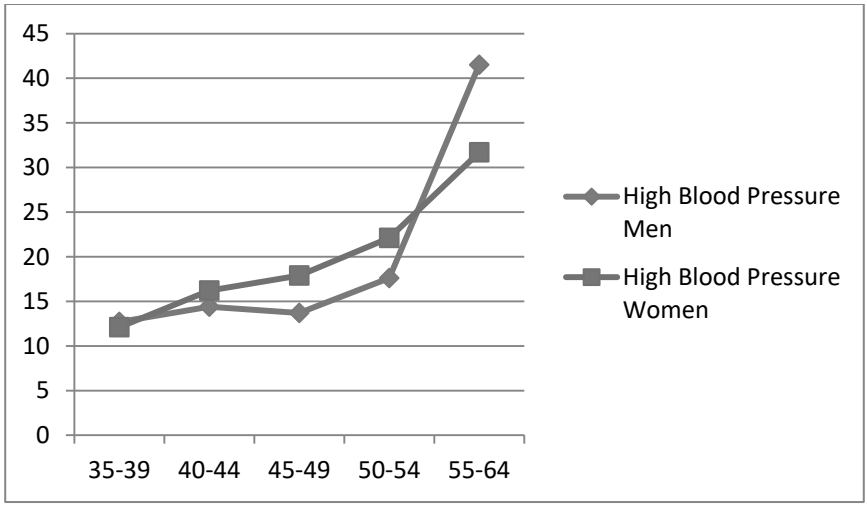

Figure 1. Age Specific-and Sex-Specific Prevalence of High Blood Pressure

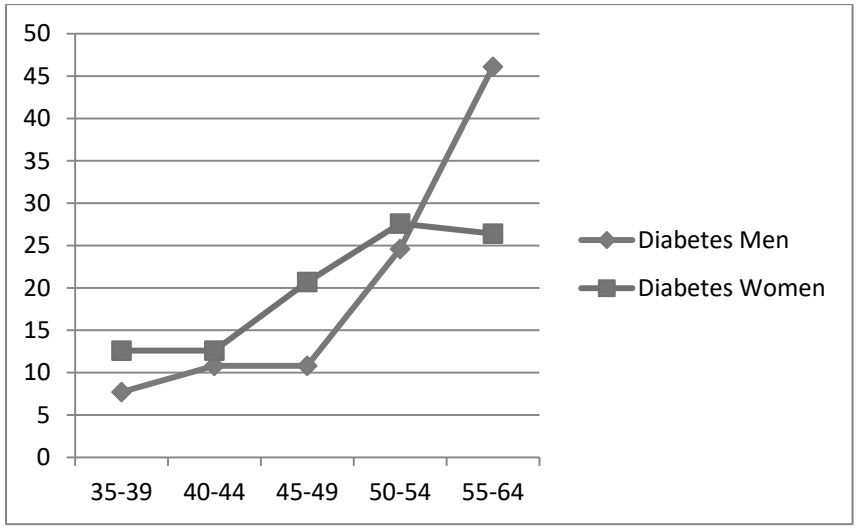

Figure 2: Age Specific-and Sex-Specific Prevalence of Diabetes

The results in Figures 1 and 2 show that obese women are more likely to have high blood pressure while in the case of men, high blood pressure is even prevalent among those with normal body mass index. Diabetes is highly likely among overweight and obese men and women. It is apparent from the analysis that the majority of men and women with high blood pressure have normal fasting blood sugar, however a high proportion of those with diabetes have also recorded high fasting glucose at the time of the survey.

Most of the men and women who are told that they have high blood pressure are on prescribed medication; while for those with diabetes, apart from the prescribed medication most of them have also been advised to control their salt intake, exercise and lose weight (Figure 3).

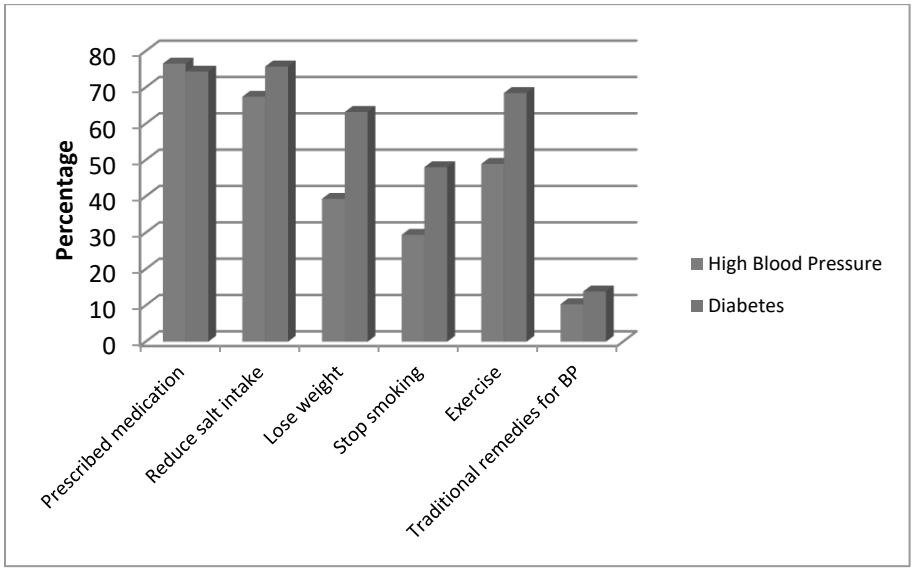

Figure 3: Variation in Prevalence of Diabetes and High Blood Pressure across Remedies to Control Disease.

Table 1 provides summaries of risk factors of NCDs by gender. The results indicate that one's smoking status is not significantly associated with high blood pressure or diabetes as the majority of adult men and women who have been told that they have high blood pressure or diabetes are non-smokers.

Sociodemographic Risk Factors of NCDs

Table 2 presents results from logistic regression. The prevalence of some risk factors is higher among men than among women; while some risk factors are common to both sexes. Age, nutritional status and level of fasting blood sugar are the common risk factors for non- communicable diseases among men and women and the effect follows almost a similar pattern among both sexes. Overall, women are more likely to have been told that they have either high blood pressure or diabetes at young ages than men. The odds ratio for women aged 40-64 years compared to those aged 35-39 years are higher than 1.00. Males in the age group 55-59 are 7.2 times more likely to have a non-communicable disease than those aged 35-39 years. Obese women are 4.9 times more likely to have been told that they have a non-communicable disease than those who are thin. A similar pattern is observed among men (OR=4.6). Male respondents with higher fasting blood sugar are

more likely to have non-communicable diseases compared to those with lower fasting blood sugar (OR=4.8) and the corresponding figure is 2.9 times more likely for women. Women in rural areas are less likely to have NCDs than those in urban areas. The results also show that richer men are highly at risk of being associated with NCDs.

Furthermore, it is apparent from the results that the smoking habit is not associated with NCDs (Table 2). The likelihood of having NCDs for smokers is 0.64 times than those who do not smoke. This implies that the majority who had been told of having high blood pressure or diabetes are not really smokers.

Table 2

Estimated Odds Ratio of Having NCDs (High Blood Pressure or Diabetes) by Sex of Respondent

	Males			Females		
	Odds ratios	95% C.I.		Odds ratios	95% C.I.	
Age group						
35-39	1.00	-	-	1.00	-	-
40-44	1.36	0.79	2.37	1.65	1.12	2.42
45-49	1.54	0.88	2.69	2.41	1.64	3.53
50-54	3.54	2.03	6.16	3.49	2.39	5.09
55-59	7.19	4.09	12.65	4.31	2.84	6.56
60-64	6.37	3.59	11.29	4.27	2.75	6.62
Blood Sugar						
Normal	1.00	-	-	1.00	-	-
Prediabetes	0.93	0.48	1.81	1.17	0.76	1.79
Diabetes	4.83	2.64	8.74	2.94	1.85	4.68
Body Mass Index						
Thin	1.00	-	-	1.00	-	-
Normal	1.77	0.95	3.31	1.55	0.90	2.66
Overweight	4.45	2.24	8.85	2.51	1.44	4.36
Obese	4.58	2.18	9.60	4.95	2.87	8.53
Wealth Index						
Poorest	1.00	-	-	1.00	-	-
Poorer	2.41	1.14	5.09	1.87	1.78	1.99
Middle	2.38	1.12	5.03	2.21	2.09	2.35
Richer	3.04	1.45	6.38	3.62	3.32	3.95
Richest	3.42	1.56	7.52	3.11	2.31	4.25
Smoking habit						
Non-Smoker	1.00			1.00		
Smoker	0.64	0.43	0.94	0.75	0.66	0.85
Place of residence						
Urban	1.00	-	-	1.00	-	-
Rural	0.56	0.47	0.67	0.69	0.53	0.92

CONCLUSION AND RECOMMENDATIONS

This study aimed to evaluate the sex specific burden and risk factors of NCDs among young adults in Namibia. The main findings were that the prevalence of high blood pressure is higher than the prevalence of diabetes, among adult men and women. Results from both univariate and bivariate analyses also showed that prevalence of NCDs is significantly associated with nutritional status. Age, area of residence and wealth status are also significantly associated with increase in the prevalence of NCDs.

Our findings bear similarities to those reported in Nigeria (Awosan et al., 2014) and China (Dong et al., 2013) both of which are developing countries. In both countries, overweight and obesity have been implicated for increasing the risk of NCDs. Once considered a high-income country problem, being overweight and obese are now on the rise in low and middle-income countries, particularly in urban settings. Overweight and obese adults in Namibia are also more likely to have NCDs. The increase in the risk of NCDs by wealth status, indicates that sedentary lifestyles have a bearing on the risk of NCD. Public health interventions such as providing health messages that encourage physical activities should be a priority to curb the rising risk of NCDs.

These findings have implications for the demand for healthcare services, health expenditure and health budgets. The rising burden of chronic NCDs affecting older people places a heavy burden on the health system because of increased demand and access to health care services. Concerted effort is needed to develop strategies for the prevention and management of NCDs. Namibia needs to be prepared to address the escalating demands of chronic diseases and this study confirms the need for effective control of NCDs among young adults. Risk factors for NCDs are both age and gender-specific and predominantly related to lifestyle. This suggests the need to design gender-sensitive prevention interventions that target lifestyle modification. There is need to further strengthen surveillance for risk factors of NCDs and more research should be done to generate supportive evidence for appropriate interventions.

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