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Original

Burden of Prehypertension and Hypertension Among Newly Recruited Medical Interns in a Niger Delta Tertiary Hospital.

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Abstract

Background: Hypertension, a persistent elevation in blood pressure (≥140/90 mmHg) or current use of antihypertensive medication, is a major non-communicable disease increasingly affecting young adults, including healthcare workers. This study assessed the burden of prehypertension and hypertension among newly recruited medical interns at the Rivers State University Hospital.

Methods: A descriptive cross-sectional study was conducted among 220 newly recruited medical interns between August and September 2024 using systematic random sampling. Anthropometric measurements were obtained using a stadiometer and beam balance. Blood pressure was measured twice, five minutes apart, using a mercury sphygmomanometer, classified according to standard guidelines. Data were collected using a structured questionnaire and analysed using SPSS version 25. Associations between variables were tested using Pearson's chi-square at a 95% confidence level, with $p<0.05$ considered significant.

Results: Most participants were aged 19–28 years (81.4%), with a mean age of 25.64±4.70 years. The majority were single (90.5%), Christian (99.1%), and had a tertiary education (100.0%). Medical officers constituted the highest proportion (36.4%), while radiographers accounted for the least (2.3%). Normotension was most prevalent (61.8%), followed by prehypertension (29.5%) and hypertension (8.6%). Overweight and obesity affected 32.3% and 19.1% of participants, respectively. Hypertension showed no significant association with age, marital status, department, alcohol use, physical activity, chronic medical conditions, or BMI ($p>0.05$). However, sex (OR=3.15, $p=0.001$) and family history of illness (OR=0.56, $p=0.048$) were significantly associated.

Conclusion: A considerable proportion of interns had elevated blood pressure, highlighting the need for pre-employment screening and workplace health promotion programmes.

Keywords: Burden, Hypertension, Medical Interns, Niger-Delta, Nigeria

How to cite this article

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INTRODUCTION

Hypertension is a growing public health concern and remains a leading contributor to the global burden of morbidity and mortality, with an estimated 1.39–1.4 billion people aged 30–79 years living with the condition and more than 10 million deaths annually attributed to uncontrolled blood pressure.[1–3] It is a well-established risk factor for life-threatening conditions such as stroke, coronary heart disease, and kidney failure worldwide.[4] It is often described as a "silent killer" due to its frequently asymptomatic nature. It affects approximately 30–50% of adults and remains a major contributor to global mortality from cardiovascular, renal, and other multi-organ diseases.[5,6] The European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) define hypertension as a persistent elevation in blood pressure, characterized by a systolic blood pressure ≥140 mmHg and/or a diastolic blood pressure ≥90 mmHg.[2,7–9] However, lower thresholds may be considered in individuals with a prior diagnosis of hypertension or those receiving antihypertensive therapy.[10]

According to the Global Cardiovascular Risk Consortium (2023), hypertension is a leading cause of morbidity and mortality and a modifiable risk factor for cardiovascular diseases (CVDs). It accounts for approximately 80% of cases in low- and middle-income countries, with the highest prevalence reported in Africa (46%) and at least 20% in Nigeria.[11,12] Estimates suggest that the number of adults living with hypertension will continue to rise substantially in the coming decades, with projections indicating approximately 1.56 billion cases by 2025.[5,11,12] Although traditionally associated with older adults, hypertension is increasingly being reported among young adults, particularly those aged 18–39 years, largely driven by lifestyle factors and occupational stress.[13,14]

Hypertension is an important occupational health concern among healthcare professionals, particularly interns and residents, due to long working hours, heavy workloads, and psychological stress. Inadequate coping mechanisms and high job demands may contribute to sustained sympathetic nervous system activation, resulting in persistently elevated blood pressure.[15–17]

Risk factors for hypertension are broadly classified into modifiable factors, such as obesity, physical inactivity, unhealthy diet, alcohol consumption, and stress, and non-modifiable factors, including age, sex, genetics, and family history.[18,19] Rapid urbanization, lifestyle transitions, and increased consumption of processed foods have contributed to the rising prevalence of hypertension in developing countries.[4,15,20–22] In Nigeria, a concerning increase has been observed among young adults aged 18–39 years, with cardiovascular risk factors reportedly rising by as much as 150% and hypertension prevalence reaching approximately 40%.[19,23]

An internship is a compulsory one-year training programme for medical graduates, providing supervised clinical exposure to develop practical skills and clinical competence in teaching hospitals. Studies have shown that interns, particularly house officers, are exposed to multiple occupational stressors, including long working hours, sleep deprivation, heavy clinical workload, limited autonomy, and emotional strain. These factors may contribute to burnout, physiological dysregulation, and an increased risk of hypertension.[24,25]

Despite growing recognition of occupational stress among healthcare workers, there remains limited data on the prevalence and determinants of hypertension among newly recruited healthcare interns in Nigeria. Understanding the burden of hypertension in this population is essential for informing effective workplace health promotion strategies.[26,27] Therefore, this study assessed the burden of hypertension among newly recruited medical interns at Rivers State University Teaching Hospital.

MATERIALS AND METHODS

Study Area: The Rivers State University Teaching Hospital (RSUTH) serves as a major referral centre for primary and secondary health facilities within and outside Rivers State. It is a 571-bed tertiary health facility with fourteen clinical departments located at both the main site and annex within the Port Harcourt Local Government Area. The hospital is staffed by multidisciplinary specialists who provide emergency, inpatient, and outpatient services, as well as professional training and research. Its clinical departments include Accident

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and Emergency, Anaesthesia, Community Medicine, Dental Surgery, Family Medicine, Obstetrics and Gynaecology, Ophthalmology, Otorhinolaryngology, Paediatrics, Pathology, Pharmacy, Physiotherapy, Radiology, and Surgery. RSUTH also functions as a key training institution for medical students and interns across multiple disciplines, including Medicine and Surgery (house officers), Dental Surgery, Nursing, Medical Laboratory Science, Pharmacy, Physiotherapy, Optometry, and Radiography.[28]

The hospital also has an Occupational Health, Safety and Environment (OHSE) unit, domiciled within the Department of Community Medicine, which is responsible for occupational, environmental, and safety services. These services include pre-employment screening, pre-placement assessments, risk assessments, and monitoring of environmental and safety protocols. In addition, staff members undergo periodic biological monitoring and psychological assessments at various stages of employment.

This study assessed the burden of prehypertension and hypertension among newly recruited medical interns at Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Nigeria.

Study Design: This was a hospital-based descriptive cross-sectional study.

Study Population: The study population comprised newly recruited interns at the Rivers State University Teaching Hospital (RSUTH), Rivers State, Nigeria, between August and September 2024. It excluded those who were critically ill and/or had incomplete blood pressure readings.

Sample Size Calculation and Sampling Technique: The minimum sample size was calculated using the single population proportion formula for cross-sectional studies. The estimated prevalence of hypertension among healthcare workers from previous studies was used, with a 95% confidence level and a 5% margin of error. The calculated minimum sample size was adjusted to account for possible non-response. However, because the total number of newly recruited interns at RSUTH during the study period was relatively small, all eligible interns were approached. Consequently, 220 newly recruited interns consented and were included, representing a census of the available study population.

Although a minimum sample size of 198 was initially calculated, 220 interns were ultimately recruited from a total of 330 interns employed during the study period. A systematic sampling technique was employed, using the formula $k = N/n$, where N represents the total population of interns and n the required sample size. This yielded a sampling interval of 1.5, approximated to 2. The first participant was randomly selected as the 5th intern attending the Occupational Health, Safety and Environment (OHSE) clinic for pre-employment screening using a table of random numbers. Thereafter, every second intern presenting at the clinic was recruited until the desired sample size was achieved.

Study Tool and Measurements: Height was measured using a stadiometer to the nearest 0.1 cm, while body weight was measured using a calibrated beam balance scale to the nearest 0.1 kg. Blood pressure (BP) was measured using a mercury sphygmomanometer, widely regarded as the gold standard for BP assessment in clinical practice. BP measurement followed a standardized protocol. Participants were instructed to abstain from caffeine, alcohol, and tobacco use for at least 30 minutes before assessment. On arrival, each participant rested in a seated position for approximately five minutes before measurements were taken. BP was then measured using an appropriately sized cuff, with the participant seated and the arm supported at heart level. Two readings were taken at 4–5 minute intervals, and the average of the readings was recorded. Measurements were taken on the same arm; however, initial readings were obtained from both arms when necessary, and the arm with the higher reading was subsequently used for final measurements.

Validity and Reliability: The study instrument was a structured questionnaire that underwent pre-testing before data collection. Content validity was ensured through expert review and revision of items to improve clarity and alignment with the study objectives. The questionnaire was pre-tested among 22 participants (approximately 10% of the study population) who were excluded from the main study. Following the pre-test, ambiguous or unclear items were identified and revised appropriately before commencement of the main study.

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Internal consistency reliability was assessed using Cronbach's alpha coefficient, which yielded a value of 0.71, indicating acceptable internal consistency. Temporal stability (test–retest reliability) was assessed by administering the questionnaire to the same respondents at two different time points. Reliability was evaluated using the intraclass correlation coefficient (ICC), which demonstrated good stability of responses (ICC = 0.80; 95% confidence interval: 0.76–0.84). These findings indicate that the instrument was both consistent and stable for use in the study population.

Data Analysis: Data were entered and analysed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize the data and were presented as frequencies and percentages. Inferential statistics were performed using the chi-square test to assess associations between independent variables and hypertension. Where expected cell counts were less than five, Fisher's exact test was applied. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to determine the strength of associations, and a p-value of <0.05 was considered statistically significant.

RESULTS

The majority of the participants were 19-28 years of age (n=179, 81.4%), with a mean and standard deviation of 25.64.2±4.70. The results showed that 199 (90.5%) participants were single, 218 (99.1%) were Christians, and all 220 (100.0%) attended tertiary education. Participants were medical officers (36.4%), laboratory scientists (30.5%), nurses (25.0%), optometrists (5.9%), and radiographers (2.3%) (Table 1).

Almost two-thirds (61.82%) of the respondents were normotensive, while the prevalence of pre-hypertension and hypertension was 29.54% and 8.64%, respectively (Figure 1).

Most participants (61.82%) were normotensive (90–119/60–79 mmHg), while 2.73% were hypotensive (<90/60 mmHg). Furthermore, 29.54% had pre-hypertension (120–139/80–89 mmHg), 8.18% had Stage 1 hypertension (140–159/90–99 mmHg), and 0.5% had Stage 2 hypertension (≥160–179/100–109 mmHg) (Figure 2).

The majority of respondents (n = 162, 73.6%) reported no chronic medical condition. Among those with chronic conditions, hypertension was the most commonly reported (n = 27, 46.6%), followed by diabetes (n = 24, 41.4%), glaucoma (n = 5, 20.0%), and arthritis and asthma (n = 1, 1.7% each). Furthermore, 57 (25.9%) participants reported a family history of hereditary illnesses, with cancer being the most frequently reported condition (n = 11, 19.3%), while prostate cancer was reported by 4 (1.4%) respondents (Table 2).

Among alcohol users (n = 46), 87.0% reported consuming one bottle per day. Only 0.5% of respondents reported steroid use, including agents such as prednisolone, hydrocortisone, anabolic steroids (methyltestosterone), and danazol. The majority of participants (n = 189, 85.9%) engaged in physical activity, with more than 45.0% reporting brisk walking/jogging as their main form of exercise (Table 3).

The majority of participants (80.9%) had a height of >1.61 m, while 19.1% had a height of ≤1.60 m. Most respondents (91.4%) had a body weight of 50–99.9 kg, whereas 5.9% and 2.7% weighed ≥100 kg and <49.9 kg, respectively. Regarding BMI, 43.2% had normal weight (18.5–24.9 kg/m^2), 32.3% were overweight, 19.1% were obese, and 5.5% were underweight (Table 4).

The association between selected socio-demographic and lifestyle factors and hypertension showed that age, marital status, internship department, alcohol consumption, physical activity, chronic medical conditions, and BMI were not significantly associated with hypertension. However, sex was significantly associated with hypertension, with females having higher odds compared to males (OR = 3.15; 95% CI: 2.43–4.09; p = 0.001). Family history of illness was also significantly associated with hypertension, with participants with a family history having lower odds of hypertension compared to those without (OR = 0.56; 95% CI: 0.294–0.999; p = 0.048). Overall, only sex and family history of illness were significantly associated with hypertension in the bivariate analysis (Table 5).

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Table 1: Socio-demographic characteristics of medical interns in Rivers State.

Variables	Frequency (n=220)	Percentage (%)
Age (Years)		
19-28	179	81.4
29-38	35	15.9
≥39	6	2.7
Mean ± SD = 25.64±4.70 years		
Sex		
Male	97	44.1
Female	123	55.9
Marital Status		
Single	199	90.5
Married	17	7.7
Cohabiting	3	1.4
Separated	1	0.5
Religion		
Christianity	218	99.1
Islam	2	0.9
Highest level of education		
Tertiary	220	100.0
Occupation (job description)		
Medical officer	80	36.4
Medical Laboratory Science	67	30.5
Nurse	55	25.0
Optometrist	13	5.9
Radiography	5	2.3

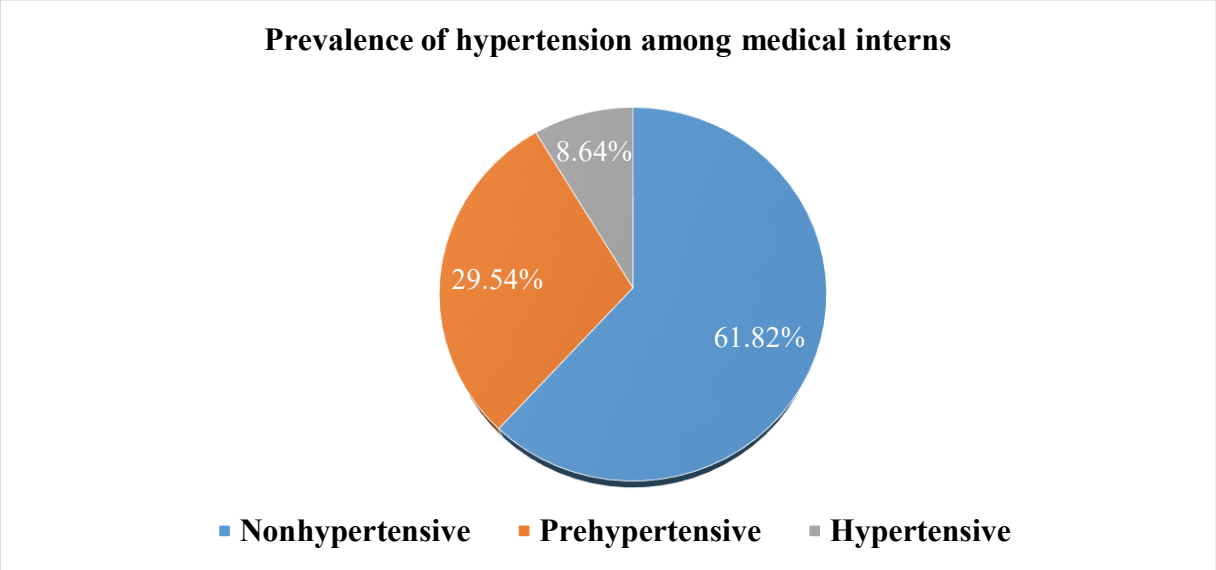


Fig 1: Prevalence of hypertension among medical interns in RSUTH

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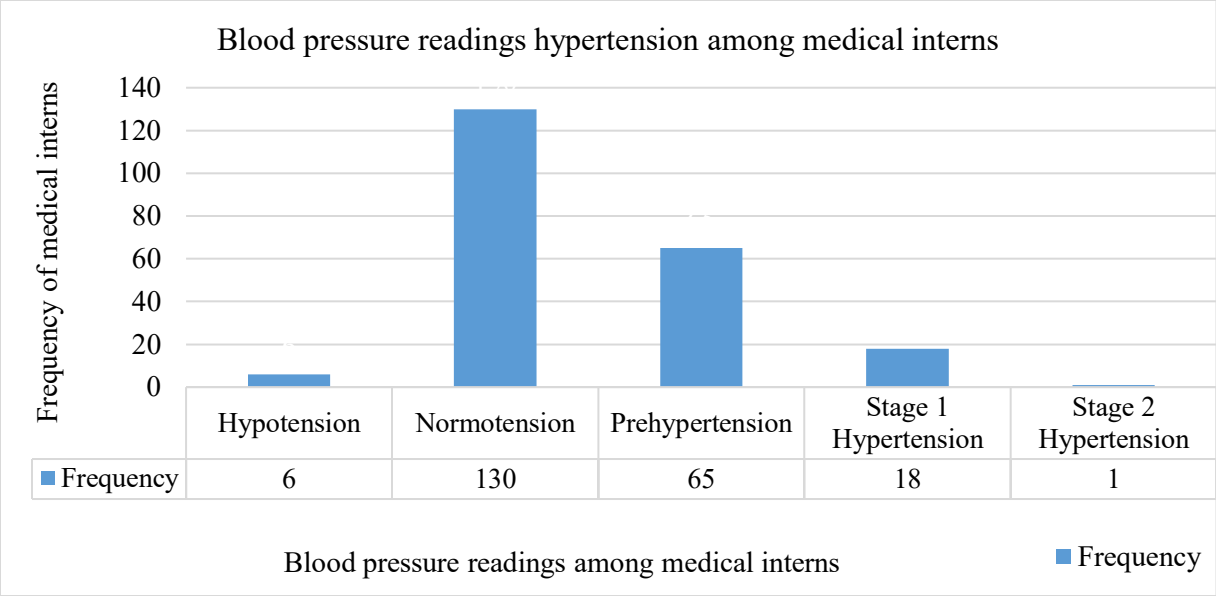


Fig 2: Blood pressure readings among medical interns in RSUTH

Table 2: Family and medical history of medical interns in RSUTH

Variables	Frequency	Percentage (%)
Chronic medical condition (n=220)		
Yes	58	26.4
No	162	73.6
Type of chronic medical condition in the family (n=58)		
Hypertension	27	46.6
Diabetes	24	41.4
Glaucoma	5	8.6
Arthritis	1	1.7
Asthma	1	1.7
Family medical condition or hereditary illness (n=220)		
Yes	57	25.9
No	163	74.1
Family history of cancer (n=57)		
Yes	11	19.3
No	46	80.7
Type of cancer (n=11)		
Prostate Cancer	4	36.4
Breast Cancer	3	27.3
Colorectal Cancer	2	18.2
Burkitt Lymphoma	1	9.1
Cervical Cancer	1	9.1

Table 3: Lifestyle history of medical interns in RSUTH

Variables	Frequency	Percentage (%)
Alcohol consumption (n=220)		
Yes	46	20.9
No	174	79.1
Quantity of alcohol (n=46)		
1 bottle/day	40	87.0

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2 bottles/day	6	13.0
Tobacco consumption (n=220)		
No	220	100.0
Use of steroids (prednisolone, hydrocortisone, etc.) (n=220)		
Yes	1	0.5
No	219	99.5
Physical activity (n=220)		
Yes	189	85.9
No	31	14.1
Type of physical activity (n=189)		
Brisk walk/jogging	99	45.0
Dancing/swimming	47	21.4
Games	36	16.4
Biking	7	3.2

Table 4: Anthropometric measurements of medical interns in RSUTH

Variable	Frequency (n=220)	Percentage (%)
Height (m)		
≤1.60	42	19.1
>1.60	178	80.9
Weight (kg)		
<49.9	6	2.7
50-99.9	201	91.4
≥100	13	5.9
BMI (kg/m²)		
<18.5 (Underweight)	12	5.5
18.5-24.9 (Healthy weight)	95	43.2
25-29.9 (Overweight)	71	32.3
≥30 (Obese)	42	19.1

Table 5: Association between risk factors and prevalence of hypertension among medical interns

Variables (n = 220)	Non-hypertensive n (%)	Hypertensive n (%)	χ^2 (p-value)	OR (95% CI)
Age (years)				
≤26 years	88 (64.2)	49 (35.8)	0.343 (0.898)	1.31 (0.749–2.289)
≥27 years	48 (57.8)	35 (42.2)		
Sex				
Male	35 (36.1)	62 (63.9)	107.1 (0.001)*	3.15 (2.43–4.09)
Female	39 (31.7)	84 (68.3)		
Marital status				
Single	122 (61.2)	77 (38.7)	0.231 (0.631)	0.792 (0.306–2.051)
Married	14 (66.7)	7 (33.3)		
Intern's department				
Medical officer	45 (56.3)	35 (43.8)	4.493 (0.343)	0.69 (0.40–1.20)
Nurse	39 (70.9)	16 (29.1)		
Medical Laboratory Science	43 (64.2)	24 (35.8)		
Radiology	2 (40.0)	3 (60.0)		
Optometrist	7 (53.8)	6 (46.2)		
Alcohol consumption				
Yes	27 (58.7)	19 (41.3)	0.240 (0.624)	0.83 (0.437–1.644)
No	109 (62.6)	65 (37.4)		
Physical activity				

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Yes	119 (63.0)	70 (37.0)	0.745 (0.388)	1.40 (0.650–3.013)
No	17 (54.8)	14 (45.2)		
Chronic medical condition				
No	36 (62.1)	22 (37.9)	0.002 (0.963)	1.015 (0.547–1.882)
Yes	100 (61.7)	62 (38.3)		
Family history of illness				
Yes	29 (50.9)	28 (49.1)	3.902 (0.048)*	0.56 (0.294–0.999)
No	107 (65.6)	56 (34.4)		
BMI				
Healthy weight	69 (64.5)	38 (35.5)	0.628 (0.428)	1.247 (0.722–2.151)
Obese	67 (59.3)	46 (40.7)		

**Significance, Fisher's exact*

DISCUSSION

The present study revealed a relatively high prevalence of hypertension (8.64%) and prehypertension (29.54%) among respondents. These rates were higher than those reported in earlier studies conducted in Nigeria, which documented lower hypertension prevalence rates of 5% and 2.5% among their respective study populations. Similarly, studies conducted in Palestine[29] and Tanzania[30] reported findings comparable to those observed in the present study. These variations may be attributable, in part, to differences in study populations, as the present study focused on healthcare interns who are likely to experience higher levels of occupational stress and work-related demands.

In contrast, systematic reviews by Nwankwo et al[31] and Adeloye et al[32] reported higher pooled prevalences of hypertension of 34.2% and 30.6%, respectively, with the latter also reporting a prehypertension prevalence of 30.9%.[32] Similarly, studies conducted in Nigeria have documented higher prevalence rates of 19.93%,[33] 29.3%,[34] and 33.4%,[35] as well as prehypertension rates of 42.5%,[34] 48.7%.[33] Also, a study conducted in Uganda reported a prevalence of 27.3%,[36] while a systematic review estimated prevalence rates ranging from 13% to 40% among healthcare workers.[26] These findings suggest that hypertension is relatively common among healthcare professionals, likely driven by occupational stress, high workload demands, and lifestyle-related factors such as irregular dietary patterns and reduced physical activity.

The present study demonstrated a statistically significant association between family history of hypertension and its prevalence ($p = 0.048$; OR = 0.56), indicating that respondents with a positive family history were more likely to have hypertension than those without. In contrast, no significant associations were observed between hypertension and age, marital status, alcohol consumption, physical activity, body mass index (BMI), or the presence of chronic medical conditions.

This finding is consistent with a study conducted in the occupational health and safety unit of a university hospital in Turkey, which reported significant associations between hypertension and male gender, increasing age, and body mass index (BMI).[37] Family history was also identified as an important predictor of hypertension. Similarly, a cross-sectional study in Thailand demonstrated an increased risk of hypertension with advancing age and higher BMI.[38] Furthermore, a study among healthcare workers in Najran, Saudi Arabia, reported significant associations between hypertension and factors such as BMI, physical inactivity, smoking, and sleep duration.[27]

The consistency between the findings of the present study and previous research underscores the role of genetic and hereditary factors in the development of hypertension across diverse populations. Conversely, differences in lifestyle-related factors such as physical activity and alcohol consumption may reflect variations in socio-demographic characteristics, occupational demands, and stress exposure between healthcare interns and other studied populations.

Study Limitations

1. The cross-sectional nature of the study, since it was not a cause-and-effect study
2. The study was conducted in a single centre instead of multiple centres

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3. The presence of information or self-reported bias
4. Confounding variables such as sleep, salt intake, and stress scores were not measured

CONCLUSION

This study found that the interns were predominantly young, educated adults who were mostly single and Christian, with a tertiary education. The highest proportion was medical officers. The prevalence of hypertension (8.64%) and prehypertension (29.54%) was relatively high. A positive family history of hypertension was significantly associated with hypertension. A considerable proportion of participants also reported a family history of illnesses, including hereditary cancers. However, factors such as younger age, substance use, higher BMI, diabetes, and physical activity were not significantly associated with hypertension.

Recommendations

Healthcare providers should prioritize family-based health education programmes to increase awareness of the hereditary risk of hypertension and encourage regular blood pressure monitoring, particularly among individuals with a family history of the condition. Furthermore, institutional health promotion should be strengthened. The management of the Rivers State University Teaching Hospital should implement routine health promotion activities during medical training, including internship placements. These activities should include regular blood pressure screening, dietary counselling, and the dissemination of information on the risk factors and prevention strategies for hypertension.

Declarations

Ethics approval and consent to participate:
Consent for publication:
Availability of data and materials:
Authors' contributions:
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Reporting guideline:

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