# Prevalence and Predictors of Overweight, Obesity and Hypertension among Undergraduates of a Southern Nigerian University

Authors
**Ojule Inumanye Nkechi, Odoeme N. J**
Department of Preventive and Social Medicine, University of Port Harcourt, Rivers State, Nigeria
Corresponding Author
**Ojule Inumanye Nkechi**
Email: *inumanye.ojule@uniport.edu.ng*, Phone No: +2348171183099

**Abstract**
**Objectives**: *This study aimed to determine the prevalence and predictors of overweight, obesity and hypertension among undergraduates of Ignatius Ajuru University of Education, Port Harcourt.*
**Materials and Method**: *A cross sectional study was conducted among 304 undergraduates who were sampled using a multi-stage sampling technique. A self-administered questionnaire was structured using the WHO STEPS Instrument. The data was analyzed for magnitude of correlation using Spearman's rho (rs) and Chi-square tests using 1BM*
**Results**: *Among the 304 undergraduates, 179 (58.9%) were females while 125(41.1%) were males, this difference in proportion was statistically significant ($X^2$ =6.066, P =0.0140).The mean age of the participants was 24±3.45. The prevalence of hypertension was 14(4.6%) and 135(44.4%) were found to have pre-hypertension. Isolated Systolic Hypertension was identified in 3.6% of the participants.*
*Prevalence of Overweight & Obesity was 50(16.4%) and 14(4.3%) respectively. A significant association exist between BP and gender of participants (χ2 =31.345, p<0.001), BMI and gender (χ2 =16.688, p=0.001). Also a strong positive correlation between BP and alcohol consumption ($r_{s=}$0.106, p=0.006) and between BP and high salt intake ($r_{s=}$0.188, p=0.001) were detected. Alcohol consumption and high salt intake was identified in 176(57.9%) and 94(30.9%) of the participants respectively.*
**Conclusions**: *A high prevalence of elevated Blood Pressure and overweight was observed among the participants. Alcohol intake, high salt intake and being a female gender were predictors of rising blood pressure and overweight. An interventional program is needed to control these risk factors in this young population.*
**Keywords**: *Hypertension, Risk factors, Undergraduates, Obesity.*

## Introduction

All over the world, Blood pressure (BP) measurement is a mandatory procedure that must be performed by physicians of all specialties and other properly trained health professionals in every clinical evaluation of adult patients. Hypertension remains a global public health challenge because it affects people all over the world and is a prominent risk factor for cardio-vascular diseases[1,2,3,4] and other non-communicable diseases.

Various factors affect an individual's blood pressure or risk for hypertension. Age, gender, race, socio-economic factors, high salt

consumption, obesity and excess alcohol consumption are the main determining factors of hypertension[5]. Hypertension has been recognized as a "silent killer" due to its asymptomatic presentation and contributes to global mortality and morbidity [6.] As the world crossed into a new millennium, the WHO[7] estimated that globally, there are close to 1 billion people with hypertension and projected that it will increase to 1.56 billion by the year 2025. About one-in-three (7.1million) of all avoidable untimely deaths are caused by hypertension worldwide [3,7,8].

Hypertension in children and young adults is a well-established phenomenon and is a strong predictor of hypertension in the future [9].

In recent times, the prevalence of hypertension seems to be on the rise especially among populations in developing countries[3.] Most of which are still burdened with communicable diseases.

Abnormal accumulation of fat that cause health impairment defines the medical condition known as Obesity[(13)] and leads to a reduction in life expectancy and an increase in health problems particularly hypertension, heart disease and Type 2 diabetes. A linear relationship has been observed to exist between blood pressure (BP) values and weight of an individual as a review on the association between obesity and hypertension indicates that 65 – 75% risk of essential hypertension was due to excess weight gain [9,10,11,12]. A study in this region aimed at identifying the prevalence of obesity among indigenous people of this area, the Kalabaris recorded a prevalence of 49.34%[13]. The authors concluded that the high prevalence of obesity was the out-come of the peoples' means of livelihood, food choices, genetic and socio-cultural lifestyle.

The improvement in global telecommunication, transportation and entertainment brought about increased sedentary way of life and an un-acculturated diet. Young people are the most affected. They are gaining weight faster than any age group due to the synergy between intrinsic metabolic changes and environmental influences.

The weight gain should be a concern to all in Nigeria as it serves as a pointer of a possible escalation of overweight and obesity and the attendant co- morbidities. Physical morbidities which will continue and worsen throughout adulthood as a result of overweight and obesity include hypertension, diabetes, polycystic ovarian syndrome, breast cancer and depressive illnesses. Due to limited time passage, health consequences of obesity are challenging to manage in young adults as the symptoms may be minimal and hidden. They are less likely to engage with healthcare due to their perception of mortality and morbidity as only associated with advancing years. Clinicians who manage young adults with obesity need to be aware of these age-specific challenges.

The emphasis should then be on lifelong adoption of increased physical activity and a reduction in consumption of high calorie food. Considering that hypertension is a major, but modifiable risk factor for cardiovascular diseases, a crucial public health goal is to implement strategies which are aimed at achieving a gradual and consistent lowering of blood pressure values in the population. Identification and understanding of these risk factors in this study population will be important in designing and implementing health and lifestyle programs that target the young.

## Materials and Method
### Study design
This study was a descriptive a cross-sectional study.

### Sample and Sampling Technique
A sample of students from the study population was obtained from calculation. Sample size was calculated using a 95% level of significance, 23.5% prevalence of high blood pressure [2] and a tolerable margin of error of 5%. The calculated sample size was 276. A 10% non-response rate was accommodated to arrive at a final sample size of 304. A multi-stage sampling technique was use to sample eligible participant.

## Data Collection

A self-administered questionnaire was structured using the WHO STEPS Instrument[14]. It was modified and used to collect data on age, sex, ethnicity, behavioral and lifestyle practices such as salt intake, alcohol consumption, smoking (cigarettes, marijuana etc.) and family history of hypertension.

Data was collected between May and July, 2017.

## Outcome Measurements

### Blood Pressure

Blood Pressure of participants was measured before answering the questionnaire using the Accuson mercury sphygmomanometer made in England device after the respondent had rested for 5 minutes in the sitting position, having had no cigarettes, coffee, or tea, the average of the two measurements taken 5 minutes apart was calculated. Standardization was carried out by comparing measurements obtained against that of another accurate well maintained mercury sphygmomanometer for accuracy and reliability. The first sound (Korotkoff 1) was taken as the systolic and the extinction of all sounds (Korotkoff 5) as the diastolic blood pressure. Blood pressure was recorded to the nearest 2cm. Blood pressure readings were told to the students and the students with elevated blood pressures were referred to the University health center and also advised concerning positive lifestyle behavior.

### Anthropometric Measurements

Height and weight of participants were taken. With height measured barefoot while standing without heavy clothing with a Stadiometer (Seca GmbH, Co. Kg. Germany) to the nearest 0.5 cm while weight was measured in light clothing and no shoes using portable scale (Hana BR) with a 120-kilogram capacity, placed on a leveled floor and previously calibrated. Weight was recorded in kilometers to the nearest 0.1kg. Weighing scale standardization was ensured each day by comparing with a weight of a 20kg iron bar and adjusting the scale pointer zero appropriately.

BMI was calculated as weight in kilograms divided by square of height in meters. The BMI classification criteria used was as provided by the World Health Organization[15].

The practice of Sedentary lifestyle was measured by the amount of time spent sitting or reclining on a typical day such as playing video games, browsing the internet or watching television. A participant was considered to have a severe practice of sedentary life-style if time spent on any or all of these activities were greater than 121 minutes daily.

Smokers were classified by the answer of yes to the question do you smoke while those who had not smoked and answered no were classified as non-smokers.

Alcohol drinkers were classified by the answer of yes to the question do you take alcohol while those who do not drink and answered no were classified as non-drinkers. Salt intake was the only dietary factor considered. Students were considered to practice the risk factor if they required extra salt at table.

The modified classification criteria for adults as provided by the World Health Organization (2006) was used in the assessment of BMI values, that is: "normal weight (BMI of $18.5kg/m^2$ - $24.9kg/m^2$), over-weight (25.0 $kg/m^2$ - 29.99 $kg/m^2$), obesity (BMI > 30 $kg/m^2$), morbid obesity (BMI > 35 $kg/m^2$) and under-weight was $<18.5kg/m^2$".

The Blood Pressure value of each participant was categorized based on the recommendations of the Seventh Report of the Joint National Committee of Prevention, Detection, Evaluation and Treatment of High BP (JNC VII). The classification of Blood Pressure (expressed in mmHg) for adults aged 18 years or older as follows; normal if systolic BP is lower than 120 and diastolic BP is lower than 80, pre-hypertensive if systolic BP is 120-139 and/or diastolic BP is 80-89, and Hypertensive if systolic BP is >140 and/or diastolic BP is> 90".Blood pressure readings were told to the students and the hypertensive students were advised to visit the

clinic for regular check for their blood pressure and also concerning positive lifestyle modification.

Data obtained was analyzed on the computer using the statistical package for social sciences version 20 and statistical significance was fixed at p < 0.05. Spearman's Rank Non-Parametric Correlation Coefficient (rho) was used to show the extent of correlation between BP and BMI categories and these parameters with smoking, alcohol consumption, lack of physical activity, and salt intake. Relationship between observed BP/BMI and sex of participants, smoking and alcohol consumption was established using Chi-square test.

**Data Analysis**

Data obtained was analyzed using the statistical package for social sciences (SPSS) version 20 and statistical significance was fixed at p < 0.05. Spearman's Rank Non-Parametric Correlation Coefficient (rho) was used to show the extent of correlation between BP and BMI categories and these parameters with smoking, alcohol consumption, lack of physical activity, and salt intake. Relationship between observed BP/BMI

and sex of participants, smoking and alcohol consumption was established using Chi-square test.

**Ethical Consideration**

Approval for this study was obtained from the Research and Ethics Committee of the University of Port Harcourt and permission to conduct this study was given by the authorities of the Ignatius Ajuru University of Education, Port Harcourt. Individual informed consent was obtained.

**Results**

This study recruited three hundred and four (304) undergraduates of Ignatius Ajuru University of Education of which there were significantly more females than males 179 (58.9%) were females while 125(41.1%) were males: ($X^2$ =6.066, P =0.0140).The mean age of the participants was twenty four (24±3.45) years with a minimum age of 16years and a maximum age of 42years.

Table 1 below shows the level of awareness of hypertension (HTN) among participants. Only 9.9% of the participants were aware of their BP status while 90.1% were unaware of their blood pressure status

**Table 1:** Awareness of hypertension (HTN) among Participants

| Knowledge | Male N=125 Freq (%) | Female N=179 Freq (%) | Total N=304 Freq (%) |
|---|---|---|---|
| Has heard of HTN | 120(43.2) | 164(57.7) | 284(93.4) |
| Can define HTN | 72(34.1) | 139(65.9) | 211(69.4) |
| Has measured BP before | 77(34.4) | 147(65.6) | 224(73.7) |
| Has knowledge of BP status | 16(53.3) | 14(46.7) | 30(9.9) |
| Has family history | 27(21.6) | 53(29.6) | 80(23.6) |
| No family history | 98(78.4) | 123(68.7) | 221(72.7) |
| Has no knowledge of family history | 0(0) | 3(1.7) | 3(1) |

Table 2 shows the knowledge of risk factors among the study participants, among the participants 154(50.7%), 140(46.1%) and

232(76.3%) did not agree that high salt intake, obesity and use of oral contraceptives respectively are risk factors.

**Table 2:** Knowledge of risk factors among the study participants

| Risk factor | Agree Freq (%) | Disagree Freq (%) | I don't know Freq (%) | Total Freq (%) |
|---|---|---|---|---|
| Smoking | 210(69.1) | 94(30.9) | 0(0) | 304(100) |
| Large consumption of alcohol | 205(67.4) | 99(32.6) | 0(0) | 304(100) |
| Large consumption of fatty foods | 140(46.1) | 163(53.6) | 1(0.3) | 304(100) |
| Lack of exercise (physical inactivity) | 140(46.1) | 161(53) | 3(1) | 304(100) |
| Consumption of excess coffee | 89(29.3) | 11(69.4) | 4(1.3) | 304(100) |
| High salt intake | 148(48.6) | 154(50.7) | 2(0.7) | 304(100) |
| Obesity | 140(46.1) | 52.3(159) | 5(1.6) | 304(100) |
| Use of oral contraceptives | 63(20.7) | 232(76.3) | 9(2.3) | 304(100) |

Table 3 below shows the practice of risk factors among participants, about 10(3.3%) of the participants were smokers while 96(56%) of females and 80(64%) males consumed alcohol. Majority of the participants in this study are physically active with the prevalence of physical in-activity as 30.6% among female students. There was high consumption of salt 94(30.9%) in this study.

**Table 3:** Practice of risk factors among participants

| Risk factor | Male N=125 | Female N=179 | Total N=304 |
|---|---|---|---|
| **Smoking** | | | |
| Smoker | 6(4.8) | 4(2.2) | 10(3.3) |
| non smoker | 119(95.2) | 175(97.8) | 294(96.7) |
| **Alcohol consumption** | | | |
| Consumes alcohol | 64%(80) | 56%(96) | 176(57.9) |
| Does not consume alcohol | 45(36) | 83(46.4) | 128(42.1) |
| **Sedentary lifestyle** | | | |
| I don't know | 8(6.4) | 3(1.7) | 11(3.6) |
| <90minutes | 36(28.8) | 72(40.2) | 108(35.5) |
| 90-120minutes | 45(36) | 62(34.6) | 107(35.2) |
| >90minutes | 36(28.8) | 42(23.5) | 78(25.7) |
| **Physical in-activity** | | | |
| No physical in-activity | 101(80.8) | 110(61.5) | 211(69.4) |
| Physical in-activity | 24(19.2) | 69(38.5) | 93(30.6) |
| High salt intake(extra salt at meal) | | | |
| Require extra salt | 42(33.6) | 52(29.1) | 94(30.9) |
| Does not require extra salt | 83(66.4) | 127(70.9) | 210(69.1) |

The table 4 below shows the prevalence of hypertension in the study population was 14(4.6%).

**Table 4:** Blood pressure profile of participants

| BLOOD PRESSURE CLASS | FREQUENCY | PERCENT |
|---|---|---|
| Normal (<120/<80mmHg) | 138 | 45.4 |
| Pre-Hypertensive (120-139/80-89mmHg) | 135 | 44.4 |
| Hypertensive (>140/>90mmHg) | 14 | 4.6 |
| Isolated Systolic Hypertension (>140/>90mmHg) | 11 | 3.6 |
| Hypotension(<90/<60mmHg) | 6 | 2.0 |
| Total | 304 | 100.0 |

The table 4.5 below shows the mean BMI was 22.19±3.625. Prevalence of Overweight & Obesity were 50(16.4%) and 14(4.3%) respectively.

**Table 5:** BMI of participants

| BMI CLASS | FREQUENCY | PERCENT |
|---|---|---|
| <18.5(underweight) | 30 | 9.9 |
| 18.5-24.9(normal weight) | 211 | 69.4 |
| 25-29.9(overweight) | 50 | 16.4 |
| >30(Obese) | 13 | 4.3 |
| *Mean±SD* | *22.19±3.625* | |
| **Total** | **304** | **100** |

A test of correlation between BP and BMI (Spearman's Rank Non –Parametric Correlation Coefficient) showed a strong positive correlation between BP and alcohol consumption ($r_s$=0.106,

p=0.006) and between BP and high salt intake ($r_s$=0.188, p=0.001) where $r_s$ represents Spearman's rho.

Chi-square test was used to test for significance between BP and BMI categories and if these were related to gender, smoking, alcohol consumption and family history of HTN. There was significant difference between BP and gender of participants ($\chi 2$ =31.345, p<0.001); BMI and gender ($\chi 2$ =16.688, p=0.001); while there was no significant difference between BMI, BP and other variables.

## Discussion

The current study was conducted to determine the prevalence and predictors of hypertension, overweight and obesity among undergraduates of Ignatius Ajuru University of Education.

Findings show that though most of the study participants have had their blood pressure measured, only very few were aware of their blood pressure status, which are in line with findings from a study by Simao et al.[2] among undergraduates in Angola, This leaves an alarming majority who do not know their blood pressure status even though they have had their blood pressure measured before. It is believed that raising awareness is a key component in hypertension management. A multi-country study also reported lower awareness in lower income countries like ours compared with high income Countries [16].

A little over half of the participants identified smoking, alcohol consumption as risk factors of hypertension and less than half of the participants identified consumption of fatty foods as a risk factor. A huge gap in knowledge was seen with respect to coffee consumption and use of oral contraceptives and this is similar to findings obtained by Avadesh et al[17] in 2014 among first year undergraduates of Banaras Hindu University in India. The level of alcoholic beverages consumed in this study is similar to findings recorded in an Angolan University [2]. In our study, about 56% female undergraduates consumed alcohol. This finding among our young women of

child-bearing age is quite worrisome cognizant of the fact that these are pregnant mothers of tomorrow keeping in view the prognosis for pregnancy induced hypertension and fetal alcohol syndrome if the unhealthy trend continues. The pattern of alcohol consumption among females may be related to culture as most of our traditional ceremonies are tied to use of alcoholic beverages and women are major implementers.

A large proportion (30.9%) of the participants consumed extra salt (high salt intake) similar to what Avadesh and colleagues[17]reported. large number of the undergraduates were over-weight and few were obese, in line with findings by Yasin et al[11], and most were females which correlates with the findings of other researchers[11,16]. This may be attributable to poor food choices like the quick fix food young people have affinity to, and physical inactivity especially in this era of information technology which most of the time is carried out in a sedentary position.

The underweight findings were similar to results by Simao et al.[2] among Angolan undergraduates but lower than that among undergraduates in Ethiopia[18]. Mean Blood Pressure values were similar to results obtained in another university in this geo political zone[19] and lower than values obtained in a similar study by Hujova[20]. More than half of all the participants that were hypertensive were males, similar to findings obtained by Oghagbon et al[19,]Simao et al.[2] and Yasin et al[11] among undergraduates in Nigeria, Angola and Palestine respectively though with slightly differing prevalence.

A large percentage of the students are at the Pre-Hypertensive stage almost half as much the prevalence found among Slovakian undergraduates[20]. The hypertension prevalence obtained from this study, is similar to results obtained by Mona et al[21] among undergraduates in North Africa and relatively similar to prevalence obtained by Oghagbon et al[19] but lower than that obtained by Takele and Henok[18] among University students in Ethiopia.

The high prevalence of pre-hypertension in this study if not checked in this population and similar populations, hypertension and its complications are likely to increase.

This study also detected cases of Isolated Systolic Hypertension (ISH) and Hypotension. Several studies indicate that cases of Isolated Systolic Hypertension is considerably more prevalent among the elderly [24, 25] and not until the 1980s the DBP was thought to be the most relevant parameter for prognosis of hypertensive patients as elevated SBP was considered to be an inevitable consequence of aging hence many physicians were reluctant to recommend therapy for elevated SBP [24]. A study among young adults aged 18-39years in the U.S.A by Grebla et al.[25] obtained a lower prevalence of ISH compared to the prevalence obtained from this study. An Ilorin, Nigerian study among teenagers detected a similar prevalence of Isolated Systolic Hypertension[22, 23, 24].

A strong association between Blood Pressure and alcohol consumption ($r_s$=0.106, p=0.006) and between Blood Pressure and high salt intake ($r_s$=0.188, p=0.001) was noticed.

This is distinct from findings of a similar study by Yasin et al[11] which established a correlation between blood pressure and sedentary lifestyle. Also, results from this study detected a significant difference between blood pressure and gender of participants ($\chi^2$ =31.345, p=0.000); BMI and gender ($\chi^2$ =16.688, p=0.001), while there was none between BMI, BP and other variables.

## Conclusion

Generally, the findings obtained from this study showed an alarming rate of increasing elevated blood pressure, alcohol consumption and a considerably high rate of overweight. In this study alcohol consumption and high salt intake are predictive of rising blood pressure. The importance of knowledge and awareness of blood pressure status in this respect cannot be over emphasized as it is good knowledge that will initiate the need for lifestyle modification. In this same line of thought, it is possible to relate this poor level of awareness of blood pressure status (rs=0.0273, p<0.001) to the relatively high prevalence of pre-hypertension, further emphasizing the need for routine blood pressure measurements. Considering that elevated blood pressure is asymptomatic until complications set in, students as should all individuals be pro-active about their health especially with regards to routine medical check-up which always includes a blood pressure measurement.

**Conflict of interest**

None declared.

**Competing interest**

Authors confirmed that there is no competing interest.

**Authors' contributions**

NJO: Designing, collecting, selecting, and reviewing data, writing article. INO: Designing, Supervision. Writing and revising article, reviewing data. All authors read and approved the final manuscript

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