*American Journal of Public Health Research, 2020, Vol. 8, No. 2, 41-46*
Available online at http://pubs.sciepub.com/ajphr/8/2/1
Published by Science and Education Publishing
DOI:10.12691/ajphr-8-2-1

# Prevalence and Correlates of Hypertension among Healthcare Professionals in Nigeria: Lessons from a Tertiary Hospital in South-South Nigeria

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*Received January 01, 2020; Revised February 10, 2020; Accepted March 01, 2020*

**Abstract** The prevalence of hypertension and its complications are increasing in Sub-Saharan Africa. The disease is largely undiagnosed. Among the public health implications of the consequent morbidity and mortality are the effects of its toll on health workers; reports of sudden death among this crucial group have not been infrequent. Maintaining their health is imperative in the light of massive brain drain in the sector. There is limited information on the risk-factors among these professionals. The goal of this study was to ascertain the prevalence and correlates of hypertension among health workers with a view to guiding health promotion intervention in the sector. A cross-sectional study was conducted among the various cadres of health workers, using stratified sampling, in a tertiary health facility in South-South Nigeria. A pretested questionnaire was used, and measurements of blood pressure, weight, height, waist circumference, and hip circumference were taken using standardised equipment and procedures. SSPSS version 22 was used for analysis. Hypotheses were tested with chi-square and student *t*-test (level of significance set at less than 0.05). Magnitude of associations was determined by odds ratios. The prevalence of hypertension was 36.2%. Being overweight/obese was associated with hypertension, OR 2.13 (CI 1.20 - 3.80), as were increasing age, obesity, and lack of exercise, though the last factor was not statistically significant**.** Although almost three-quarters of hypertensive subjects had a family history of hypertension, there was no significant association. The high prevalence of hypertension in this study indicates a need for health promotion strategies among this group. The prominence of a few of the known risk factors of hypertension among the health workers would suggest areas of policy thrust by the Nigerian health system Managers. Interventions could be more efficient by targeting fitness and weight loss while paying closer attention to health workers as they age.

***Keywords:*** *hypertension, healthcare professionals, prevalence, correlates, health promotion, Nigeria*

**Cite This Article:** Irikefe P. Obiebi, Nnamdi S. Moeteke, Godson U. Eze, and Ibiyemi J. Umuago, "Prevalence and Correlates of Hypertension among Healthcare Professionals in Nigeria: Lessons from a Tertiary Hospital in South-South Nigeria." *American Journal of Public Health Research*, vol. 8, no. 2 (2020): 41-46. doi: 10.12691/ajphr-8-2-1.

## 1. Introduction

The epidemiology of hypertension (HTN) has been extensively described across the globe, and increasing incidence has been reported in various settings [1,2]. Hypertension has become a crucial public health problem because of its association with a high level of cardiovascular morbidity and mortality worldwide [3]. It remains the most common risk factor for cardiovascular disease worldwide [4,5]. However, other factors including smoking, have been linked to increased risk of a cardiovascular event [6]. Initially uncommon in sub-Saharan Africa, it is now a major non-communicable disease posing a serious public health threat in the region [7]. It is projected that by 2025, the figure in sub-Saharan Africa would climb by 70% relative to 2008 [2]. It is the commonest risk factor for cardiovascular diseases and chronic renal failure in Nigeria [8]. Although there has conventionally been higher prevalence in urban locations, recent studies show increasingly greater levels of occurrence in rural communities [9,10]. Nonetheless, the factors that drive the surge in the prevalence of hypertension are apparently more dominant in metropolitan settings [11]. Hypertension is a significant risk factor for sudden death and it remains largely undiagnosed among populations [7].

Adequate and properly trained healthcare professionals are the fulcrum of a sturdy and functional health system. Recent events in Nigeria and elsewhere indicate a increase in the occurrence of sudden death among healthcare workers [12,13,14]. This should be noteworthy especially for developing countries like Nigeria at a time as this when it is increasingly difficult to retain workers due to massive brain drain. Maintaining health workers' health status has become imperative in order ensure high-quality

performance at all levels of health care delivery [15,16]. A number of studies have investigated blood pressure levels and the risk for hypertension among the general population as well as occupational groups, but there is limited information about long-established risk factors among this all-important group of professionals in Nigeria [17,18]. A seemingly related study conducted in northern Nigeria reported correlation between blood pressure and risk factors without testing for associations between conventional risk factors and presence of hypertension [19]. Another report from south-west Nigeria only provided associations between stress levels and hypertension [20]. The most closely related study on this subject conducted in a resource-limited setting similar to Nigeria was done in India [21]. Therefore, this study sought to build on available knowledge while bridging the gap in evidence. The objectives were to determine the prevalence of hypertension and risk factors among healthcare professionals; and to ascertain the associations of hypertension among healthcare professionals with age, sex, physical activity, family history of diabetes mellitus (DM)/hypertension, body mass index (BMI), and abdominal obesity.

## 2. Materials and Methods

### 2.1. Study Area and Design

Using a cross-sectional design, this study was carried out in the Delta State University Teaching Hospital, Oghara, which is in the South-South geopolitical zone of Nigeria. It is a tertiary health facility with various cadres of healthcare professionals (specialist and non-specialist) including doctors, nurses, physiotherapists, laboratory scientists and pharmacists.

### 2.2. Sample Size/Sampling Technique

Stratified technique was used to obtain a sample of two hundred and thirty-two healthcare professionals from the various departments (laboratory, physiotherapy, pharmacy, internal medicine, paediatrics, surgery, obstetrics & gynaecology, accident & emergency departments, etc).

### 2.3. Data Collection/Analysis

Data collection was done by the investigators themselves. A pre-tested, semi-structured self-administered questionnaire was used, with a section for entry of values of blood pressure and anthropometric measurements done by the investigators.

Using a mercury sphygmomanometer (Accoson Dekamet Model, Accoson Ltd, Ayrshire, United Kingdom) with an accuracy of 2mmHg, systolic and diastolic blood pressures were measured while participants sat in a relaxed position after resting for at least five minutes. The measurement was taken three times on the left arm and the average recorded. Participants' heights were taken using a stadiometre with a measuring range of 50-205cm and a graduation of 1mm (1/8"). Body weight was measured in conformity with the National Health and Nutrition Examination Survey (NHANES) III protocol [22] using an electronic weighing scale (Harrison Emperors made in the People's Republic of China) with a maximum capacity of 120kg in divisions of 100 grams. A stretch-resistant tape measuring tape was used to ascertain waist circumference by placing it around the abdomen at the midpoint between the lower margin of the last palpable rib and the upper margin of the iliac crest, while hip circumference was obtained by applying the tape around the buttocks at the level of the widest diameter. For both circumferences, the subjects stood with their feet brought together, arms at the side and body weight evenly distributed, the subject relaxed, and the tape parallel to floor. Abdominal obesity was set at a cut-off of waist-hip ratio > 0.90 for men, and > 0.85 for women.

SPSS version 22 software was used to analyse the data. Categorical variables such as education, marital status, professional cadre and age group were expressed as percentages while continuous variables such as 'time spent on physical exercise' were summarised using mean and standard deviation. Hypotheses were tested with chi-square and student *t* tests, with level of significance set at less than 0.05. Magnitude of association between variables was determined using odds ratio (OR).

### 2.4. Ethical Consideration

Approval was obtained from the Health Research Ethics Committee of Delta State University Teaching Hospital. All participants were required to give written informed consent, and no names were written on the questionnaires to ensure confidentiality

## 3. Results

All respondents had a bachelor's degree at the least, while 6.5% and 1.3% respectively had a masters and/or medical fellowship in addition. Respondents' mean age was 35.19 ± 5.68 years, and a minority (14.2%) was older than forty years (See Table 1).

**Table 1. Socio-demographic Characteristics of Respondents**

| Variable | Categories | Frequency (%) |
|---|---|---|
| Age in years | Mean ± SD | 35.19 ± 5.68 |
| | ≤40 | 199 (85.8) |
| | >40 | 33 (14.2) |
| Sex | Male | 117 (50.4) |
| | Female | 115 (49.6) |
| Profession | Doctor | 96 (41.4) |
| | Nurse | 88 (37.9) |
| | Pharmacist | 8 (3.4) |
| | Lab Scientist | 16 (6.9) |
| | Physiotherapist | 3 (1.3) |
| | Lab Technician | 6 (2.6) |
| | Others | 15 (6.5) |
| Level of Education | First Degree | 213 (91.8) |
| | Masters | 15 (6.5) |
| | Fellowship | 4 (1.3) |

The prevalence of hypertension in this study was 36.2%. Slightly over half (51.1%) of the obese respondents had hypertension. Obesity was significantly associated with hypertension. Obese or overweight respondents were

twice as likely as others to be hypertensive, OR 2.13 (1.20 -3.80). Hypertension was significantly associated with dichotomized BMI as well as waist-height ratio ($p<0.05$) (See Table 2). The majority of respondents as well as of hypertensive subjects had a family history of hypertension (74.3% and 74.1% respectively) and just over two-fifths had a positive history of DM (43.4% of all respondents and 42.5% of hypertensive subjects); however isolated family history of hypertension or diabetes mellitus was not significantly associated with hypertension. Abdominal obesity was not associated with family history of diabetes mellitus or hypertension (See Table 3). Over half (54.5%) of respondents above forty years had hypertension. Younger respondents were 52% less likely to be hypertensive, p=*0.033*. Regular moderate intensity exercise (brisk walking or cycling) for at least 10 minutes daily was protective of hypertension, although this association was not statistically significant. Being hypertensive was significantly associated with age, a likelihood that increased with higher age, p=0.012. Almost three-fifth (59.2%) of persons aged 41-50 were hypertensive. Sixty-four percent of hypertensive subjects were aged 31-40 years as against 21.4% in those middle-aged (See Table 4). Anthropometric indices had lower values among the non-hypertensive sub-group, with BMI and waist circumference being significantly higher among hypertensive males. A similar pattern was observed among females for all indices except BMI (See Table 5). BMI and waist-height ratio were higher among women although the reverse was the case for waist-hip ratio (See Table 6). Anthropometric indices correlated positively but weakly with blood pressure (See Table 7).

**Table 2. Association between Hypertension and Obesity among Respondents**

| Variable | Blood Pressure vs. Indices of Obesity<br>Frequency (%) | | | | | |
|---|---|---|---|---|---|---|
| | Blood Pressure vs. Body Mass Index | | | Blood Pressure vs. Waist-Height Ratio | | |
| | ≥140/90 | <140/90 | Total | ≥140/90 | <140/90 | Total |
| | n=84 | n=148 | N=232 | n=84 | n=148 | N=232 |
| **Underweight** | 0 (0.0) | 6 (100.0) | 6 (100.0) | 3 (18.8) | 13 (81.2) | 16 (100.0) |
| **Normal** | 23 (27.7) | 60 (72.3) | 83 (100.0) | 21 (27.6) | 55 (72.4) | 76 (100.0) |
| **Overweight** | 37 (38.5) | 59 (61.5) | 96 (100.0) | 45 (41.3) | 64 (58.7) | 109 (100.0) |
| **Obese** | 24 (51.1) | 23 (48.9) | 47 (100.0) | 15 (48.4) | 16 (51.6) | 31 (100.0) |
| | ***$X^2$ =12.481, $p$= 0.006** | | | **$X^2$ =4.465, $p$= 0.215** | | |
| **Underweight /normal** | 23 (25.8) | 66 (74.2) | 89 (100.0) | 24 (26.1) | 68 (73.9) | 92 (100.0) |
| **Overweight** | 37 (38.5) | 59 (61.5) | 96 (100.0) | 45 (41.3) | 64 (58.7) | 109 (100.0) |
| **Obese** | 24 (51.1) | 23 (48.9) | 47 (100.0) | 15 (48.4) | 16 (51.6) | 31 (100.0) |
| | **$X^2$ =8.857, df=2, $p$= 0.012** | | | **$X^2$ =7.287, df=3, $p$= 0.026** | | |
| **Overweight /obese** | 61 (42.7) | 82 (53.7) | 96 (100.0) | 60 (40.3) | 80 (59.7) | 140 (100.0) |
| **Under/normal weight** | 23 (25.8) | 66 (74.2) | 89 (100.0) | 24 (26.1) | 68 (73.9) | 92 (100.0) |
| | **OR = 2.13 (1.20 - 3.80); $p$=0.01** | | | **OR = 2.13 (1.23 - 3.76); $p$=0.009** | | |

OR: Odds Ratio; *p*: Two tailed *p*-values based on chi square test for proportions: 84/232 (36.2%) =hypertensive

**Table 3. Association of Family History of Hypertension /Diabetes Mellitus with Hypertension and Abdominal Obesity in Respondents**

| Variable | | Family History of Hypertension /Diabetes Mellitus<br>Frequency (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Family History of Hypertension | | | Family History of Diabetes | | |
| | | Yes | No | Total | Yes | No | Total |
| | | n=169 | n=58 | N=227 | n=95 | n=124 | N = 219 |
| **Presence of hypertension** | **Yes** | 60 (74.1) | 21 (25.9) | 81 (100) | 34 (42.5) | 46 (67.5) | 80 (100.0) |
| | **No** | 108(74.5) | 37(25.5) | 145 (100) | 61 (43.9) | 78 (56.1) | 139 (100.0) |
| | | **OR = 0.98 (0.531 - 1.82); p=0.946** | | | **OR = 0.95 (0.54 - 1.64); p= 0.842** | | |
| | **N/A** | | 6 | | | 13 | |
| **Presence of abdominal obesity** | **Yes** | 96 (75.6) | 31(24.4) | 127(100.0) | 57 (46.7) | 65 (53.3) | 122 (100.0) |
| | **No** | 71 (72.4) | 27(27.6) | 98(100.0) | 39 (41.1) | 56 (58.9) | 95 (100.0) |
| | | **OR = 1.66 (0.94 -2.91); p=0.078** | | | **OR = 1.26 (0.73 - 2.16); p=0.404** | | |
| | **N/A** | | 7 | | | 15 | |

OR: Odds Ratio; *p*: Two tailed *p*-values based on Chi square test for proportions; N/A: Not Available

**Table 4. Determinants of Hypertension among Respondents**

| Variable | | Presence of Hypertension | | |
|---|---|---|---|---|
| | | Yes (%) | No (%) | Total (%) |
| | | n=84 (36.21) | n=148 (63.79) | N=232 (100) |
| **Sex of respondent** | **Male** | 45 (38.5) | 72 (61.6) | 117 (100) |
| | **Female** | 39 (33.9) | 76 (66.1) | 115 (100) |
| | | **OR = 1.22 (0.71 -2.08); *p = 0.471*** | | |
| **Age of respondent** | **21-30** | 12 (22.2) | 42 (77.8) | 54 (100.0) |
| | **31-40** | 54 (37.2) | 91 (62.8) | 145 (100.0) |
| | **41-50** | 16 (59.2) | 11 (40.8) | 27 (100.0) |
| | **51-60** | 2 (33.3) | 4 (66.7) | 6 (100.0) |
| | | ***$X^2$ =10.873, *p*= 0.012** | | |
| | **≤40** | 67 (33.7) | 133 (66.3) | 199 (100) |
| | **>40** | 18 (54.5) | 15 (45.5) | 33 (100) |
| | | **OR = 0.42 (0.20 - 0.88); *p =0.033*** | | |
| **Regular brisk walking or cycling up to 10mins per day** | **Yes** | 60 (35.1) | 111 (64.9) | 171 (100) |
| | **No** | 24 (39.3) | 37 (60.7) | 61 (100) |
| | | **OR = 0.83 (0.46 - 1.52); *p*=0.553** | | |
| **Long hours of sitting at work** | **Yes** | 28 (42.4) | 38 (57.6) | 66 (100) |
| | **No** | 56 (64.9) | 110 (35.1) | 166 (100) |
| | | **OR = 1.45 (0.81 - 2.59); *p*=0.214** | | |

OR: Odds Ratio; *p*: Two tailed *p*-values based on Chi square test for proportions

**Table 5. Mean Difference in Anthropometric Indices between Respondents with and without Hypertension**

| Sex | Variables | Hypertension | | P-value | MD | 95% CI of the Difference | |
|---|---|---|---|---|---|---|---|
| | | Present | Absent | | | Lower | Upper |
| **Male only** | Waist circumference (cm) | 95.76 ±12.92 | 89.55 ±12.11 | 0.010 | 6.21 | 1.52 | 10.90 |
| | Body Mass Index | 27.19 ±4.60 | 24.98 ±4.19 | 0.009 | 2.21 | 0.57 | 3.85 |
| | Waist-Hip Ratio | 0.94 ±0.07 | 0.90 ±0.07 | 0.120 | 0.02 | -0.01 | 0.05 |
| | Waist-Height Ratio | 54.01 ±11.03 | 49.96 ±11.15 | 0.058 | 4.05 | -0.14 | 8.24 |
| **Female only** | Waist circumference (cm) | 97.95 ±11.30 | 92.16 ±11.47 | 0.012 | 5.79 | 1.31 | 10.27 |
| | Body Mass Index | 28.39 ±4.07 | 26.79 ±4.72 | 0.075 | 1.60 | -0.16 | 3.37 |
| | Waist-Hip Ratio | 0.90 ±0.06 | 0.87 ±0.06 | 0.013 | 0.03 | 0.02 | 0.05 |
| | Waist Height Ratio | 60.24 ±6.88 | 55.84 ±6.69 | 0.001 | 4.40 | 1.75 | 7.04 |
| **Both Male & female** | **Waist circumference** | 96.78 (12.17) | 90.88 (11.82) | <0.001 | 5.90 | 2.67 | 9.13 |
| | **BMI** | 27.75 (4.38) | 25.90 (4.54) | 0.003 | 1.84 | 0.64 | 3.05 |
| | **Waist-hip ratio** | 0.91 (0.07) | 0.89 (0.07) | 0.004 | 0.03 | 0.01 | 0.05 |
| | **Waist-height ratio** | 56.90 (9.80) | 52.96 (9.58) | 0.003 | 3.94 | 1.33 | 6.55 |

MD; Mean Difference

**Table 6. Mean Difference in Anthropometric Indices and Blood Pressure between Male and Female Respondents**

| Variables | Sex | | P-value | MD | 95% CI of the Difference | |
|---|---|---|---|---|---|---|
| | Male | Female | | | Lower | Upper |
| Waist circumference (cm) | 91.96 ±12.74 | 94.03 ±11.72 | 0.200 | -2.07 | -5.23 | 1.11 |
| Body Mass Index (kg/m$^2$) | 25.83 ±4.47 | 27.31 ±4.54 | 0.013 | -1.48 | -2.64 | -0.31 |
| Waist-Hip Ratio | 0.91 ±0.07 | 0.88 ±0.06 | <0.001 | 0.03 | 0.01 | 0.05 |
| Waist-Height Ratio | 51.53 ±11.23 | 57.28 ±7.07 | <0.001 | -5.74 | -8.19 | -3.30 |
| Systolic BP (mmHg) | 122.00 ±13.34 | 119.39 ±16.15 | 0.181 | 2.61 | -1.22 | 6.45 |
| Diastolic BP (mmHg) | 83.57 ±10.70 | 80.26 ±13.50 | 0.040 | 3.31 | 0.16 | 6.46 |

**Table 7. Correlation of Blood Pressure with Anthropometric Indices**

| | | Systolic Blood Pressure (mmHg) | Diastolic Blood Pressure (mmHg) |
|---|---|---|---|
| Waist Height Ratio | Pearson Correlation | 0.207 | 0.183 |
| | *P-value* | 0.002 | 0.005 |
| Waist-Hip Ratio | Pearson Correlation | 0.266 | 0.195 |
| | *P-value* | <0.001 | 0.003 |
| Body Mass Index | Pearson Correlation | 0.280 | 0.230 |
| | *P-value* | *<0.001* | *<0.001* |
| Hip circumference (cm) | Pearson Correlation | 0.202 | 0.190 |
| | *P-value* | 0.002 | 0.004 |

# 4. Discussion

As stated earlier, there is a paucity of studies highlighting the association between risk factors and hypertension among health workers. Over a third of the health workers in this study had hypertension, a high prevalence which portends an increased propensity for cardiovascular complications because hypertension is not just associated with multi-systemic disorders but also amplified mortality risk [3,8]. Other studies have reported lower figures [21] probably because the study participants were of different ethnic backgrounds as people of African descent usually have a higher risk of hypertension. Nonetheless, it is alarming to record a high prevalence amongst health workers, who not only have a high rate of positive family history - a known predictor of hypertension - but also are engaged in jobs that are stressful in nature, and rarely affords time for regular exercise. However, unlike age, exercise was not significantly associated with hypertension. Incidence of hypertension among young persons in the general population is reportedly increasing. It is, therefore, no wonder that about three-fifths of all participants 41-50 years had hypertension. Despite this finding, it is surprising to record a greater proportion of respondents with this cardiovascular disease were seen among 31-40 years olds than the middle-aged. It is established that, generally, hypertension becomes established with advance in age and is most predominant in the elderly. While this drift in the prevalence of hypertension is intriguing, it may not be unconnected with occupation-associated stress which inadvertently amplifies underlying risks for the disease. Those with higher waist-hip ratios had increasingly higher tendency to be hypertensive. Obese or overweight workers were twice as likely as others to have hypertension. At least a fifth of all respondents had a BMI ≥30; however, just over a tenth had a waist-height ratio categorized as obese. Waist circumference, BMI, waist-hip ratio as well as waist-height ratio had a positive correlation with blood pressure, albeit weak. Frequency of hypertension was about the same in women and men although women had higher BMI and waist-height ratio. While this appears ironical, since higher BMI and waist-height ratio are associated with hypertension, it is not unlikely that a lower waist-hip ratio in women even out any difference in prevalence.

# 5. Conclusion

Giving the evidence of high prevalence of hypertension both in the general population and among health workers as corroborated by this study, we sought to determine the predominant risk factors among this important group of professionals. Health promotion Interventions against hypertension and its complications for this group could be prioritised for efficiency based on the stronger associations identified. The Nigerian government and health system managers would do well to lay emphasis on programmes to help health workers keep fit and maintain

the right size, while paying keen attention to them as they grow older. Larger multi-centre studies are however needed to underscore the relative importance of risk factors, and strengthen the evidence.

## Statement of Competing Interests

The authors have no competing interests.

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