

Prevalence of Physical Inactivity, Hypertension, Obesity and Tobacco Smoking: A Case of NCDs Prevention among Adults in Maiduguri, Nigeria

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Abstract Background: The prevalence of non-communicable diseases (NCDs) is at an all time high. In fact these diseases result from prolonged exposure to one or more risk factors, Population measurement of risk factors can be used to describe the distribution of future diseases and knowledge of risk factors can then be applied to shift population distribution of these risk factors. Purpose: The purpose of this study was to evaluate the prevalence of Non-communicable diseases risk factors among adults in Maiduguri, Nigeria. Methods: A cross-sectional survey was conducted among a representative sample of 498 adults (age, 20–65 years) living in Maiduguri, Nigeria. Participants comprised of 167 (34%) female and 331 (66%) males. Physical activity was measured using the international physical activity questionnaire (IPAQ) short version. Using the World Health Organization (WHO) guideline, participants were classified as physically inactive, moderately active and highly active. Blood pressure was measured using standardized procedures and recorded as hypertensive blood pressure if measures $\geq 140/90$ mmHg and non hypertensive if it is $120/80 \pm 10$ mmHg. Body mass index (BMI) was measured as a ratio of participants' weight in kilogram by the square of their height in meter (kg/m^2). BMI was classified based on World Health Organization criteria, as underweight if < 18.5 kg/m^2 , normal weight if 18.5 - 24.9 kg/m^2 , overweight if 25 - 29.9 kg/m^2 and obese if ≥ 30 kg/m^2 . Information on tobacco smoking was also recorded as smoking or not smoking. Results: Overall, 15.3%, 4.6%, 19.2% and 13.1% and 68.6% of Nigerian adults were hypertensive, obese, physically inactive and tobacco smokers respectively. Hypertension significantly increases with age ($p < 0.001$). Significant difference ($p < 0.01$) was found between prevalence of obesity, age and marital status. Physical inactivity significantly increases with increased age ($p < 0.001$). Also prevalence of physical inactivity was significantly higher among females than males, among married, by religion educational status ($p < 0.01$). Prevalence of smoking was found to be significantly higher among the male than the female smokers ($p < 0.001$). Significant difference was also observed in smoking by marital status and religion. Conclusion: High prevalence of NCDs risk factors were reported in this study. Health promotion with regard to smoking cessation, weight loss, and increasing physical activity may be accentuated among people in Nigeria.

Keywords: NCD risk factors, physical inactivity, hypertension, obesity, tobacco smoking

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1. Introduction

The prevalence of non-communicable diseases (NCDs) is at an all time high, as at 2008, about 63% (36 million deaths) of the 57 million deaths occurring worldwide were due to NCDs, principally mortalities from cardiovascular diseases, diabetes, cancer and chronic respiratory diseases [1]. Compared to majority of countries in the America, Eastern Mediterranean, Europe, South-East Asia, and the Western Pacific where NCDs are the most frequent causes of deaths, there are still more deaths from infectious

diseases than NCDs in the African Region [2]. However, the prevalence of NCDs is rising rapidly in Africa and is projected to cause almost three-quarters as many deaths as communicable, maternal, perinatal, and nutritional diseases by 2020, and to exceed them as the most common causes of death by 2030 [2]. In reality, about 80% of the burden of NCDs is already occurring in middle- and low-income countries like Nigeria, where most of the world's population lives [3,4]. In Nigeria, the impact of NCD is enormous and glaring with about 5 million people predicted to die from NCDs by the year 2015 [5]. Also, the economic cost of premature deaths due to NCDs in

Nigeria as at 2005 was about 400 million dollars and it is estimated to rise to about 8 billion dollars by 2015 [5].

NCDs are backed up by many common risk factors [6,7]. These diseases result from prolonged exposure to one or more risk factors, many of which are associated with personal behaviors and environmental factors. Behavioural risk factors, including tobacco use, physical inactivity and diets are responsible for about 80% of coronary heart disease and cerebrovascular diseases [8,9]. Four to six risk factors associated with NCDs have been identified as the leading global risk factors for morbidity and mortality and they include high blood pressure, tobacco use, physical inactivity, overweight or obesity, high blood glucose levels, and high cholesterol levels [6,10].

The lack of physical activity has emerged as an important risk factor for many chronic diseases, such as coronary heart diseases [11], hypertension, non-insulin dependent diabetes mellitus (NIDDM), stroke, obesity, and Fibromyalgia [12,13]. Physical inactivity causes 9% of premature mortality, or more than 5.3 million of the 57 million deaths in 2008 [14]. In the African region, about 27.5% of people are physically inactive [15], and the mortality from physical inactivity for the region was estimated at 6.3% [14]. The prevalence of physical inactivity among Nigerian adults was found to be 31.4% [16].

Hypertension is a major risk factor for heart disease, stroke, and kidney disease. It has been widely reported in Africa and is the most common cause of cardiovascular disease on the continent [17,18,19]. In Nigeria, the prevalence of hypertension was previously documented as 11.2% with approximately 4.3 million Nigerians adults (15 years and above) considered being hypertensive [20]. At present, about 8 million Nigerians suffer from hypertension, [21] indicating that the prevalence of hypertension has doubled in the past two decades. Hypertension in Nigeria today is the commonest risk factor for stroke, heart failure, ischemic heart disease and chronic kidney disease [22]. The increasing trend of hypertension is a serious concern for Nigeria.

Similarly, tobacco use and obesity are other important risk factors of NCDs in the developing countries. Studies show the risk of coronary heart disease (CHD) and lung cancer to increase in a roughly linear manner with increase number of cigarettes smoked per day and that cigarettes smoking also promotes the progression of diabetic neuropathy in patients with both type II and I diabetes and stroke in young adults [23,24,25]. The prevalence of cigarette smoking among male and female adults in North-Eastern Nigeria was reported as 36.0% and 25.0% respectively [26]. This high prevalence may constitute immediate and future population health challenge as result of direct or passive smoking.

Obesity once thought to be a problem of the developed world is increasingly becoming common in the less developed countries. In many Sub-Saharan African countries, there has been a marked increase in the prevalence of obesity as well as many chronic diseases associated with it [27]. Excess body weight and fatness pose a great risk to both the quality and quantity of one's life. Obese individuals have a shorter life expectancy and greater risks for the development of non-communicable diseases. Obese people are more at risk of type 2 diabetes,

stroke, osteoarthritis, several types of cancers, multiple myeloma and Hodgkin's lymphoma [28].

Chronic non-communicable diseases deliver a two punch blow to development of a nation especially in developing countries. They cause billions of dollars losses of national income and they push millions of people below the poverty line each year [29]. According to Ekpenyong et al., more effort should be directed towards identifying the major risk factor which may vary in order of significance from country to country and even within country [30]. The variation may exist from state to state depending on the socio-demographics characteristics and cultures as it affect lifestyle of a given population. Population measurement of risk factors can be used to describe the distribution of future diseases and knowledge of risk factors can then be applied to shift population distribution of these risk factors [30]. However, there is little or no readily available empirical data on the prevalence of certain risk factors of non-communicable diseases in north-eastern Nigeria. Therefore this study aims to determine the prevalence of certain risk factors (tobacco smoking, physical inactivity, obesity and hypertension). It also determine their difference with socio-demographic characteristics of adults in Maiduguri, North-Eastern Nigeria.

2. Method

2.1. Design and Settings

A cross-sectional survey design was used to collect data between May and July 2012. Maiduguri is the largest city and capital of Borno State, in north-eastern Nigeria. It has an estimated population of 749 123, and consists of Kanuri, Shuwa Arabs, Hausa, Fulani, and other ethnic groups. Borno State covers an area of 72 609 square kilometers (population density, 57 people/square kilometer) and attracts immigrants from the Republic of Cameroon, Republic of Niger, and Republic of Chad. The diverse inhabitants of Maiduguri predominantly use the Hausa language as a common means of communication and commercial activities. The Figure shows a map indicating the location of Maiduguri [16].

2.2. Participants and Sample Size

Four hundred and ninety-eight adult males (66.5%) and females (33.5%) aged 20-65 years participated in this study. Participants were recruited from their various residences within Jere local government area of Maiduguri, North-Eastern Nigeria using a multistage probability sampling technique was used to recruit participants for the study. Using the international guidelines for conducting community surveys [31]. 7 of the 11 political wards into which Jere Local Government is divided were randomly selected by lottery (stage 1). In each of the 6 selected wards, 2 enumeration areas per ward were randomly selected, for a total of 12 enumeration areas (stage 2). For each of the selected enumeration areas, houses were numbered on-site, and every odd-numbered house was approached, to determine study interest and eligibility (stage 3). Participants were invited to participate in the study if they met the following eligibility criteria: (1) residence in the identified household, (2) age between 20-

65 years Sample size was calculated using Daniel's formula for prevalence studies [32]. Using an effect size [d] of 0.043, we determined that 498 participants were needed to estimate the population prevalence of physical activity, Hypertension, Obesity and Tobacco Smoking with good precision. A total of 498 adults (42 per enumeration area) were contacted for the study in a door-to-door house survey.

2.3. Ethical Consideration

Ethical approval of the Institutional Ethical Review Committee of the University of Maiduguri Teaching Hospital was sought and obtained before the commencement of this study (ADM/TH/EC/75/III; 9/05/2012). The protocol of the study was explained to each participant and their informed consent was obtained before they were allowed to participate in the study.

2.4. Procedure

Participants were approached at their residences and socio-demographic information of age, gender, marital status, ethnicity, and educational level were obtained. Data on current tobacco smoking was also obtained. Blood pressure (mmgh), height (m) and weight (kg) were measured using standardized methods. Physical inactivity level was also measured using the international physical activity questionnaire (IPAQ).

2.4.1. Measurements

Physical Activity: The International Physical Activity Questionnaire (IPAQ) short version was used to obtain Information on the time spent been physically active in the last seven days, and measuring vigorous intensity activities, moderate intensity activities, walking activities and sitting activities (www.ipaq.ki.se). The activity pattern was obtained by multiplying these activity categories with their estimated value in METs and summed to get the overall estimate of physical activity in a week (www.ipaq.ki.se). The MET intensities used to score the IPAQ in this study were vigorous (8 METs), moderate (4 METs) and walking (3.3 METs). Participants were categorized as physically inactive when total METs spent in a week is <600. They are categorized as moderately active when the total METs spent in a week is 600-1499 METs and highly active when the total METs in a week is more than 1500 METs (www.ipaq.ki.se). The test-retest reliability (ICC= 0.33-0.73) and concurrent validity ($\rho=0.78-0.92$) of the IPAQ-short form in Nigeria were found to be good [33]. In a 12-country evaluation, IPAQ has been considered to be an acceptable measure of physical activity [34].

Body mass index (BMI): was measured as a ratio of participants' weight in kilogram by the square of their height in meter (kg/m^2). The BMI was classified based on World Health Organization criteria, [35] (2000) as underweight if $< 18\text{kg}/\text{m}^2$, normal weight if $18.5-24.9\text{ kg}/\text{m}^2$, overweight if $25-29.9$ and obese if $\geq 30\text{ kg}/\text{m}^2$. **Blood pressure:** was taken using a digital sphygmomanometer, after the participants have been seating quietly for 5 minutes. Three measurements were taken at intervals of 3-5 minutes on the left arm, and the mean systolic blood pressure and diastolic blood pressure were calculated. The value was recorded as non hypertensive if it is $120/80 \pm$

10mmHg and as hypertensive if blood pressure measure was $\geq 140/90\text{ mmHg}$ [36].

Tobacco Smoking: Data on current tobacco smoking was obtained and coded as Yes, not smoking was coded as No.

2.5. Statistical Analyses

Data were coded and analysed by using SPSS version 16. Descriptive statistics (mean, standard deviation, frequency and percentage) were used to estimate prevalence of physical inactivity, obesity, tobacco smoking and hypertension and other categorical variables.. Chi-square statistics (χ^2 test) was used to test for difference in prevalence of physical inactivity, hypertension, obesity and tobacco smoking among participants and their socio demographic characteristics. Statistical significance was set at $p < 0.05$.

3. Results

Table 1 summarizes the characteristics of the participants. Majority of the participants were males 331(66.5%) and 167 (33.5%) were females with a mean age of 34.93 ± 12.04 yrs. Simple majority of the participants were between 20-34 years (59.8%), married (41.2%) and had secondary school education (50.8%).

Table 1. Socio-demographic characteristics of the participants

Characteristics	Frequency (n)	Percentage (%)
Total (overall)	498	100%
Gender		
Male	331	66.5%
Female	167	33.5%
Age group (years)		
20-34	298	59.8%
35-50	127	25.5%
51-65	73	14.7%
Marital status		
Married	205	41.2%
Divorce	54	10.8%
Single	239	48.0%
Ethnicity		
Hausa	149	29.9%
Fulani	79	15.9%
Kanuri	138	27.7%
Others	128	25.7%
Religion		
Islam	399	80.1%
Christianity	90	18.1%
Others	7	1.4%
Educational level		
>Secondary	154	30.9%
Secondary	253	50.8%
<Secondary	80	16.1%

About 19.2% of the participants were physically inactive, while 27.5% and 53.2% were moderately and highly physically active, respectively (Table 2). More

female (28.7%) than male (14.5%) participants were physically inactive. The highest prevalence rates of physical inactivity were found among participants aged 51-65 years (50.7%), those who are females (28.7%), divorced (27.8%), have secondary school education (24.1%), and those who belong to the Kanuri ethnic group (22.5)%. The prevalence of physical inactivity was significant among female gender, those aged between 51-65 years, those with divorced marital status, Islamic religion, and those with secondary school education (Table 2).

Table 2. Prevalence of Physical activity by socio-demographic characteristics

Characteristics	PI	MA	HA	p-value
	n %	n %	n %	
Total (overall)	96(19.2)	137(27.5)	265(53.2)	
Gender				
Male	48(14.5)	84(25.4)	199(60.1)	
Female	48(28.7)	53(31.7)	66(39.5)	<0.001
Age group (years)				
20-34	34(11.4)	74(24.8)	190(63.8)	
35-50	25(19.7)	40(31.5)	62(48.8)	<0.001
51-65	37(50.7)	23(31.5)	13(17.8)	
Marital status				
Married	49(23.9)	57(27.8)	99(48.3)	
Divorced	15(27.8)	17(31.5)	22(40.7)	0.008*
Single	32(13.4)	63(26.4)	144(60.3)	
Ethnicity**				
Hausa	31(20.8)	40(26.8)	78(52.3)	
Fulani	15(19.0)	24(30.4)	40(50.6)	0.538
Kanuri	31(22.5)	34(24.6)	73(52.9)	
Others	19(14.8)	39(30.5)	70(54.7)	
Religion **				
Islam	83(20.8)	96(24.1)	220(55.1)	
Christianity	12(13.3)	38(42.2)	40(44.4)	0.037 *
Others	1(14.3)	2(28.6)	4(57.1)	
Educational level**				
>Secondary	25(16.2)	42(27.3)	87(56.5)	
Secondary	61(24.1)	68(26.9)	124(49.0)	0.026*
<Secondary	7(8.8)	22(27.5)	51(63.8)	

** Total numbers may not be equal to 498 due to missing data in some variables.

* - significant at p<0.05

PI-Physical inactivity

MA-moderately active

HA-Highly active.

Table 3 shows the prevalence of obesity by sociodemographic characteristics of the participants. Prevalence was observed to be 23(4.6%). Prevalence was found to be higher though not significant ($p>0.05$) among male ($n=16$, 4.8%) participants than female ($n=7$, 4.2%) participants. Eighty (16.1%) of the participants were overweight. The prevalence of obesity was found to be significantly higher among the middle age-group (35-50) year olds 8(6.3%) when compared to 11(3.7%) among the younger age group (20-34) years and 4(5.5%) among the older age group (51-65) years. Prevalence of obesity was found to be significantly higher ($p<0.01$) among the married participants when compared to other categories of marital status. No statistical difference in obesity was found among the different ethnic groups, religion and educational level.

Table 3. Prevalence of Obesity by socio-demographic characteristics

Characteristics	BMI grouping				P-value
	Underweight*	Normal*	Overweight	Obese	
	n (%)	n(%)	n(%)	n (%)	
Total (overall)	145(29.1)	250(50.2)	80(16.1)	23(4.6)	
Gender					
Male	98(29.6)	164(49.5)	53(16.0)	16(4.8)	0.966
Female	47(28.1)	86(51.5)	27(16.2)	7(4.2)	
Age group (years)					
20-34	101(33.9)	141(47.3)	45(15.1)	11(3.7)	
35-50	34(26.8)	63(49.6)	22(17.3)	8(6.3)	0.038*
51-65	10(13.7)	46(63.0)	13(17.8)	4(5.5)	
Marital status					
Married	45(22.0)	106(51.7)	41(20.0)	13(6.3)	
Divorced	11(20.4)	32(59.3)	9(16.7)	2(3.7)	0.006*
Single	89(37.2)	112(46.9)	30(12.6)	8(3.3)	
Ethnicity**					
Hausa	39(26.2)	76(51.0)	24(16.1)	10(6.7)	
Fulani	34(43.0)	32(40.5)	11(13.9)	2(2.5)	0.199
Kanuri	36(26.1)	75(54.3)	22(15.9)	5(3.6)	
Others	33(25.8)	66(51.6)	23(18.0)	6(4.7)	
Religion **					
Islam	120(30.1)	205(51.4)	58(14.5)	16(4.0)	
Christianity	22(24.4)	43(47.8)	19(21.1)	6(6.7)	0.372
Others	2(28.6)	2(28.6)	2(28.6)	1(14.3)	
Educational level*					
>Secondary	42(27.3)	78(50.6)	27(17.5)	7(4.5)	
Secondary	74(29.2)	132(52.2)	38(15.0)	9(3.6)	0.886
<Secondary	26(32.5)	35(43.8)	13(16.3)	6(7.5)	

** Total numbers may not be equal to 498 due to missing data in some variables.

* - significant at p<0.05.

Table 4. Prevalence of Hypertension by socio-demographic characteristics

Characteristics	Hypertensive	Non-Hypertensive*	p-value
	n %	n %	
Total (overall)	76(15.3)	422(84.7)	
Gender			
Male	54(16.3)	277(83.7)	0.358
Female	22(13.2)	145(86.8)	
Age group (years)			
20-34	28(9.4)	270(90.6)	
35-50	20(15.7)	107(84.3)	<0.001*
51-65	28(38.4)	45(61.6)	
Marital status			
Married	37(18.0)	168(82.0)	
Divorced	9(16.7)	45(83.3)	0.263
Single	30(12.6)	209(87.4)	
Ethnicity**			
Hausa	18(12.1)	131(87.9)	
Fulani	13(16.5)	66(83.5)	0.428
Kanuri	20(14.5)	118 (85.5)	
Others	25(19.5)	103(80.5)	
Religion**			
Islam	60(15.0)	339(85.0)	
Christianity	13(14.4)	77(85.6)	0.208
Others	3(42.9)	4(57.1)	
Educational level**			
>Secondary	24(15.6)	130(84.4)	
Secondary	36(14.2)	217(85.8)	0.309
<Secondary	16(20.0)	64(80.0)	

** Total numbers may not be equal to 498 due to missing data in some variables.

* - significant at p<0.05.

Table 4 shows the prevalence of hypertension by sociodemographic characteristics of the participants. The prevalence of hypertension among the participants was 76(15.3%), with 422 (84.7%) of the participants not hypertensive. The prevalence of hypertension was not significant though higher among the male participants 54(16.3%) than the females 22(13.2%) participants. Prevalence of hypertension was significantly higher ($p<0.05$) among the older age group of 51-65 years 28(38.4%) when compared with the younger age groups, and among the married 37(18.0%) when compared with the divorced 9(16.7%) and single 30(12.6%). It was also observed that hypertension increased significantly ($p<0.01$) with age. Prevalence of hypertension was found to be not significant by educational level even though prevalence was found to increase with more educational qualification among participants.

Table 5 shows the prevalence of tobacco smoking with sociodemographic variables. Sixty-five (13.1%) of the participants were smokers. More males 60(18.1%) than females 5(3.0%) were found to be smokers. Four hundred and thirty-three (86.7%) were non smokers with male and females non smokers of 271(81.9%) and 161(97.0%) respectively. The result shows prevalence of tobacco smoking to be higher among the married 31(15.1%) than the singles 29(12.1%). Tobacco smoking was found to decrease with age with highest prevalence among the younger age-group 41(13.8%) than the middle and older age-groups 17(13.4%) and 7(9.6%) respectively ($P>0.05$). There was a significant difference in the prevalence of tobacco smoking by gender, marital status and religion ($p<0.05$).

Table 5. Prevalence of Tobacco Smoking by socio-demographic characteristics

Characteristics	Smokers*	Non-smokers*	p-value
	n %	n %	
Total (overall)	65(13.1)	432(86.7)	
Gender			
Male	60(18.1)	271(81.9)	< 0.001
Female	5(3.0)	161(97.0)	
Age group (years)			
20-34	41(13.8)	257(86.2)	
35-50	17(13.4)	110 (86.6)	0.427
51-65	7(9.6)	66(90.4)	
Marital status			
Married	31(15.1)	174(84.9)	
Divorced	5(9.3)	49(90.7)	0.044*
Single	29(12.1)	210(87.9)	
Ethnicity**			
Hausa	22(14.8)	127(85.2)	
Fulani	9(11.4)	70(88.6)	0.844
Kanuri	18(13.0)	120(87.0)	
Others	15(11.7)	113(88.3)	
Religion**			
Islam	46(11.5)	353(88.5)	
Christianity	16 (17.8)	74(82.2)	0.043*
Others	3(42.9)	4 (57.1)	
Educational level**			
>Secondary	20(13.0)	134(87.0)	
Secondary	30(11.9)	222 (87.7)	0.518
<Secondary	15(18.8)	65(81.3)	

** Total numbers may not be equal to 498 due to missing data in some variables.

* - significant at $p<0.05$.

4. Discussions

The purpose of this study was to evaluate the prevalence of some risk factors of Non-communicable diseases in an urban community in Maiduguri, Nigeria. The study found high and comparable prevalence of risk factors for NCDs among these community dwellers. Prevalence of risk factors for NCDs such as obesity, physical inactivity, hypertension and tobacco smoking as described in the present study has reached epidemic stages all over the world, with Nigeria experiencing a shift from predominantly communicable, maternal and child diseases to predominantly non-communicable diseases.

Prevalence of physical inactivity (19.2%) reported in this study was lower when compared with the global findings that 31% of adults aged 15 years and above were reported to be insufficiently active in 2008[9]. Prevalence reported in the present study was also lower than prevalence in some part of Africa that reported (52.6%, 49.1% and 44.7%) in Mauritania, Swaziland and South Africa respectively, however, findings from the present study reported higher prevalence of physical inactivity than Burkina Faso (7.8%), Malawi (8.4%) and Ghana (8.8%) [37]. Similarly, finding on physical inactivity in the present study was lower than findings reported by [16] in Maiduguri, Nigeria. Physical inactivity has become a public health problem all over the world. Globally, around 31% of adults aged 15 years and over were insufficiently active in 2008 (men 28% and women 34%). Approximately 3.2 million deaths each year are attributable to insufficient physical activity. The current high level of physical inactivity is believed to be partly due to insufficient participation in physical activity during leisure time and an increase in sedentary behavior during occupational and domestic activities [9,16].

Significant finding in the prevalence of physical inactivity among male and female adults, with more physically inactive women (28.7%) than men (14.5%) is inconformity with majority of studies [38,39,40,41,42,9]. Thus, buttressing finding from previous studies. However, this finding disagree with the study by [16] that reported no significant difference in physical inactivity among male and female with men more highly inactive than their women counterparts. In many African countries it is not the norm for the female gender to engage in moderate to vigorous physical activities. This may be due to the socialization process that does not seem to encourage such activities by females [43].

Significant finding on physical inactivity was also reported with age. This is consistent with the study of [16] that revealed increasing age to be negatively associated with physical activity. Other studies also have documented inverse relationship between physical activity and age [16,44]. This is probably because most persons tend to be less physically active as they grow older.

Contrary to the study of Oyeyemi et al., [16] that found higher prevalence of physical activity among the divorcees (80.4%), our findings reported significant higher prevalence of physical inactivity among the divorcees when compared with the other categories of marital status. This might be attributed to the fact that divorced persons tends to be older and engaged less in domestic and recreational physical activity.

Similar to the study of [16] no significant difference was observed between ethnicity and physical inactivity in this study. The Kanuri ethnic group reported higher prevalence of physical inactivity which contrasted with the study by [16] that reported higher physical inactivity among the Yoruba. Studies in the UK, USA and Asia have shown that physical activity patterns varies among different ethnic groups [45,46,47]. An overarching goal of the *Healthy People 2010* is to reduce health disparities between racial/ethnic groups. Efforts to address racial/ethnic disparities can be bolstered by studies of correlates of physical inactivity behaviors in disparate groups. Further investigation into attitudes toward and barriers to physical activity might enhance programs for promoting physical activity among racial/ethnic minority populations [48].

Participants practicing Islamic religion were found to be significantly physically inactive when compared with those practicing Christianity and other religion. Previous study [16] did not test physical activity level by religion. Nathanson and Wen [49] in their study found that high levels of religious salience may correspond to greater likelihood of obesity and lesser likelihood of getting regular exercise. Policy implications may include a greater emphasis on diet and physical activity in religious settings.

The present study also reported a significant finding between physical inactivity and educational qualification with higher prevalence among those with secondary school education (24.1%) and more than secondary education (16.2%). This is in agreement with the study by Oyeyemi et al., [16] that reported significant lower physical activity among those with secondary school education and those with more than a secondary school education. However this contradicts an earlier study of that reported prevalence of meeting recommended levels of physical activity to be lower among less educated and with lower socioeconomic status as compared to higher educated and those with high socioeconomic status [41].

The prevalence of hypertension among this community is high 15.3%. This result is slightly higher than what was reported by [22] in his study on the prevalence of hypertension in Nigeria. Findings are however; lower than 18.7% by [50] among semi-urban population and 27.1% by [51] among paid workers. However, [52] reported lower finding of 13.16% in a rural community all in South-Western Nigeria. Prevalence of hypertension (32.8%) in the south east of Nigeria was also found to be higher than report from the present study [53]. Meta analysis of prevalence rate of hypertension among Nigerian populations from 1990 to 2009 ranges from 12.4% to 34.8% with a combined prevalence rate of 22% [54]. The variation observed in the prevalence of hypertension among the different regions in Nigeria might be because of the variation in the studied settings (rural or urban), the region where the study was conducted, the study design and method employed in investigating blood pressure as well as the bench mark in the diagnosis of hypertension, the sample size and also the age bracket of the studied population. One major reason in the observed variation might perhaps be due to the behavioral and lifestyle differences.

Prevalence of hypertension in the current study was high among the male participants when compared with their female counterparts, even though prevalence was

found to be not significant by gender. This is consistent with [52] that reported no significant finding between hypertension and gender among rural adults, in Nigeria. However this finding was not consistent with the study by Ekwunife et al., [54]. One possible reason that could be put forward as an explanation for the higher rate of hypertension amongst males (16.3%) than females (13.2%) could be that males naturally lead a more stressful lifestyle and tend to have more responsibilities to cope with than their female counterparts.

Similarly, the prevalence of hypertension was seen to increase significantly with age in this study and this agrees with previous studies [53,54,55]. Age has been recognized as a risk factor for High blood pressure [56,57] with some researchers believing that high prevalence of hypertension among older people might be due to changes that occur in the blood vessels as one age [57].

The prevalence of obesity (4.6%) is comparable to the 6% prevalence of obesity reported by the Nigeria Demographic and Health Survey of 2008. The prevalence is also consistent with the 6% reported in the Singaporean population. This finding however is lower and contrast the prevalence of (10%) reported in West Africa by Abubakari et al., [58] and 21% previously reported in urban population in northern Nigeria by Wahab et al., [59]. The differences in prevalence may be due to the fact that Nigeria is witnessing both demographic and epidemiologic transitions due to various degrees of the adoption of western life in different part of the country. The prevalence found in the present study should be of concern, and it might be due to the ever increasing availability of fast food outlets mimicking the western life style and abandoning of the traditional healthy foods that are more nutritious and healthy with less energy-dense foods by these population.

Our finding on obesity and age is in line with a study conducted by Singh et al., [60] in India that found obesity to increase with age. Obesity tends to develop slowly during adulthood and this could be a possible explanation for increased obesity in the older individuals [61].

The prevalence of tobacco smoking was high (13.1%) and comparable with figures from the WHO that reported that Africa has the lowest prevalence of tobacco smoking of 13% [2] when compared with America. Finding from the current study is in contrast with the study by Salawu et al., [28] in Yola, North Eastern Nigeria who found prevalence of 32.8% of current smokers in their survey among adolescents. Prevalence in the present community was also not consistent with a population based study on the prevalence of cigarette smoking and its characteristics in south western Nigeria (22%) that reported higher prevalence [62].

Prevalence of cigarette smoking in the current study was significantly higher among the males (18.1%) than the females (3%). This is consistent with existing studies that found prevalence of tobacco smoking to be significantly higher among the male when compared with the females [62,63,64]. Prevalence of tobacco smoking among the females in the present study was higher than that reported among females in Saudi Arabia (0.9%) [65] and India (0.1%) [66]. However, prevalence was lower than that found in south western Nigeria (4.6%) [64] and 25% in Yola north eastern Nigeria [28]. Affirming the result of the present study that women in this study are

likely to be more exposed to the consequences of tobacco smoking than women from other countries. Therefore there is a likely hood of increased NCDs related to tobacco smoking among females in Nigeria when compared with females from other countries. In the same line prevalence of tobacco smoking among the males 18.1% in this study was lower than previously reported values of (28.4%) in India [65], (36%) northeast Nigeria [28] and (13.2%) in south western Nigeria [62]. Higher prevalence among males is associated with the risk of passive smoking which continues to endanger the health of innocent citizens, predominantly wives and children of smokers [62]. Smoking has been reported to result in high morbidity and mortality [67]. Increase in the prevalence of the leading causes of death such as chronic obstructive pulmonary disease, trachea, bronchus, lung cancer and related diseases have been associated with increase in tobacco use and exposure to second hand smoke [68].

Prevalence was also found to be low among those in the older age group of 51-68 years (9%), this is consistent with [65] who assert in their study that cigarette smoking decreases with age. However this finding disagrees with the study in India [66] that reported significantly higher prevalence among the older age groups than the younger age groups with increase rate of smoking as one aged. Increasingly higher levels of smoking in the younger age groups as reported in the current study may be related to progressive increasing Western lifestyle and exposure to American films, also via television. Understanding the health risk and health consciousness might be the possible decrease in smoking among the older age groups.

Being married in the present study significantly report higher prevalence of tobacco smoking, This finding was asserted by that of [65]. This high prevalence reported among the married participants might be because perhaps married individuals are burdened with a lot of family as well as societal responsibilities that are saddled with stress. Findings from studies [69,70,71] showed that stress increases smokers' desire to smoke. High prevalence among the married is also of concern as smoking behavior and attitude of family members have been found to influence smoking in young adults [72,73]. A study by Hrubá and Žaloudíková, [74] found that parents and other relatives' smoking behavior led to a significant increase in the number of children who were determined to smoke in the future or who were considering to do so. This buttresses the need for interventional measures among this cohort of individuals.

Prevalence was also found to be significantly higher among other religions (42.9%) when compared to Christianity (17.8%) and Islamic religions (11.5%). Previous studies did not consider religion and tobacco smoking among their participants [63,64,65,66]. Perhaps the low prevalence rate of tobacco smoking may be due to beliefs laid down by religion, as majority of the participants were either Muslims or Christians and their religion view smoking as a non-responsible behavior, coupled with the culture of the people in the north as to the way cigarette smokers were looked at in the community.

Concerted efforts should therefore be directed towards anti-smoking programs in Nigeria. Such efforts should include: continuing anti-smoking health education, legislation to curtail the manufacture, advertisement and sale of cigarettes, increase in taxes of tobacco products

thereby increasing the retail price. Anti-smoking laws in public places need to be enforced, while smoking cessation programs need to be commenced in Nigeria. The necessity for the domestication of the WHO Framework Convention on Tobacco Control (FCTC) which was ratified by Nigeria is urgent [75].

Our findings from this survey have its limitations, even though results obtained are reliable and comparable with existing studies. First, the direction of causality could not be addressed due to the cross-sectional study design. Due to religion and cultural factors fewer females than males were able to participate in the study. Also younger (20-34 years) adults are more eager to participate than the older people making the sample of participants to be generally from the younger age group. Another limitation was the recollection bias for physical activity and the self-report for tobacco smoking may be a conservative estimate, in the light of a possible Hawthorne effect. As no any other test was carried out to ascertain smoking among participants. Therefore, making it difficult to generalized findings among adults living in Nigeria.

Prevalence rate of NCDs risk factors in the study is comparable to previous studies, their spread in the sampled population wide, indicating a need for intervention and health promotion programs. An established principle in primary health care is the advantage of preventing diseases instead of treating them. WHO [76] recommended that by preventing a few common risk factors it could have a positive impact on preventing a number of chronic diseases that might arise from them. Thus, addressing them simultaneously than separately. Physical activity appears to be a pivotal factor that may influence all four other risk factors. It's recommended that Health care teams, can assist the public by promoting physical activity and describing the type, quality and activities that improves health. Health promotion with regard to smoking cessation, weight loss, and increasing physical activity should be accentuated among people in Nigeria.

5. Conclusion

Physical inactivity, hypertension, obesity and tobacco use are common risk factors of NCDs among adults in Maiduguri, North Eastern Nigeria. Women are more physically inactive than men. and age have an inverse relationship with physical activity. Prevalence of obesity was significantly higher among 35-50 years old and significantly higher among the married participants. Obesity was also observed to be higher among the Hausa ethnic group, those of other religion, and among those with less than secondary school education. Prevalence of tobacco smoking was significantly higher among the male participants, married participants and those from other religion. Prevalence was also higher among those with less than secondary school education and of the Hausa ethnic group. The prevalence of hypertension was found to significantly increase with age.

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Conflict of Interest

The authors declare no conflict of interest.

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