**Original Research Article**

**Prevalence and risk of hypertension among adults in Accra, Ghana:** **A cross-sectional study among employees of Architectural & Engineering Services Limited (AESL) headquarters**

**Abstract**

**Introduction:** Hypertension (HTN) has remained a severe disease with increasing worldwide prevalence, leading to life-threatening complications for decades. Previous studies conducted in Ghana indicated that HTN prevalence cut across all professionals, regions and rural and urban settings of the country.

**Aim**: The study aimed to estimate the prevalence and associated risk factors of hypertension among employees at AESL Headquarters.

**Methods:** This cross-sectional survey involved 112 persons aged 20 to 60 years (non-pregnant and with complete blood pressure measurement) who responded to a questionnaire and underwent physical examinations, including blood pressure measurements. HTN was classified as systolic blood pressure (BP) ≥140 mmHg and/or diastolic BP ≥90 mmHg among employees. Chi-square test and logistic regression analysis were used to determine the association between hypertension and the risk factors.

**Results:** The overall prevalence of hypertension among respondents was 52.7% and was higher among males, older adults and engineers. Gender, age, history of smoking, history of alcohol intake, and fast-food consumption were associated with the prevalence of hypertension. Employees aged 40-49 years, and 50-59 years were 7.58 times (aOR=7.58, 95% CI =1.65-34.77), and 5.96 times (aOR=5.96, 95% CI=1.23-28.99) more likely to become hypertensive, respectively. Employees with a history of alcohol intake were 4.18 times more likely to become hypertensive than those who had never taken alcoholic drinks (aOR=4.18, 95% CI=1.47-11.87).

**Conclusion:** Efforts on awareness and sensitisation programmes, diet modifications and health screening programmes should be intensified in the general population.

***Keywords:*** *Hypertension, prevalence, risk factors, awareness, public sector workers*

**1 Introduction**

Hypertension (HTN), also known as high blood pressure (BP), has remained a significant public health concern worldwide for decades due to its increasing prevalence and negative health consequences.1 It is the leading cause of cardiovascular diseases and premature deaths in both developed and developing countries.2 About 54% of strokes, 47% of ischemic heart diseases, and 10.5 million annual deaths can be attributed to hypertension.3

The global prevalence of HTN shot up to 1.39 billion people in 2010, with 31.5% prevalence in low- and middle-income countries, whilst 28.5% prevalence was noted in high-income countries.4 Currently, it is estimated that about 1.4 billion people worldwide have hypertension, with almost one-third of the adult population suffering from the condition and only 14% having it under control.5,6 Due to its increasing rate, people with hypertension are estimated to reach about 1.56 billion globally by 2025, with 75% expected to be in developing countries.7,8

In Africa, the prevalence of HTN is on the rise, and it is estimated that over 80 million people suffer from the condition.7,9 Ghana is recorded an increase in the prevalence of hypertension among adults with an associated rise in cardiovascular morbidity and mortality.7,10 In 2016, hypertension was reported to be the fourth major cause of outpatient morbidity in Ghana.11,12 Again, between 1990 and 2010, outpatient cases of hypertension increased from 60,000 to approximately 700,000.13,14 Some studies in Ghana have also reported that hypertension prevalence cuts across ecological regions and different locations, including both rural and urban settings. Indeed, Duah et al. identified 28.3% and 28.7% prevalence of hypertension in Accra and Kumasi, respectively.15 Bansal et al. also reported hypertension prevalence among adults in Ghana, with 27.4% in rural 15.5% to 59.2% in urban settings.16

Several studies have reported several risk factors of hypertension, which have been categorised into modifiable and non-modifiable risk factors.17 The modifiable risk factors include bad dietary lifestyle (too much salt intake, high saturated fatty diets, low consumption of fruits and vegetables), body mass index (being overweight), excessive alcohol intake, lack of sleep, smoking, educational status, lack of physical activity, and job-related factors (stress, burnout, income).18–20 The non-modifiable risk factors include age, sex, genetics or family history, and underlying diseases such as kidney disease and diabetes.8,21 Other factors related to the workplace have been identified as critical in examining the prevalence of hypertension, especially among workers. Most jobs come with a significant amount of stress, particularly professions that require long hours of work, such as banking, healthcare, architecture, engineering, construction, and factory work.22 Long working hours without enough sleep or rest may lead to stress and burnout, which tend to result in workers developing physiological and psychological challenges that may predispose them to hypertension.17,23

Identifying the prevalence and risk factors associated with HTN will help design strategies to prevent and manage the burden of this condition. However, not much is known regarding the prevalence of hypertension and risk factors among employees in the construction industry of Ghana, especially those at the headquarters of the AESL. Extant studies on the prevalence of hypertension and risk factors in Ghana have focused on the general and community populations, civil servants, gold miners, rubber company workers, automobile garage workers, university staff, bank workers, and media workers. Therefore, this study aims to estimate the prevalence and risk factors of hypertension among employees, contributing to the design and implementation of initiatives that support the UN’s Sustainable Development Goal (SDG) 3: “Good Health and Well Being”. It aims to raise awareness among construction industry employees about high blood pressure, highlighting its seriousness and dangers, to prompt lifestyle changes to reduce their susceptibility to the condition.

**2 Materials and Methods**

*2.1 Study design, setting and participants*

We analyzed data from a cross-sectional survey undertaken in March, 2023 of employees (20–60 years) at the Architectural and Engineering Services Limited (AESL) headquarters based in Accra, Ghana (N= 113). The AESL is a public service agency comprised of practicing professionals engaged in the building and engineering consultancy services to provide creative and innovative building and engineering designs and services to meet the needs of its clients. The group comprises a range of categories of qualified and experienced staff, including architects, land and quantity surveyors, civil engineers, structural engineers, mechanical engineers, electrical engineers, water engineers, drafters, and geotechnical engineers. There are also technicians and administrative staff who form part of the organization’s labor force.

*2.2 Sampling technique and size*

The study population consisted of all 158 employees of the AESL, including the professionals (81), technicians (45), and the administrative support staff (32) at the headquarters of the organization. Stratified probability random sampling was used to select participants. All respondents were randomly selected from the strata of professionals, technicians and administrative staff to respond to the questionnaires. Exclusion criteria were people who did not give their consent to participate in the study, were unable to answer questions, were aged < 20 or> 60 years, or had worked for less than two years at the headquarters of AESL. Additionally, professionals and technicians on leave or unavailable for other reasons were excluded from the study during data collection. In the end an estimated total sample size of 112 respondents participated in the study.

*2.3 Data Collection*

A structured questionnaire was used to gather data from the respondents. The questionnaire was hand-delivered to each respondent and consisted mainly of closed-ended questions. The questions were organized based on the research objectives and mostly self-reported, except for height, weight, and blood pressure, where real-time measurements of participants were taken. The self-report questions covered measures such as demographic characteristics, tobacco use, alcohol consumption, dietary consumption, physical activity, awareness/knowledge of hypertension, hypertension status, history of hypertension, other medical conditions and exposure to job stress. Following the STEPPS survey procedures, socio-behavioural information was evaluated in Step 1, and physical and blood pressure measurement in Step 2. Data were collected over one month between 1st March and 31st March, 2023.

**2.4 Measures**

*2.4.1 Blood Pressure*

Blood pressure was measured on the left arm using a validated OMRON M6 digital automatic blood pressure monitor, battery-powered. Respondents were asked to remain seated, relaxed, and blood pressure measurements were taken as per the World Health Organisation (WHO) steps protocol. In summary, two BP measurements were taken with at least a 3-minute interval. The mean value of the 1st and 2nd measurements was used for analysis. BP was classified according to the Seventh Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII). HTN was defined as mean measured blood pressure of ≥140 mmHg systolic and/or the mean measured diastolic blood pressure of ≥90 mmHg or self-reported current use of hypertensive medications. Other classifications of hypertension were as follows: normal hypertension systolic blood pressure (SBP) <120mmHg and diastolic blood pressure (DBP) <80mmHg with self-reported current use of hypertensive medications; normal high or prehypertension was SBP between 120mmHg - 139mmHg, or DBP between 80mmHg - 89mmHg; stage one hypertension, SBP between 140mmHg - 159mmHg or DBP between 90mmHg - 99mmHg; and stage two hypertension where SBP ≥160mmHg or DBP ≥100mmHg

*2.4.2 Predisposing factors* consisted of sex, age, family history, religion, ethnicity, marital status and ethnicity.

*2.4.3 Enabling factors* consisted of educational level, household income tertile, job category, average monthly income, size of household, job tenure, smoking status, heavy alcohol use ( in the last month (≥ five standard units in men and ≥ 4 units in women in one drinking session), dietary lifestyle, physical activity job stress, working hours, sleeping hours, current tobacco use, heavy alcohol use in the last month (≥ 5 standard units in men and ≥ 4 units in women in one drinking session), and low and high physical activity (according to the Global Physical Activity Questionnaire). The monthly income in Ghana Cedis was categorised into four tertiles: < 1000, 1000 to < 1900, 2000 to 3000, and above 3000. The average exchange rate of the Ghana Cedi to the United States Dollar (USD) in 2024 was 14.3 to USD 1.

*2.4.4 The need factor* wasmeasured by body mass index (BMI). The weight and height of the respondents were measured at their work premises after answering the questionnaire. A Measuring Scale was used to measure the weight in kilograms (kg) whilst a Measuring Tape was used to measure their height in centimetres (cm). The body mass index (BMI) was categorised as per the WHO guidelines9 by dividing the weight in kilograms (kg) by height in meters squared (m2). Underweight was classified as (BMI <18.5), normal (BMI ≥18.5 to ≤ 24.9), overweight (BMI ≥ 25.0 to ≤ 29.9) or obese (BMI ≥30.0).

**2.5 Statistical analyses**

Data management and analysis were conducted using the Statistical Package for Social Sciences (SPSS) version 21. The prevalence of hypertension was age-standardised using the WHO world population for people aged 15 years and above. The independent Student’s t-test was used for continuous variables. Chi-square test was used to test the relationship between the dependent variables (hypertension status) and categorical variables (sex, age, educational level, religion, ethnicity, job category, average monthly income, size of household, job tenure, smoking status, alcohol consumption, dietary lifestyle, physical activity, diabetes, high cholesterol, family history, job stress, working hours, sleeping hours and body mass index) at 5% significance level. Bivariate logistic regression was used to ascertain the individual influence of the risk factors on hypertension. A multivariate logistic regression model was used to determine significant risk factors associated with hypertension. We report crude odds ratios (COR), adjusted odds ratios (aOR), and their respective 95 % confidence intervals (CI) as the measure of association.

**3 Results**

***3.1 Demographic characteristics of Participants***

A total of 112 employees at the AESL headquarters responded to the questionnaire administered. As shown in **Table 1**, out of this number, the majority, 64.3% were males. Concerning the age of the respondents, most of the respondents (31.3%) were between 40 and 49 years, 29.5% were between 30 and 39 years, 22.3% were between 50 and 59 years, and 16.1% were between 20 and 29 years. Only one respondent was aged 60 years. About marital status, 37.5% of the respondents had never married, 33.9% were married, 12.5% had divorced, 6.3% had separated from their spouses, and 9.8% were widowed. The level of education of respondents was also investigated and indicated that 57.1% had a graduate degree, 21.4% had vocational or technical education, whilst 19.6% had attained a post-graduate degree. The remaining respondents had senior high school education (0.9%) and primary level education (0.9%) as their highest level of education attained.

In terms of religion, the majority of the respondents (89.3%) were Christians, 9.8% were Muslims, and only one respondent had another religion (Baha'i). Regarding ethnicity, 37.5% of the respondents were Akans, 29.5% were Gas, 16.1% were northerners, whilst 13.4% and 3.6% were Ewes and Krobos, respectively. Most of the respondents (53.6%) had a household size of between 4 and 6, 43.8% had between 1 and 3 household members, and 2.7% had between 7 and 9 household members.

Concerning job characteristics of respondents, 30.4% were engineers, 27.7% were technicians, 14.3% were architects, whilst 10.7% were surveyors. The remaining were administrative staff (9.8%), interior designers (4.5%) and valuers (2.7%). About job tenure, 55.4% of the respondents had worked at AESL for over 10 years, 24.1% had worked for 6 to 10 years, and 20.5% had been working in the organisation for 2 to 5 years.

**Table 1: Demographic characteristics of employees of AESL, 2023.**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable |  | Frequency (N=112) | % |
| Sex | Male | 72 | 64.3 |
| Female | 40 | 35.7 |
| Age group | 20 – 29 | 18 | 16.1 |
| 30 – 39 | 33 | 29.5 |
| 40 – 49 | 35 | 31.3 |
| 50 – 59 | 25 | 22.3 |
| 60 and above | 1 | 0.9 |
| Marital Status | Never Married | 42 | 37.5 |
| Married | 38 | 33.9 |
| Separated | 7 | 6.3 |
| Divorced | 14 | 12.5 |
| Widowed | 11 | 9.8 |
| The Highest Educational level attained in the household | Primary school | 1 | 0.9 |
| Senior high school | 1 | 0.9 |
| Vocational/Technical school | 24 | 21.4 |
| Graduate degree | 64 | 57.1 |
| Post-graduate degree | 22 | 19.6 |
| Religion | Christian | 100 | 89.3 |
| Muslim | 11 | 9.8 |
| Other (Baha'i) | 1 | 0.9 |
| Ethnicity | Akan | 42 | 37.5 |
| Ga | 33 | 29.5 |
| Ewe | 15 | 13.4 |
| Northerner | 18 | 16.1 |
| Krobo | 4 | 3.6 |
| Size of household | 1 – 3 | 49 | 43.8 |
| 4 – 6 | 60 | 53.6 |
| 7 – 9 | 3 | 2.7 |
| Job Title/Category | Technician | 31 | 27.7 |
| Quantity/Land Surveyor | 12 | 10.7 |
| Interior Designer | 5 | 4.5 |
| Valuer | 3 | 2.7 |
| Architect | 16 | 14.3 |
| Engineer | 34 | 30.4 |
| Administrative Staff | 11 | 9.8 |
| Average Monthly Income | Below 1,000 cedis | 14 | 12.5 |
| 1,000 – 1,999 cedis | 39 | 34.8 |
| 2,000 – 3000 cedis | 25 | 22.3 |
| Above 3,000 cedis | 34 | 30.4 |
| Job Tenure | 2 – 5 years | 23 | 20.5 |
| 6 – 10 years | 27 | 24.1 |
| 11- 15 years | 31 | 27.7 |
| Above 15 years | 31 | 27.7 |

## 3.2 Prevalence of hypertension among employees at AESL headquarters

According to the findings, the overall prevalence of hypertension among respondents was 52.7%. Regarding the stages of hypertension, the figure showed that 49.1% (n=55) of the respondents had stage 1 hypertension, whilst only 9.8% (n=11) had stage 2 hypertension. **Figure 1.**

**Figure 1: Prevalence of hypertension among employees of AESL, 2023.**

**3.3 Prevalence of different grades of hypertension and demographic characteristics**

**Table 2** shows the proportions of the various grades of hypertension and demographic features of the respondents. About sex, the prevalence of the various grades of hypertension was higher among males than females. Specifically, there was a 62.5% prevalence of overall hypertension among males and 35.5% among females. Systolic hypertension was more prevalent among males (59.7%) than females (30%). Diastolic hypertension had a 50% prevalence among males and a 27.5% among females. However, prehypertension was prevalent among females (52.5%). There was a 58.3% prevalence of stage 1 hypertension among males and 35% among females. Stage 2 hypertension was prevalent among males (11.1%) than among females (7.1%).

About age, hypertension was more prevalent among employees aged 40 years and above. There was a 62.9% prevalence among employees between 40 and 49 years, and a 72% prevalence was found among those aged between 50 and 59 years. Systolic hypertension was also prevalent among employees aged 40 years and above. There was a 60% prevalence of diastolic hypertension among respondents aged between 50 and 59 years, a 48.6% prevalence among those within 40 and 49 years, and a 36.4% among those aged 30 and 39 years. Prehypertension was prevalent across all ages, with rates of 48% for ages between 50 and 59 years, 45.5% for ages between 30 and 39 years, 44.4% for those aged between 20 and 29 years, and 40% for those between 40 and 49 years. The only respondent aged 60 was prehypertensive. Stage 1 hypertension was 62.9% prevalent among those aged 40 and 49 years, and 64% for those within the ages of 50 and 59 years. Stage 2 hypertension had a relatively low prevalence across the age groups.

On the prevalence of hypertension by marital status, the results showed 54.6% prevalence among those who have never married and 52.6% prevalence among those who are married. Similarly, systolic hypertension was also prevalent among those who are married (52.6%) and have never married (50%). Diastolic hypertension was 45.3% commonplace among those who had never married, and 39.5% among those who were married. Prehypertension, Stage 1 hypertension and Stage 2 hypertension were all prevalent among employees who have never married and those who have married, compared to those who are divorced, separated and widowed.

In terms of job category, the prevalence of hypertension was 48.4%(n=15) among technicians, 58.3%(n=7) among quantity/land surveyors, 60%(n=3) among interior designers, 61.8%(n=21) among engineers, 43.8%(n=7) among architects, 33.3% among valuers and 45.5%(n=5) among administrative staff. This implies that engineers were more prone to have hypertension. This is true for the other forms of hypertension, as evident in Table 2.

**Table 2. Prevalence of different stages of hypertension and demographic characteristics among employees of AESL, 2023.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | HTN=59 | SBPN=55 | DBPN=47 | PHTN=50 | Stage 1 HTN=56 | Stage 2 HTN=11 |
| SexMaleFemale | 45(62.5)14(35.5) | 43(59.7)12(30) | 36(50)11(27.5) | 29(40.3)21(52.5) | 42(58.3)14(35) | 8(11.1)3(7.1) |
| Age group20 - 2930 - 3940 - 4950 - 5960 and above | 5(27.8)14(42.4)22(62.9)18(72)0(0) | 5(27.8)12(36.4)22(62.9)16(64)0(0) | 3(16.7)12(36.4)17(48.6)15(60)0(0) | 8(44.4)15(45.5)14(40)12(48)1(100) | 5(27.8)13(39.4)22(62.9)16(64)0(0) | 2(11.1)3(9.1)2(5.7)4(16)0(0) |
| Marital StatusNever marriedMarriedSeparatedDivorcedWidowed | 23(54.8)20(52.6)2(28.6)8(57.1)6(54.5) | 21(50)20(52.6)2(28.6)7(50)5(45.5) | 19(45.2)15(39.5)2(28.6)6(42.9)5(45.5) | 15(35.7)20(52.6)2(28.6)8(57.1)5(45.5) | 22(52.4)18(47.4)2(28.6)8(57.1)6(54.5) | 3(7.1)8(21.1)0(0)0(0)0(0) |
| Job CategoryTechnicianQuantity/Land SurveyorInterior designerValuerArchitectEngineerAdministrative Staff | 15(48.4)7(58.3)3(60)1(33.3)7(43.8)21(61.8)5(45.5) | 15(48.4)6(50)3(60)1(33.3)6(37.5)19(55.9)5(45.5) | 10(32.3)5(41.7)2(40)1(33.3)7(43.8)17(50)5(45.5) | 12(38.7)8(66.7)3(60)1(33.3)6(37.5)15(44.1)5(45.5) | 14(45.2)6(50)3(60)1(33.3)7(43.8)20(58.8)5(45.5) | 2(6.5)3(25)0(0)0(0)1(6.2)5(14.7)0(0) |

**3.4 Bivariate analysis of risk factors and prevalence of hypertension among employees of AESL, 2023.**

A bivariate analysis was conducted to determine the relationship between the prevalence of hypertension and potential risk factors. The results indicated that sex and age had a statistically significant positive relationship with the prevalence of hypertension (χ2=7.80, *p*= 0.01; χ2=12.2, *p*=0.02). Also, history of smoking (χ2=10.53, *p*< 0.001), history of alcohol intake (χ2=19.40, *p*= 0.000), and fast-food consumption (χ2=8.09, *p*= 0.04) had a statistically significant positive relationship with the prevalence of hypertension. **Table 3.**

**Table 3. Bivariate analysis between the prevalence of hypertension and risk factors** **among employees of AESL, 2023.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Hypertensive N=59 | χ² | Df | *P*-value |
| Sex |  |  |  |  |
| Male | 45 (40.2%) | 7.8 | 1 | 0.01 |
| Female | 14 (12.5%) |  |  |  |
| Age group |  | 12.2 | 4 | 0.02 |
| 20 - 29 | 5 (4.5%) |  |  |  |
| 30 - 39 | 14 (12.5%) |  |  |  |
| 40 - 49 | 22 (19.6%) |  |  |  |
| 50 - 59 | 18 (16.1%) |  |  |  |
| 60 and above | 0 (0%) |  |  |  |
| Ethnicity |  | 3.08 | 4 | 0.55 |
| Akan | 20 (17.9%) |  |  |  |
| Ga | 17 (15.2%) |  |  |  |
| Ewe | 11 (9.8%) |  |  |  |
| Northerner | 9 (8%) |  |  |  |
| Krobo | 2 (1.8%) |  |  |  |
| Family history of hypertension | 0.14 | 1 | 0.71 |
| Yes | 31 (27.7%) |  |  |  |
| No | 28 (25%) |  |  |  |
| Family history of Diabetes | 1.66 | 1 | 0.2 |
| Yes | 16 (14.3%) |  |  |  |
| No | 43 (38.4%) |  |  |  |
| Family history of High Cholesterol | 2.97 | 2 | 0.23 |
| Yes | 14 (12.5%) |  |  |  |
| No | 28 (25%) |  |  |  |
| Don’t know | 17 (15.2%) |  |  |  |
| Education level | 0.2 | 4 | 0.37 |
| Primary school | 0 (0%) |  |  |  |
| Senior high school | 1 (0.9%) |  |  |  |
| Vocational/Tech. school | 14 (12.5%) |  |  |  |
| Graduate degree | 30 (26.8%) |  |  |  |
| Post-graduate degree | 14 (12.5%) |  |  |  |
| Religion |  | 0.14 | 2 | 0.34 |
| Christian | 54 (48.2%) |  |  |  |
| Muslim | 4 (3.6%) |  |  |  |
| Other (Baha'i) | 1 (0.9%) |  |  |  |
| Marital Status | 1.83 | 4 | 0.77 |
| Never married | 23 (20.5%) |  |  |  |
| Married | 20 (17.9%) |  |  |  |
| Separated | 2 (1.8%) |  |  |  |
| Divorced | 8 (7.1%) |  |  |  |
| Widowed | 6 (5.4%) |  |  |  |
| Size of household | 0.05 | 2 | 0.88 |
| 1-3 | 26 (23.2%) |  |  |  |
| 4-6 | 31 (27.7%) |  |  |  |
| 7-9 | 2 (1.8%) |  |  |  |
| Job Category | 0.16 | 6 | 0.83 |
| Technician | 15 (13.4%) |  |  |  |
| Quantity/Land Surveyor | 7 (6.2%) |  |  |  |
| Interior designer | 3 (2.7%) |  |  |  |
| Valuer | 1 (0.9%) |  |  |  |
| Architect | 7 (6.2%) |  |  |  |
| Engineer | 21 (18.8%) |  |  |  |
| Administrative Staff | 5 (4.5%) |  |  |  |
| Average Monthly Income | 0.24 | 3 | 0.09 |
| Below 1,000 cedis | 3 (2.7%) |  |  |  |
| 1,000 – 1,999 cedis | 25 (22.3%) |  |  |  |
| 2,000 – 3,000 cedis | 26 (23.2%) |  |  |  |
| Above 3,000 cedis | 5 (4.5%) |  |  |  |
| History of smoking | 10.53 | 1 | 0.001 |
| Yes | 24 (21.4%) |  |  |  |
| No | 35 (31.2%) |  |  |  |
| Alcohol intake | 19.4 | 1 | 0 |
| Yes | 50 (44.6%) |  |  |  |
| No | 9 (8%) |  |  |  |
| Fast food consumption | 8.09 | 3 | 0.04 |
| Always | 10 (8.9%) |  |  |  |
| Sometimes | 35 (31.2%) |  |  |  |
| Rarely | 13 (11.6%) |  |  |  |
| Never | 1 (0.9%) |  |  |  |
| Salt consumption | 0.21 | 5 | 0.4 |
| Far too little | 1 (0.9%) |  |  |  |
| Too little | 14 (12.5%) |  |  |  |
| Just the right amount | 37 (33%) |  |  |  |
| Too much | 3 (2.7%) |  |  |  |
| Far too much | 1 (0.9%) |  |  |  |
| Don’t know | 3 (2.7%) |  |  |  |

**3.5** **Multivariable analysis of risk factors and prevalence of hypertension among employees of AESL, 2023.**

To determine risk factors that significantly influence the prevalence of hypertension, a multivariate logistic regression analysis was subsequently performed. In performing the logistic regression analysis, female was made the reference for sex, 20 - 29 years was made reference for age, never smoked (No) was made the reference for history of smoking, never consumed alcohol (No) was referred for alcohol intake, and never consumed fast food was made reference for fast food consumption. The multivariate analysis revealed that in relation to sex, males were 1.9 times likely to be hypertensive than females, although not statistically significant [Adjusted odds ratio (aOR)] =1.90, 95% CI=0.69-5.23, *p*-value=0.22). The results further revealed that employees aged 40-49 years and 50-59 years were 7.58 times (aOR=7.58, 95% CI =1.65-34.77, *p*=0.01) and 5.96 times (aOR=5.96, 95% CI=1.23-28.99, *p*=0.03) more likely to become hypertensive as compared to those aged between 20 and 29, respectively. Employees with a history of smoking were 2.7 times more likely to become hypertensive than those who have never smoked (aOR=2.70, 95% CI= 0.83-8.76), but it is not statistically significant with p-value = 0.10. Again, employees who have a history of alcohol intake are 4.18 times more likely to become hypertensive than those who have never taken alcoholic drinks (aOR=4.18, 95% CI=1.47-11.87), and it is statistically significant with p=0.01. Finally, respondents who always consume fast foods were 20.09 times more likely to be hypertensive compared to those who have never consumed fast foods (aOR=20.09, 95% CI=0.79-509.35; *p*>0.05).



Abbreviation: ref.- reference; aOR -adjusted odds ratio; p-p-value; CI-confidence interval

**Figure 2: Multivariate regression analysis of risk factors and the prevalence of hypertension among AESL employees, 2023.**

**4. Discussion**

The study estimated the prevalence and risk factors of hypertension among 112 employees at AESL headquarters. The findings revealed that most of the employees had hypertension, with higher rates among males, older adults, and engineers. Risk factors associated with hypertension included age, history of smoking, history of alcohol intake, and fast-food consumption. The overall prevalence of hypertension among employees at AESL headquarters was 52.7%, and the prevalence of Stage 1 hypertension was 50%. This implies that more than half of the employees at AESL headquarters are hypertensive. A similar high prevalence of hypertension was reported to be 61.7% among adults in both urban and rural areas of Ghana. 12,24However, other studies have reported relatively lower hypertension prevalence among adults.12

The study results also showed that hypertension is more prevalent among male employees (62.5%) than female employees (35.5%) at AESL headquarters. This aligns with previous studies that indicate hypertension is prevalent mainly among male adults compared to female adults in both developed and developing countries. It was further identified that the prevalence of hypertension was high among employees aged 40 years and above. There was a 62.9% prevalence among employees aged 40-49 years and a 72% prevalence among those aged 50-59 years. Similarly, Stage 1 hypertension prevalence was 62.9% among those aged 40-49 years and 64% among those aged 50-59 years. This implies that AESL has most of its older employees who are hypertensive. Senior staff members in the organisation are therefore more hypertensive than junior staff members, consistent with similar findings by Wamala et al.25 Moreover, the prevalence of hypertension was found across various job categories, with a higher prevalence among engineers and technicians. This is consistent with findings by Bosu, who posited that hypertension is prevalent among various categories of formal workers across West Africa.9 Similarly, other studies. Identified a high prevalence of hypertension among industrial workers.26,27

Regarding risk factors of hypertension among employees at AESL headquarters, the bivariate analysis showed that modifiable risk factors such as history of alcohol intake, history of smoking, and fast-food consumption, and non-modifiable risk factors such as gender and age had a statistically significant positive relationship with the prevalence of hypertension.

The study identified that alcohol consumption among the employees was highly prevalent at 66.1%. It was found that a history of alcohol intake has a statistically strong relationship with hypertension prevalence among the employees. The multivariate analysis indicated that employees with a history of alcohol intake are 4.18 times more likely to become hypertensive than those who have never taken alcoholic drinks. This means that more alcohol intake by the employees predisposes them to hypertension, consistent with findings reported by other studies.28,29

On smoking, the study found that 27.7% of the respondents had a history of smoking, of which 10.7% were current smokers. The results showed that a history of smoking was associated with hypertension. The multivariate analysis showed that employees with a history of smoking were 2.7 times more likely to be hypertensive, although this was not statistically significant. This implies that hypertension among some employees could be attributed to their history of smoking, especially among current smokers. Several studies have reported on how smoking predisposes individuals to hypertension. Regarding dietary lifestyle, the study findings revealed that fast food consumption was prevalent among the respondents, with 58.9% consuming fast food sometimes and 10.7% consuming it always, at least once a day. It was further found that fast food consumption had a statistically significant relationship with hypertension among the employees. Those who always consume fast food are 20.09 times more likely to be hypertensive than those who have never consumed fast food, although this was not statistically significant. Similar studies have found a strong association between fast foods, which mostly contain high levels of salt and cholesterol, heightening the risks of hypertension among consumers.21,31–33 Concerning sex, the study found it to have a statistically significant relationship with hypertension prevalence at AESL headquarters. Male employees were 1.9 times more likely to be hypertensive than females, although this was not statistically significant. This can be attributed to the fact that males are more likely to consume tobacco and alcohol and are more susceptible to job stress than females. Moreover, women tend to be more aware of their blood pressure status and likely manage their blood pressure better than men. Age was also found to have a statistically significant association with hypertension among the employees at AESL headquarters. Employees aged 40-49 years and 50-59 years were 7.58 times and 5.96 times more likely to become hypertensive, respectively, compared to those aged between 20 and 29. This supports previous studies that have reported the risk of hypertension to be high with increasing age. Public awareness and sensitisation programs on hypertension are necessary to educate people on the condition to debunk the long-held belief that hypertension is a ‘rich man’s sickness.25,34,35

**5 Conclusion**

Hypertension (HTN) or high blood pressure (HBP) remains a significant health concern in Ghana and globally. This study has examined the prevalence and risk factors of hypertension among employees at AESL headquarters in Accra, Ghana. The study findings suggest that the prevalence of hypertension was high, with half of the employees surveyed having stage 1 hypertension. The prevalence of hypertension was higher among male employees compared to female employees. Employees aged 40 years and above were at serious risk of hypertension. Fast food consumption, history of smoking, and alcohol consumption are significant risk factors for hypertension in the organisation. The study concludes that hypertension is an important health concern among older adults, especially male adults, at AESL headquarters. Serious dietary and lifestyle changes are needed to tackle the prevalence of hypertension in the organisation. The study recommends that broader and intensive hypertension awareness and sensitisation programs, health screening, and health improvement activities be undertaken at AESL Headquarters to help control the prevalence of hypertension among employees in the organisation.

**Limitations of the Study**

The study relied on self-reported responses by the respondents. As a result, some responses may not be accurate due to memory loss or reluctance to provide honest responses, especially on consumption of alcohol, smoking behaviour, and other medical conditions such as diabetes and hypercholesterolemia, which may affect the veracity of the study results or lead to recall bias. There is also the tendency to underestimate or overestimate responses relating to salt consumption, fruit and vegetable intake, and physical activity. Additionally, factors like diabetes mellitus and dyslipidaemia were not included in the study due to data limitations. Since it is a cross-sectional study, findings pertain to the period during which the research was undertaken. Longitudinal studies are recommended to provide more substantial evidence of hypertension prevalence among employees across different time periods.

**Ethical Approval**

The Protocol and Ethical Review Committee of Family Health University College provided ethics approval of the study (NO.FHUC-EPRC-026/2023), and written informed consent was obtained from the study participants. All methods were carried out by relevant guidelines and regulations (e.g., Declaration of Helsinki).

**Conflict of Interest**

All authors declare no conflict of interest.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors confirm that no generative AI techniques, such as text-to-image generation

tools or big language models (such as Copilot, ChatGPT, etc.), were used in the preparation, authoring, or editing of this work.

 **Reference**

1. Hisamatsu T, Kinuta M. High blood pressure in childhood and adolescence. *Hypertens Res*. 2024;47(1):203-205. doi:10.1038/s41440-023-01488-4

2. Ware LJ, Charlton K, Schutte AE, Cockeran M, Naidoo N, Kowal P. Associations between dietary salt, potassium and blood pressure in South African adults: WHO SAGE Wave 2 Salt & Tobacco. *Nutr Metab Cardiovasc Dis*. 2017;27(9):784-791. doi:10.1016/j.numecd.2017.06.017

3. Williams EM, Fefegula GM, Leone S. Pr ep rin t n ot pe er r iew Pr ep rin t n ot ed.

4. Studies P. Statistical Investigation of the Prevalence and Incidence of High Blood Pressure among Rural Residents of Saskatchewan. 2024;(January).

5. Solomon M, Shiferaw BZ, Tarekegn TT, et al. Prevalence and Associated Factors of Hypertension Among Adults in Gurage Zone, Southwest Ethiopia, 2022. *SAGE Open Nurs*. 2023;9. doi:10.1177/23779608231153473

6. Kamara IF, Tengbe SM, Bah AJ, et al. Prevalence of hypertension, diabetes mellitus, and their risk factors in an informal settlement in Freetown, Sierra Leone: a cross-sectional study. *BMC Public Health*. 2024;24(1):1-11. doi:10.1186/s12889-024-18158-w

7. Kifle ZD, Adugna M, Chanie GS, Mohammed A. Prevalence and associated factors of hypertension complications among hypertensive patients at University of Gondar Comprehensive Specialised Referral Hospital. *Clin Epidemiol Glob Heal*. 2022;13(December 2021):100951. doi:10.1016/j.cegh.2021.100951

8. Obarisiagbon OE, Osayi D, Wagbatsoma VA. Prevalence and risk factors of hypertension among workers of an oil palm company in Edo State, Nigeria. *J Community Med Prim Heal Care*. 2018;30(2):62-74. https://www.ajol.info/index.php/jcmphc/article/view/178112

9. Kurjogi MM, Vanti GL, Kaulgud RS. Prevalence of hypertension and its associated risk factors in Dharwad population: A cross-sectional study. *Indian Heart J*. 2021;73(6):751-753. doi:10.1016/j.ihj.2021.10.006

10. Temoua ND, Urbain HDT, Zacharia ZA, et al. Edpidemiology, Clinical Profile and Short- Term Outcome of Hypertensive Crisis in N’Djamena (Chad). *J Hypertens Cardiol*. 2024;3(4):16-26. doi:10.14302/issn.2329-9487.jhc-24-5040

11. Ajayi I, Sowemimo I, Akpa O, Ossai N. Prevalence of hypertension and associated factors among residents of Ibadan-North Local Government Area of Nigeria. *Niger J Cardiol*. 2016;13(1):67. doi:10.4103/0189-7969.165168

12. Matsuzaki M, Sherr K, Augusto O, et al. Correction to: The prevalence of hypertension and its distribution by sociodemographic factors in Central Mozambique: a cross sectional study (BMC Public Health, (2020), 20, 1, (1843), 10.1186/s12889-020-09947-0). *BMC Public Health*. 2020;20(1):1-9. doi:10.1186/s12889-020-10059-y

13. Paquissi FC, Cuvinje ABP, Cuvinje AB, Paquissi AM. Hypertension among outpatients at a general hospital in South Angola: Prevalence, awareness, treatment, and control. *Clin Med Insights Cardiol*. 2016;10:111-116. doi:10.4137/CMC.S39561

14. Green AS, Lynch HM, Nanyonga RC, et al. Assessing providers’ approach to hypertension management at a large, private hospital in Kampala, Uganda. *Ann Glob Heal*. 2020;86(1):1-8. doi:10.5334/aogh.2513

15. Duah AF, Werts N, Hutton-Rogers L, Amankwa D, Otupiri E. Prevalence and Risk Factors for Hypertension in Adansi South, Ghana. *SAGE Open*. 2013;3(4):215824401351568. doi:10.1177/2158244013515689

16. Sani R, Connelly P, Toft M, hypertension NRD… of human, 2024 undefined. Rural-urban difference in the prevalence of hypertension in West Africa: a systematic review and meta-analysis. *nature.com*. Accessed July 16, 2024. https://www.nature.com/articles/s41371-022-00688-8

17. Kotwani P, Kwarisiima D, Clark TD, et al. Epidemiology and awareness of hypertension in a rural Ugandan community: A cross-sectional study. *BMC Public Health*. 2013;13(1). doi:10.1186/1471-2458-13-1151

18. Achhab Y El, Nazek L, Maalej M, Alami M, Nejjari C. Prevalence, control and risk factors related to hypertension among moroccan adults: A multicentre study. *East Mediterr Heal J*. 2019;25(7):447-456. doi:10.26719/emhj.18.057

19. Smires FB, Iloughmane Z, Elghazi M, Zerrik M, Echchachoui H, Chemsi M. High blood pressure and aeronautical fitness: experience at the aeromedical expertise center of Rabat. *Pan African Med J* . 2024;47. doi:10.11604/pamj.2024.47.41.42262

20. Abukari MH, Appiah CA, Kwarteng A, Iddrisu S. Cardiovascular risk assessment of people living in prison in the Northern region of Ghana. *Int J Prison Heal*. 2024;20(1):102-115. doi:10.1108/IJOPH-09-2022-0054/FULL/HTML

21. Guwatudde D, Mutungi G, Wesonga R, et al. The epidemiology of hypertension in Uganda: Findings from the national non-communicable diseases risk factor survey. *PLoS One*. 2015;10(9):1-13. doi:10.1371/journal.pone.0138991

22. Mariama B, Yaya BE, Idrissa D, et al. Epidemiological, Clinical and Therapeutic Aspects of Arterial Hypertension at the General Medicine Department of Nzerekore Regional Hospital. *World J Cardiovasc Dis*. 2021;11(11):533-538. doi:10.4236/wjcd.2021.1111050

23. Simo LP, Agbor VN, Noubiap JJN, et al. Hypertension prevalence, associated factors, treatment and control in rural Cameroon: a cross-sectional study. *BMJ Open*. 2020;10(9):e040981. doi:10.1136/bmjopen-2020-040981

24. Solomon I, Adjuik M, Takramah W, et al. Prevalence and awareness of Hypertension among urban and rural Adults in Hohoe Municipality, Ghana. *J Med Res*. 2017;3(3):136-145. doi:10.31254/jmr.2017.3310

25. Pires JE, Sebastião Y V., Langa AJ, Nery S V. Hypertension in Northern Angola: Prevalence, associated factors, awareness, treatment and control. *BMC Public Health*. 2013;13(1). doi:10.1186/1471-2458-13-90

26. Adjobimey M, Houehanou C, open ICB, 2024 undefined. Work environment and hypertension in industrial settings in Benin in 2019: a cross-sectional study. *bmjopen.bmj.com*. Accessed July 16, 2024. https://bmjopen.bmj.com/content/14/3/e078433.abstract

27. Kayima J, Nankabirwa J, Sinabulya I, et al. Determinants of hypertension in a young adult Ugandan population in epidemiological transition - The MEPI-CVD survey. *BMC Public Health*. 2015;15(1):1-9. doi:10.1186/s12889-015-2146-y

28. Ordinioha B, Brisibe S. Prevalence of hypertension and its modifiable risk factors amongst traditional chiefs of an oil-bearing community in south-south Nigeria. *Sahel Med J*. 2013;16(1):24. doi:10.4103/1118-8561.112065

29. Ordinioha B. The prevalence of hypertension and its modifiable risk factors among lecturers of a medical school in Port Harcourt, south-south Nigeria: Implications for control effort. *Niger J Clin Pract*. 2013;16(1):1-4. doi:10.4103/1119-3077.106704

30. Olack B, Wabwire-Mangen F, Smeeth L, Montgomery JM, Kiwanuka N, Breiman RF. Risk factors of hypertension among adults aged 35-64 years living in an urban slum Nairobi, Kenya. *BMC Public Health*. 2015;15(1):1-9. doi:10.1186/s12889-015-2610-8

31. Nooh F, Ali MI, Chernet A, Probst-Hensch N, Utzinger J. Prevalence and Risk Factors of Hypertension in Hargeisa, Somaliland: A Hospital-Based Cross-Sectional Study. *Diseases*. 2023;11(2):1-13. doi:10.3390/diseases11020062

32. Akande AA. Gender Differences in Prevalence and Risk Factors for Hypertension among Oyo State Civil Servants at Agodi Secretariat, Ibadan, Nigeria. *Texila Int J Public Heal*. 2024;12(1):1-12. doi:10.21522/TIJPH.2013.12.01.Art005

33. Van Rensburg ZJ, Vincent-Lambert C, Razlog R, Phaladze N. Prevalence of hypertension in a sample of community members in a low-income peri-urban setting in Gaborone, Botswana. *J Public Health Africa*. 2023;14(2):20-25. doi:10.4081/jphia.2023.2068

34. Odili AN, Chori BS, Danladi B, et al. Prevalence, awareness, treatment and control of hypertension in Nigeria: Data from a nationwide survey 2017. *Glob Heart*. 2020;15(1):1-13. doi:10.5334/GH.848

35. Ekwunife OI, Udeogaranya PO, Nwatu IL. Prevalence, awareness, treatment and control of hypertension in a nigerian population. *Health (Irvine Calif)*. 2010;02(07):731-735. doi:10.4236/health.2010.27111