

# Educational Status and Risks of Cardiovascular Disease in Awka, Southeast Nigeria

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## Abstract

**Background and Objectives:** All over the world, cardiovascular risks constitute a heavy healthcare burden, affecting people with different levels of education, across economies in both the developed and the developing ones. Differences in educational levels in cardiovascular risks have not been completely defined. This study was set out to evaluate the influence of levels of education on the risks of cardiovascular disease in an urban community in Awka, southeast Nigeria. **Methodology:** In this cross sectional study of 294 subjects conducted in Awka in 2017, biodata, anthropometric and demographic data were obtained. A questionnaire was used to extract information on smoking, alcohol use, tobacco snuff use, diabetes mellitus status, time spent at work > 10 hours daily and night sleep duration < 4 hours. Blood pressure and body mass index were measured. Data were analyzed and the association between levels of education and the potential cardiovascular risks determined. **Results:** The prevalence of smoking was 5.4%, tobacco snuff use 5.4%, alcohol 42.2%, thickened arterial wall 27.2%, meat protein 91.8%, diabetes mellitus 9.5%, time spent at work > 10 hours daily 29.3%, obesity 33.3%, hypertension 58.5%, night sleep < 4 hours 5.4%. Levels of education has association with tobacco use ( $p = 0.009$ ), alcohol use ( $p = 0.013$ ), thickened arterial wall ( $p < 0.001$ ), diabetes mellitus ( $p < 0.001$ ), time spent at work > 10 hours daily ( $p < 0.001$ ), obesity ( $p = 0.020$ ), hypertension ( $p < 0.001$ ), meat consumption ( $p = 0.047$ ). However, smoking and night sleep < 4 hours have no significant association with levels of education,  $p = 0.415$ , and  $p = 0.132$ . **Conclusion:** There was variability in the prevalence of cardiovascular risks at different levels of education. The prevalence of smoking and night sleep duration < 4 hours did not

vary with levels of education. The prevalence of tobacco snuff and thickened arterial wall was high in primary education holders and meat consumption in secondary education. Alcohol prevalence increased with increasing levels of education. Diabetes mellitus, time spent at work > 10 hours daily, hypertension and obesity increased in prevalence with increasing levels of education but declined with tertiary education.

### **Keywords**

Educational Status, Smoking, Alcohol, Tobacco Snuff, Thickened Arterial Wall, Meat Consumption, Diabetes Mellitus, Lengthy Working Hours, Obesity, Hypertension, Short Night Sleep

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## **1. Introduction**

Cardiovascular diseases (CVDs) are a leading cause of death worldwide. An estimated 17.9 million people died from CVDs in 2016, representing 31% of all global deaths. Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include: coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis and pulmonary embolism [1]. There are several risk factors for cardiovascular diseases which can be classified into modifiable and non-modifiable risk factors. Some of the modifiable risk factors are linked with behavioral risks that include unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol. The effects of behavioral risk factors may lead to raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity [1]. Addressing these behavioral risks will ultimately reduce the risk of developing heart diseases or even dying from heart and vascular related events [1].

Individual characteristics and behavior as well as socio economic status, environment and level of education have been described by WHO as determinants of health [2]. Levels of education seem to have a direct effect on the behavioral risk and socio economic status. Some studies have shown some association between cardiovascular risks and levels of education—association between alcohol and increasing levels of education [3] [4], meat consumption and increasing levels of education [5] [6], type 2 Diabetes mellitus and lower levels of education [7], long working hours and increasing levels of education [8], obesity and lower levels of education [9], hypertension, short nighttime sleep duration and different levels of education [10] [11]. There was a paucity of studies on the influence of educational levels on cardiovascular disease risks in Nigeria, prompting this study which was set out to evaluate these associations.

## **2. Materials and Methods**

This was a cross sectional study involving 294 subjects recruited from an urban

community in Awka. The participants were mainly traders and business operators around Awka metropolis. The leadership of the trade union approved of the study. Each of the study participants gave informed consent for the study. Due explanation of the aims of the study was given to them. Using a pretested questionnaire, data were obtained from the participants. Contained in the questionnaire were information that included biodata, cigarette smoking, alcohol use, diabetes mellitus status, tobacco snuff use, meat consumption, night time sleep duration, hours spent on at work daily, data on demography and anthropometry were obtained. Weight (kg) and height (m) were obtained and body mass index (BMI) was deduced as  $\text{Weight}/\text{height}^2$  ( $\text{kg}/\text{m}^2$ ). Brachial and radial arterial wall thickness were examined. Blood pressure was measured while patient was in a sitting position from the non-dominant hand, and recorded in mmHg, preceded by at least 10 minutes' rest, using a cuff that would cover at least 80% of the arm (with Accoson mercury sphygmomanometer. At intervals of 5 minutes, three blood pressure readings were taken [6].

The variables were graded into groups as follows:

Educational status: 1) no formal education, 2) primary, 3) secondary, 4) tertiary

Smoking: 1) those who smoked > 10 sticks of cigarette/day for > 5 years and 2) those who did not/non-smokers

Tobacco snuff use: 1) those who used tobacco snuff > 3x/day for > 5 years and 2) those who did not

Alcohol: 1) those who consumed alcohol > 2 units/day for > 5 years and 2) those who did not

Arterial wall: 1) those who have clinically determined thickened arterial wall and 2) those with normal arterial wall

Meat consumption: 1) those who consumed > 200 g of meat/day and 2) those who did not

Night-time sleep duration: A) > 6 hours, B) 4 - 6 hours, C) < 4 hours

Diabetes mellitus: 1) those with diabetes mellitus prior to the screening and 2) those whose diabetic status was not known prior to the study

Time spent at work daily: A < 8 hours, B 8 - 10 hours, C > 10 hours

The association of levels of education with the variables were determined.

The potential cardiovascular risks evaluated in this study were: tobacco snuff, smoking, arterial wall thickening, alcohol, meat consumption, short night time sleep duration, diabetes mellitus and hypertension.

## 2.1. Data Analyses

The Statistical Package for Social Sciences (SPSS Inc, Chicago, IL) version 17.0 statistical software was used to analyze the data. For continuous variables, mean values and standard deviations were calculated and the means compared using ANOVA or two sample t-test. Categorical variables were compared using the nonparametric tests Chi-square. The distribution and characterization of va-

riables with levels of education were analyzed using cross tabulation. All tests were two-tailed with  $p < 0.05$  taken as statistically significant.

## 2.2. Definition of Terms

Hypertension: SBP  $\geq 140$  mmHg and or DBP  $\geq 90$  mmHg [12]

Body mass index: [13]

Underweight: BMI  $< 18.5$  kg/m<sup>2</sup>

Normal body weight: BMI 18.5 - 24.9 kg/m<sup>2</sup>

Overweight: BMI 25.0 - 29.9 kg/m<sup>2</sup>

Mild obesity: BMI 30.0 - 34.9 kg/m<sup>2</sup>

Moderate obesity: BMI 35.0 - 39.0 kg/m<sup>2</sup>

Severe obesity: BMI  $\geq 40.0$  kg/m<sup>2</sup>

Obesity: BMI  $\geq 30.0$  kg/m<sup>2</sup> In this study Obesity was defined as BMI  $\geq 30.0$  kg/m<sup>2</sup>

The subjects who were found to have cardiovascular risks namely: hypertension, obesity, thickened arterial wall and others were counselled and advised to see clinicians in the hospitals.

## 3. Results

This study assessed 294 subjects. All the subjects responded to the questionnaire administered: there was no attrition. The mean age of the subjects was  $43.1 \pm 15.4$  years with a range of 20 - 90 years. The mean values of other parameters were shown in **Table 1**. Out of the 294 subjects, 34 (11.6%) with male:female ratio of 26.5%/76.5% had no education, 76 (25.9%) with male:female ratio of 34.2%/65.8% had primary education, 108 (36.7%) with male:female ratio of 22.2%/77.8% had secondary education whereas 76 (25.9%) with male:female ratio of 34.2%/65.8%) also had tertiary education (**Table 1**). However, there was no significant association between gender and educational status in the subjects, chi square = 4.070, df = 3, likely hood ratio = 3,  $p = 0.257$  (**Table 2**).

Sixteen (5.4%) of the 294 subjects were smokers, giving a smoking prevalence of 5.4% in the study. However, out of the 16 smokers, smoking prevalence of 37.5% in those with primary education and those with secondary education was high, whereas those with tertiary education made up 25.0% of the smokers. However, this association between smoking and educational status was not significant,  $p = 0.415$  (**Table 3**).

**Table 1.** Descriptive analysis of variables in the study population.

Variables	Minimum	Maximum	Mean	Std. Deviation
Age (years)	20	90	43.13	15.383
Body mass index	16.6	46.8	28.131	5.9537
Systolic blood pressure (mmHg)	70	200	129.31	23.695
Diastolic blood pressure (mmHg)	40	130	82.61	14.732

**Table 2.** Distribution of levels of education in the study population.

	Frequency	Percent
No education	34	11.6
Primary school education	76	25.9
Secondary school education	108	36.7
Tertiary education	76	25.9
Total	294	100.0

**Table 3.** Distribution and characterization of cardiovascular risks with levels of education.

Variables	NoEdu	PrimEdu	SecEdu	TertEd	Chi Sq	df	LHR	P value
Smoking Yes	0 (0.0%)	6 (37.5%)	6 (37.5%)	4 (25.0%)	2.853	3	3	0.415
No	34 (12.2%)	70 (25.2%)	102 (36.7%)	72 (25.5%)				
Toba snuff Yes	4 (25.0%)	8 (50.0%)	4 (25.0%)	0 (0.0%)	11.467	3	3	0.009
No	30 (10.8%)	68 (24.5%)	104 (37.4%)	78 (27.3%)				
Thickened arterial wall present	22 (27.5%)	40 (50.0%)	12 (15.0%)	6 (7.5%)	77.380	3	3	<0.001
Absent	12 (5.6%)	36 (16.8%)	96 (44.9%)	70 (32.7%)				
Alcohol use Yes	12 (9.7%)	26 (21.0%)	42 (33.9%)	44 (35.5%)	10.816	3	3	0.013
No	22 (12.0%)	50 (29.4%)	66 (38.8%)	32 (18.8%)				
Meat protein Yes	32 (11.9%)	72 (26.7%)	102 (37.8%)	64 (23.7%)	7.964	3	3	0.047
No	2 (8.3%)	4 (16.7%)	6 (25.0%)	12 (50.0%)				
DM status Yes	6 (21.4%)	18 (64.3%)	0 (0.0%)	4 (14.3%)	33.259	3	3	<0.001
No	28 (10.5%)	58 (21.8%)	108 (40.6%)	72 (27.1%)				
Time spent at work > 10 hrs	10 (11.6%)	30 (34.9%)	38 (44.2%)	8 (9.3%)	53.045	9	9	<0.001
<10 hrs	24 (11.5%)	46 (22.1%)	70 (33.7%)	68 (32.7%)				
Obesity BMI ≥ 30	8 (8.2%)	28 (28.6%)	36 (36.7%)	26 (26.5%)	19.656	9	9	0.020
<30	26 (13.3%)	48 (24.5%)	72 (36.7%)	50 (25.5%)				
Hypertension								
SBP ≥ 140 +DBP ≥ 90	20 (11.6%)	26 (15.1%)	78 (45.3%)	48 (27.9%)	27.527	3	3	<0.001
SBP ≤ 140 +DBP ≤ 90	14 (11.5%)	50 (41.0%)	30 (24.6%)	28 (23.0%)				
Night sleep < 4 hrs	2 (12.5%)	4 (25.0%)	8 (50.0%)	2 (12.5%)	9.821	6	6	0.132
≥4 hrs	32 (11.9%)	62 (23.1%)	100 (37.3%)	74 (27.6%)				

Out of the 294 subjects, 16 (5.4%) used tobacco snuff, indicating a tobacco snuff prevalence of 5.4% in the study. Among these tobacco snuff users, a prevalence of 50.0% was observed in those with primary education was significantly high compared to 25.0% in those with no education and those with secondary education,  $p = 0.009$ . In contrast, none of those with tertiary education was a tobacco snuff user (**Table 3**).

Out of the 294 subjects, 124 (42.2%) were found to be alcohol users, showing

alcohol use prevalence of 42.2% in the study. Among these 124 subjects with alcohol use, 12 (9.7%) had no education, 26 (21.0%) had primary education, 42 (33.9%) had secondary education, whereas 44 (35.5%) had tertiary education. This showed that the prevalence of alcohol use significantly increased as the levels of education increased,  $p = 0.013$  (**Table 3**).

Eighty (27.2%) of the total subjects had thickened arterial wall, demonstrating a thickened arterial wall prevalence of 27.2%. Out of these eight subjects with thickened arterial wall, 22 (27.5%) had no education, 40 (50.0%) had primary education, 12 (15.0%) had secondary education, whereas 6 (7.5%) had tertiary education. This demonstrated that the prevalence of thickened arterial wall was significantly high in those with primary education (50.0%), compared to 27.5% in those with no education, 15.0% in secondary education and 7.5% in those with tertiary education,  $p < 0.001$  (**Table 3**).

Two hundred and seventy (91.8%) of the subjects had heavy meat protein consumption, indicating heavy meat consumption high prevalence of 91.8% in the study. Heavy meat consumption increased from 11.9% in those with no education, to 26.7% in those with primary education, to 37.8% in those with secondary education, though it declined to 23.8% in those with tertiary education. This showed a significant association between heavy meat consumption and levels of education in the study,  $p = 0.047$  (**Table 3**).

The study found that 28 (9.5%) of the subjects had DM. Majority (64.3%) of these DM subjects had primary education, a figure that was significantly high compared to 21.5% in those with no education and 14.3% in those with tertiary education,  $p < 0.001$  (**Table 3**).

Those who spent  $> 10$  hours at work daily were 86 (29.3%). The prevalence of long hours at work significantly increased with increasing levels of education, from 11.6% in those with no education, through 34.9% in those with primary education, to 44.2% in those with secondary education, with a decline to 9.3% in those with tertiary education,  $p < 0.001$  (**Table 3**).

Ninety-eight (33.3%) of the subjects had obesity, giving obesity prevalence of 33.3% in this study. Among these obese, the prevalence significantly increased from 2.8% in those with no education, through 28.6% in those with primary education, to 36.7% in those with secondary education, but declined to 25.5% in those with tertiary education,  $p = 0.020$  (**Table 3**).

This study showed that 172 (58.5%) of the subjects had hypertension, indicating hypertension prevalence of 58.5% in the study subjects. Among these hypertensive, the prevalence significantly increased as the levels of education increased, from 11.6% in those with no education to 15.1% in those with primary education, peaked at 45.3% in those with secondary education, but declined to 27.9% in those with tertiary education,  $p < 0.001$  (**Table 3**).

The number of subjects with night time sleep  $< 4$  hours was 16 (5.4%), demonstrating a prevalence of poor nighttime sleep of 5.4%. Majority (50.0%) of those with poor night sleep had secondary education, followed by those with

primary education (25.0%). Those with no education made a tie with those with tertiary education (12.5% each). However, this association between poor night time sleep < 4 hours and educational status was not significant,  $p = 0.132$  (Table 3).

#### 4. Discussion

From this study there were more female among those with no formal education. Some communities see girl child education as a waste, which may have accounted for more females with no formal education, but we also noticed that among those who had education more females attained tertiary education, this explains why we have more male school drop outs than females [14] but there was no significant gender difference in level of education among the study participants.

Those who smoked cigarette were more among the participants with primary and secondary education than the ones with tertiary education in this study, though this association was not found to be significant. This finding is similar to that observed in a study by Farrel P *et al.* [15] which showed no association between levels of education and smoking, noting that smoking initiation, continuation and cessation are affected by many variables. Those who smoke cigarette usually start smoking in secondary and late primary schools. This usually occurs as a result of peer pressure and youthful exuberance but they tend to quit during the tertiary education period when more knowledge is acquired on the dangers of cigarette smoking. Our observed low rate of cigarette smoking in those with tertiary education is similar to that in a study in Argentina which noted a sharp drop in smoking prevalence among the most learned population [16]. Snuff use was significantly higher in those with secondary education and tertiary education showing that snuff use was associated with lower level of education, similar to the study by Liv Grotvedt *et al.* [17] where snuff use was seen more in people with lowest level education and low socio economic class.

Alcohol use was found to be increasing with increasing level of education in this study, in contrast to studies by Rosoff *et al.* [3] and Onodugo OD *et al.* [4], where there was a decline in alcohol use and dependency with higher educational attainment. Our findings may have been affected by the study population and not categorizing the alcohol use as majority of those who binge and take herbal drug with alcohol base were not evaluated as this is a common practice in our environment. The use of alcohol beverages in our environment may be largely affected by socioeconomic factors as these drinks are not cheap and the environment is largely filled with civil servants, owing to its status as a state capital and housing a federal university.

Excessive meat consumption is known to be one of the cardiovascular risks. This study showed a significant increase in the rate of meat consumption from the subjects with no education to those with secondary education followed by a decline among those with tertiary education. Meat consumption tends to in-

crease with rising income and socioeconomic status. This is in agreement with the findings of Akerele *et al.* [5] which also noticed a decline in meat consumption among the tertiary group as in our study. Another study by University of Florida [6] also buttressed our report. The significant decline in meat consumption among participants with tertiary education may be as a result of more awareness and knowledge of the health implication of excess meat consumption.

This study showed that among those who had education, the presence of thickened arterial wall was significantly higher among those with primary education than in those with secondary and tertiary. As thickened arterial wall is a marker of atherosclerosis, higher levels of education increase awareness and compliance to treatment of hypertension and other factors associated risks thereby reducing the rate of early atherosclerosis formation. There is dearth of studies from literature search on the relationship between levels of education and thickened arterial wall.

There was significantly more diabetics among those with primary education than those with secondary and tertiary education in this study. Though we did not categorize the diabetes into autoimmune or type 2 diabetes, studies have shown that lower levels of education are associated with type 2 diabetes and its risks like obesity, inactivity and poor blood sugar control [7].

Long working hours is known from previous studies to be associated with cardiovascular risks [8]. The educated people from our studies who spent less than 10 hours at work were significantly high compared to those who spent more than 10 hrs, Higher levels of education avails one of better opportunities, good ,paying jobs, civil service jobs and able to choose work and time convenient so as to reduce stress and have time for other activities helpful to one's health like sports and relaxation, lower level of education exposes one to menial jobs ,without good pay leading to multiple jobs and more time at work so as to make ends meet.

Higher levels of education, especially tertiary, was significantly associated with lower BMI/obesity from our study. This is in conformity with the study by K.O. Hajian-Tilaki *et al.* in Iranian adults [9]. A high level of education leads to better knowledge of good health ethics for improved cardiovascular health.

The prevalence of hypertension, in this study, was found to be significantly increasing from primary to secondary but declined among those with tertiary education. This observation agrees with previous studies [10] [11] with similar findings that hypertension is more prevalent among people with low and intermediate levels of education than those with higher levels of education. This effect of socio-economic factor and more informed knowledge with presence of other risk factors may contribute to these differences.

This study did not find any significant association between duration of night sleep < 4 hours and levels of education. Nevertheless, the reasons why an individual should have short night time sleep duration are multifactorial. Given that short night time sleep duration is a strong risk factor for the developing of



hypertension especially when sustained, more awareness should be created so as to limit these modifiable risk.

## 5. Conclusion

There was variability in the prevalence of cardiovascular risks at different levels of education. Prevalence of smoking and night sleep duration < 4 hours did not vary with educational status. Prevalence of tobacco snuff and thickened arterial wall was high in primary education holders and heavy meat consumption in secondary education holder. Alcohol prevalence increased with increasing education. Prevalence of diabetes mellitus, lengthy working hours, hypertension and obesity increased with education but declined with tertiary education.

## 6. Limitations of the Study

The study population was small, cross sectional and unstructured. In this, many eligible people might have been missed out. A larger study size would have been more representative of the population.

## Authors' Contributions

Dr Anyabolu EN designed the research while all the authors did data collection, data collation, statistical analysis and writing of the literature.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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