ORIGINAL ARTICLE

# Prevalence of self-reported hypertension and diabetes and associated risk factors among university employees in Jos, Nigeria

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**Abstract**

**Background**: Non-communicable diseases (NCD) are emerging, and their risk factors are becoming more common as lifestyles change and rates of urbanization increase. We determined the prevalence of self-reported hypertension and diabetes mellitus (DM) and their relationship to common NCD risk factors among university employees.

**Methods**: This was a cross-sectional study of 884 adults employed at the University of Jos, Nigeria. They were evaluated using the Step 1 of the WHO-STEPS questionnaire. We used logistic regression analysis to evaluate the common NCD risk factors associated with self-reported hypertension and DM.

**Results**: Significant alcohol consumption was present in 77 (8.7%) while 26 (2.5%) were current cigarette smokers. Two hundred and seventy nine (31.5%) engaged in moderate intensity exercises like brisk walking and cycling for 10 minutes on a regular basis. The median weekly fruit and vegetable intake were 3 times (range 0-8) and 3 times (range 0-7) respectively. A total of 333 (39.7%) and 64 (7.3%) participants had a prior diagnosis of hypertension and DM respectively. Self-reported hypertension was associated with the female sex (OR = 2.30; 95% CI: 1.65-3.19), increasing age (OR = 1.08; 95% CI: 1.06-1.10) and alcohol use (OR=1.38; 95% CI: 1.00-1.91), while self-reported DM was associated with increasing age (OR = 1.08; 95% CI: 1.05-1.12). Neither hypertension nor DM was associated with physical activity, smoking status or fruit and vegetable intake.

**Conclusion**: This study provides evidence on self-reported NCDs in a developing economy. Concerted efforts to implement NCD prevention measures will serve to reduce the high burden of NCDs.

**Keywords**: Non-communicable disease, Diabetes mellitus, Hypertension, Lifestyle, risk factors

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## Introduction

Non-communicable diseases (NCDs) are emerging in Africa, and their risk factors are becoming more common as lifestyles change and rates of urbanization increase [1]. It has been estimated that 80% of NCD-related deaths occur in low-and-middle income countries (LMICs) and these deaths are occurring at a much earlier age than in developed countries [2]. NCD-related deaths are life-ending events in LMICs, instead of an end of life event as is the case in developed countries, with majority of NCD deaths occurring below the age of 60 years [3].

The World Health Organization (WHO) estimates that by 2020, NCDs will account for 80 percent of the global burden of disease, causing seven out of every 10 deaths in developing countries, about half of them premature deaths under the age of 70[4]. The socioeconomic impacts of NCDs are also affecting progress towards the Sustainable Development Goals (SDGs) with serious implications for poverty reduction and economic development. In LMICs, poverty exposes people to behavioral risk factors for NCDs and in turn, resulting NCDs become an important driver for poverty, thus hampering economic development [5-8].

Studies have demonstrated a growing link between lifestyle and NCDs. Risk factors such as tobacco use, physical inactivity, inappropriate diet (rich in fats and low in fruits and vegetables), and alcohol consumption have been implicated in the occurrence of these chronic diseases [9-12]. These risk factors are measurable and largely modifiable and therefore offer healthcare providers an opportunity to avert the growing NCD epidemic in this part of the world [13-16]. There is limited data from Nigeria exploring the association between the most common NCDs and their related risk factors, especially among populations at high risk for developing these NCDs.

Our aim in this study was to determine the prevalence of self-reported hypertension and diabetes mellitus and their relationship to common NCD risk factors among university employees in Jos, Nigeria.

## Materials and Methods

This was a cross-sectional study of adults aged 18 years and above employed in the University of Jos. As at the end of July 2010, the University workforce comprised a

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total of 2603 (1793 senior staff and 810 junior staff). The minimum sample size (864) was calculated from the Kish formula using the prevalence of hypertension, the NCD with the highest prevalence (25%) and a precision of 5%. All consecutive adults were evaluated using the WHO STEPS questionnaire. This entailed history taking, looking particularly for risk factors for NCDs and the lifestyle of the subjects. Physical activity was evaluated using the healthy people physical activity guidelines standard, which recommended 150 minutes of moderate to severe intensity of aerobic physical activity per week in bouts of 10 minutes or more for adults aged between 18 and 64 years. Based on this, participants were classified into two groups; physically active and physically inactive. Dietary habits were assessed by assessing intake of the number of servings of vegetables and fruits per day and frequency of fruit and vegetable intake per week. To assess smoking status, participants were asked whether they had ever smoked or were current smokers. Those who said they currently smoked on the day of their assessment were defined as current smokers. Participants were also classified based on their alcohol intake into two groups namely; current drinkers (those with history of alcohol intake in the 30 days preceding the survey) and those who had history of ever having used alcohol. Alcohol consumption was considered significant if it exceeded14grams weekly for women and 21 grams weekly for men. Socio-demographic information was also obtained. The presence of self-reported hypertension and diabetes mellitus and their association with these variables were determined.

The Human Research and Ethics Committee of the Jos University Teaching Hospital approved the study. All participants provided written informed consent before recruitment.

Data obtained was analysed using the Epi Info 7 Statistical software (CDC, Atlanta, GA). Means (± standard deviation, SD) was used to describe continuous variables and proportions for categorical variables. The student "t" test was used to compare group means and the Chi-Squared test to compare proportions. The Fisher exact test was used where cells contained less than five observations. Bivariate analyses were used to assess the relationship between the outcome variables (self-reported hypertension and DM) and independent variables. Key demographic (age and sex) and lifestyle (history of alcohol use, current smoker status, physical activity and fruit and vegetable intake) variables used in bivariate analyses were entered into multiple logistic regression models to determine the factors independently associated with self-reported hypertension and DM. A p-value < 0.05 was considered significant.

## Results

*Characteristics of subjects*

A total of 884 subjects were recruited into the study, and 521 (59.0%) were males. The mean age of the total cohort was 44±9 years, with the males being younger than the females (43±10 vs. 45±9 years; p = 0.002). The majority of the subjects (707; 80.0%) were married (Table 1). The mean number of years of schooling attained by the subjects was 15±6, with 440 subjects (49.8%) having attained tertiary level of education. The median duration of employment in the University of Jos was 10 years (IQR: 5-23 years).

Table 1. Characteristics of University of Jos employees evaluated for self-reported hypertension and diabetes mellitus

| Variables | Total | Males | Females | p-value |
|---|---|---|---|---|
| Age, years, mean ±SD | 44±9 | 43±10 | 45±9 | 0.0002 |
| Married, n (%) | 707 (80.5) | 437 (61.8) | 270 (38.1) | |
| Junior staff, n (%) | 466 (55.2) | 319 (68.4) | 147 (31.5) | < 0.0001 |
| Tertiary education, n (%) | 440 (50.2) | 243 (55.2) | 197 (44.7) | 0.02 |
| Number of years employed, median (range) | 10 (1-38) | 8 (1-38) | 14 (1-36) | 0.0004 |
| House hold income, Naira median (range) | 60,000 (1500-960,000) | 50,000 (1500-960,000) | 70,000 (1500-800,000) | 0.01 |
| Ever consumed alcohol, n (%) | 422 (51.0) | 294 (96.6) | 128 (30.3) | < 0.0001 |
| Significant alcohol use, n (%) | 93 (10.5) | 89 (95.7) | 4 (4.3) | < 0.0001 |
| Ever smoked cigarette, n (%) | 55 (6.1) | 54 (98.1) | 1 (1.8) | < 0.0001 |
| Current cigarette smoker, n(%) | 26 (2.9) | 25 (96.6) | 1 (3.8) | < 0.0001 |
| Weekly fruit intake, median (range) | 3 (0-8) | 3 (1-8) | 3 (0-7) | < 0.0001 |
| Daily fruit servings, median (range) | 2 (0-7) | 2 (1-7) | 1 (0-7) | 0.68 |
| Weekly vegetable intake, median (range) | 3 (0-7) | 3 (1-7) | 3 (0-7) | 0.0003 |
| Daily vegetable servings, median (range) | 2 (0-24) | 2 (1-7) | 2 (0-24) | 0.09 |
| Physically active, n (%) | 377 (42.7) | 265 (70.2) | 112 (29.7) | < 0.0001 |
| Time spent reclining, mins, median (range) | 180 (30-2400) | 180 (30-2100) | 180 (50-2400) | 0.32 |
| Self-reported hypertension | 333 (37.7) | 155 (31.7) | 178 (50.8) | < 0.0001 |
| Self-reported diabetes | 64 (7.2) | 34 (6.5) | 30 (8.2) | 0.32 |

*Lifestyle factors*

Nearly half (47.7%) reported history of ever having consumed alcohol (Table 2). However, significant alcohol use was present in only 77 (8.7%) subjects. Fifty five subjects (6.2%) reported having ever smoked while 26 (2.5%) were current smokers. Two hundred and seventy nine (31.5%) engaged in moderate intensity exercises like brisk walking and cycling for 10 minutes on

a regular basis. The median weekly fruit was 3 times (IQR: 2-5) and the weekly vegetable intake were 3 times (IQR: 2-5).

*Self-reported diagnosis of hypertension and diabetes mellitus*

A total of 333 (39.7%) subjects reported a prior diagnosis of hypertension of which 204 (61.2%) were on treatment. The odds of self-reporting hypertension was higher for females compared to males (AOR = 2.30; 95% CI: 1.65-3.19). Hypertension was also associated with history of alcohol intake (AOR=1.38; 95% CI: 1.00-1.91) and increasing age (AOR = 1.08; 95% CI: 1.06-1.10). A year increase in age increased the odds of self-reporting hypertension by 9% after adjusting for other variables (Table 3). Sixty four subjects (7.3%) self-reported DM, with all of them being on treatment. Self-report of DM was associated with increasing age (OR= 1.08; 95% CI: 1.05-1.12), with a year increase in age being associated with an 8% increase in the odds of self-reporting DM. Neither hypertension nor DM was associated with physical activity, fruit and vegetable intake or smoking status.

## Discussion

According to the World Health Organization, 4 out of 5 premature deaths attributable to NCDs occur in developing countries[1]. In 2015, the WHO global progress report on NCD monitor estimated the proportion of deaths from NCDs to be 25%, with a 20% probability of premature mortality from NCDs [17]. In this study, over a third (39.7%) of the subjects self-reported hypertension, while 7.3% self-reported diabetes mellitus. We found increasing age and female sex to be the independent predictors of self-reported hypertension, while current smoker status and increasing age were the independent predictors of self-reported DM.

Our findings parallel the prevalence of hypertension and DM in Nigeria[18-19] and also reflect the trend in previous studies on self-report of hypertension and DM in sub-Saharan Africa and Asia. Mafuya et al [20] reported 30.5% and 9.2% for hypertension and DM respectively among 3840 older adults in South Africa. Rameswarapu and co-workers [21] reported that hypertension and DM were present in 21.1% and 22.1% respectively among corporate professional employees across 20 states in India. A similar study conducted in Southwest Nigeria among university employees found hypertension and DM to be present in 21.5% and 11% respectively[19] Similarly, Tagoe and colleagues found that 9% of a 3873 participants self-reported DM in a household survey in Ghana [22]. These findings support the growing burden of NCDs in LMICs and highlight the need for urgent interventions.

Our study found an association between female gender, older age and the presence of hypertension and older age, smoking with DM. These factors have been variably reported to determine the occurrence

Table 2. Variables associated with self-reported hypertension and diabetes mellitus among University of Jos employees on bivariate analyses

| Variables | HTN+ve | HTN-ve | p-value | DM+ve | DM-ve | p-value |
|---|---|---|---|---|---|---|
| Age, mean(SD), yrs | 48±8 | 41±9 | <0.0001 | 51+8 | 43+9 | <0.001 |
| Sex, Males, n (%) | 155 (31.7) | 333 (68.2) | <0.0001 | 34 (6.5) | 487 (93.4) | 0.32 |
| MHI (Naira) | 80,000.00 (1500.00-800,000.00) | 50,000.00 (6000.00-960,000.00) | <0.0001 | 100,000.00 (2000.00-800,000.00) | 56,000.00 (1500.00-960,000.00) | 0.004 |
| Ever used alcohol, n (%) | 170 (42.0) | 234 (57.9) | 0.13 | 33 (7.8) | 389 (92.1) | 0.62 |
| Significant alcohol use, n (%) | 35 (41.1) | 50 (58.8) | 0.77 | 5 (5.3) | 88 (94.6) | 0.46 |
| Ever smoked, n (%) | 14 (26.4) | 39 (73.5) | 0.04 | 2 (3.6) | 53 (96.3) | 0.21* |
| Current smoking, n (%) | 8 (30.7) | 18 (69.2) | 0.34 | 3 (11.5) | 23 (88.4) | 0.28* |
| WFI | 3 (1-8) | 3 (0-7) | 0.004 | 3 (1-7) | 3 (0-8) | 0.1 |
| DFS | 2 (1-7) | 2 (0-7) | 0.97 | 1 (1-7) | 2 (0-7) | 0.92 |
| WVI | 3 (1-7) | 3 (0-7) | 0.71 | 3 (1-7) | 3 (0-7) | 0.34 |
| DVS | 2 (1-7) | 2 (0-24) | 0.78 | 1 (1-4) | 2 (0-24) | 0.40 |
| Physically active, n (%) | 132 (36.6) | 228 (63.3) | 0.11 | 25 (6.6) | 352 (93.3) | 0.54 |

MHI = monthly household income presented as median with range; WFI = weekly fruit intake presented as median with range; DFS = daily fruit serving presented as median with range; WVI = weekly vegetable intake presented as median with range; DVS = daily vegetable servings presented as median with range; *Fisher exact

Table 3. Independent associations of self-reported diabetes and hypertension in employees of the University of Jos

| | Diabetes mellitus | | | Hypertension | | |
|---|---|---|---|---|---|---|
| Variable | Adj OR§ | 95% CI | p-value | Adj OR§ | 95% CI | p-value |
| Age* | 1.08 | 1.05-1.12 | <0.001 | 1.08 | 1.06-1.10 | <0.001 |
| Sex (Female vs Male) | 1.10 | 0.62-1.94 | 0.72 | 2.30 | 1.65-3.19 | <0.001 |
| Ever used alcohol (Yes/No) | 1.02 | 0.58-1.78 | 0.92 | 1.38 | 1.00-1.91 | 0.04 |
| Current smoker (Yes/No) | 2.40 | 0.62-9.32 | 0.20 | 1.20 | 0.46-3.09 | 0.70 |
| Physically active (Yes/No) | 0.71 | 0.29-1.73 | 0.45 | 1.07 | 0.68-1.66 | 0.76 |
| Adequate fruit/vegetable intake (Yes/No) | 1.13 | 0.31-4.14 | 0.84 | 1.19 | 0.58-2.45 | 0.63 |

*Per annual increment §Adjusted Odds ratio

of common NCDs in various populations [18, 20, 23-25]. Other traditional risk factors such as physical inactivity and poor diet were not found to be related to self-reported hypertension or DM. The apparent lack of association between our outcome measures and these traditional risk factors may be due to the fact that our study was cross-sectional in nature and was therefore unable to detect cause and effect. In spite of the lack of association reported in our study, these risk factors are known to be strong determinants of NCDs globally [26-29].

The findings of this study must be interpreted in the light of the limitations encountered. Selection bias is inherent in this study as university employees are a highly selective group and does not reflect the greater majority of the population. Secondly we relied on self-reported lifestyles and diagnosis of hypertension and diabetes mellitus. Thus the impact of recall bias on our findings could not be discountenanced. There was no way of verifying the lifestyle practices of the participants. Despite the foregoing, our study had certain strengths. We studied a largely educated population, hence we could use the WHO-STEPS; a validated tool for elucidating lifestyle practices. Our findings form a basis for further studies to evaluate the relationship between lifestyle practices and NCDs.

In conclusion, a significant proportion of our subjects self-reported hypertension and DM, with these conditions being determined by overlapping risk factors. Despite the fact that we did not find any association between self-reported NCDs and modifiable risk factors in this study, these factors were still present among our subjects. There is a need for concerted efforts to reduce the burden of NCDs and their impact on individuals and communities.

**Author contribution**

EIA, MOA, PAA and ANO conceptualised the study. EIA, MOA, PAA, ANO, ZMG, BJF and FGI collected the data. EIA and PAA conducted data analysis. EIA and PAA interpreted the data and wrote the draft manuscript. All authors approved the final manuscript.

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