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A Regional Study on Hypertension Prevalence in College Girls: Evidence from Kohat District, KP Pakistan

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Abstract

Hypertension is a growing public health challenge worldwide and remains one of the leading modifiable risk factors for cardiovascular morbidity and mortality. While traditionally considered a condition of older age, it is increasingly being diagnosed in younger populations—driven largely by modifiable lifestyle factors. In Pakistan, rapid urbanization, psychosocial stress, unhealthy diets, and sedentary behavior are contributing to rising blood pressure levels, particularly among young women. A cross-sectional study was carried out involving 300 female students aged 17 to 22 years, enrolled at Government Girls Postgraduate College, Kohat, and Government Girls Degree College No. 3, Kohat. Blood pressure was recorded using a standard mercury sphygmomanometer (Yamasu Model YS-600). Lifestyle variables including dietary habits, physical activity, sleep patterns, and stress levels—as well as family history and symptom profiles—were assessed through a pre-validated structured questionnaire. Out of the 300 participants, 32.4% exhibited normotensive readings, 58.7% fell within the prehypertensive range, and 9.0% were classified as hypertensive. Urban students demonstrated a higher prevalence of elevated blood pressure compared to their rural counterparts (prehypertension: 39.7%; hypertension: 6.7%). The highest number of hypertensive cases was observed among 22-year-old students (2.0%). Students belonging to middle socioeconomic backgrounds showed the greatest prevalence of prehypertension (51.3%) and hypertension (8.3%). Factors such as chronic stress, physical inactivity, poor sleep hygiene, and excessive consumption of salty foods were more frequently reported in individuals with raised blood pressure. Headache was identified as the most common symptom, reported by 46.6% of those affected. A significant proportion of the young female cohort demonstrated elevated blood pressure levels, with nearly 59% being prehypertensive and 9% hypertensive. These findings underscore an urgent need for early screening, preventive education, and targeted lifestyle interventions to mitigate long-term cardiovascular risks in this vulnerable demographic.

INTRODUCTION

Hypertension, commonly referred to as high blood pressure (BP), is clinically defined as a sustained systolic BP ⩾140 mmHg and/or a diastolic BP ⩾90 mmHg, or the use of antihypertensive medication (Hafsa et al., 2018). The concept of elevated blood pressure is not new; historical references to its manifestations can be traced back to 2600 BC in the Chinese medical text *The Yellow Emperor's Classic of Internal Medicine*, where an excessive intake of salt was already linked to a "hard pulse"—an early recognition of vascular resistance. Ancient interventions such as acupuncture, bloodletting, and leech therapy reflect the earliest documented efforts to address what we now recognize as hypertension (Bakris & Weber, 2024). Often described as a "silent killer," hypertension is typically asymptomatic in its early stages and may remain undetected until it manifests as a serious cardiovascular event such as a stroke, myocardial infarction, or kidney failure. Although the majority of individuals with elevated BP are asymptomatic, some may experience non-specific symptoms including headaches, dizziness, visual disturbances, or occasional syncope (Singh et al., 2017).

Hypertension is broadly categorized into two forms: primary (essential) and secondary hypertension. The primary form accounts for more than 90% of cases and is multifactorial, with modifiable lifestyle elements such as poor dietary habits, physical inactivity, and obesity playing key roles in its development. The secondary form, seen in roughly 10% of patients, has identifiable causes including renal diseases, endocrine disorders, or medication and substance use (Carey et al., 2019). Among these, primary aldosteronism and renovascular diseases are the most common underlying contributors to secondary hypertension. Traditionally, a BP threshold of 140/90 mmHg has been used to define hypertension. However, contemporary evidence indicates that cardiovascular

risk increases linearly with BP values above 115/75 mmHg. For every 20 mmHg rise in systolic BP or 10 mmHg rise in diastolic BP beyond this point, the risk of cardiovascular complications doubles. Consequently, the term prehypertension is now used to describe systolic BP between 120–139 mmHg or diastolic BP between 80–89 mmHg, highlighting the importance of early lifestyle interventions (Bonita Falkner, 2009).

Globally, approximately 25% of the adult population is affected by hypertension, a figure projected to rise to 29% by 2025. Alarmingly, cardiovascular complications related to hypertension often emerge at younger ages in developing countries, accounting for nearly 70% of hypertension-related mortality (Anwer & Malik, 2024). A comprehensive analysis involving data from 90 countries found a hypertension prevalence of 31.5% in low- and middle-income countries (LMICs), compared to 28.5% in high-income nations. In Pakistan, the National Health Survey reported a prevalence of 18.9% in individuals over 15 years of age, with higher rates observed in urban areas and among men. Notably, recent studies also indicate a disproportionately high burden of elevated BP among South Asian children, though the exact cause remains poorly understood (Elahi et al., 2023).

Over recent decades, hypertension has emerged as a significant public health concern not only in older populations but also among young adults (18–24 years) and middle-aged individuals (25–44 years) worldwide (Meher et al., 2023). In 2010, about 31.1% of the global adult population—an estimated 1.39 billion individuals—were living with hypertension, with lifestyle factors such as high sodium and low potassium intake, poor diet, physical inactivity, and increasing life expectancy driving the prevalence upward (Mills et al., 2020). Today, approximately 1.13 billion people globally are hypertensive, with two-thirds residing in LMICs (Ali & Feroz, 2020). In Pakistan,

urbanization has been associated with dietary and lifestyle shifts—characterized by increased intake of salt, saturated fats, and calories, and decreased consumption of fruits and vegetables—which likely contribute to the higher prevalence of hypertension in urban compared to rural populations (Shah et al., 2018). Furthermore, ethnicity and age are significant risk factors; BP generally rises with age in both men and women. Other modifiable risk factors include obesity, alcohol intake, sedentary behavior, and diets high in sodium and low in potassium (Mills et al., 2020). Obesity, in particular, is a key driver of hypertension, although the underlying pathophysiological mechanisms remain incompletely understood (Ekim Seven, 2015). In Pakistan, additional contributors include low body mass index (BMI), nutritional deficiencies, genetic susceptibility, gender disparities, and social norms that discourage physical activity—especially among women (Javeed et al., 2024).

Hypertension is not only a leading risk factor for cardiovascular diseases such as coronary artery disease and stroke, but it also significantly contributes to chronic kidney disease and other non-communicable diseases globally (Elahi et al., 2023). In LMICs, 47% of CVD-related deaths and 44% of CVD-related disease burden are directly attributable to elevated BP (Ali & Feroz, 2020). The history of blood pressure measurement dates back to 1733 when Reverend Stephen Hales first measured intra-arterial pressure in a horse. A century later, non-invasive BP measurement devices—sphygmographs and eventually sphygmomanometers—became integral tools in clinical diagnostics (Theodore, 2011). While pharmacological therapy plays a central role in BP control and the prevention of cardiovascular events, non-pharmacological interventions—particularly dietary and lifestyle modifications—are equally critical. The World Health Organization emphasizes that reducing salt intake alone can substantially lower the

incidence of hypertension, stroke, and other cardiovascular events. Indeed, elevated BP is implicated in 47% of ischemic heart disease cases and 54% of stroke occurrences globally (Riaz et al., 2021). The salt-BP relationship was first postulated by Ambard and Beaujard in 1904, laying the groundwork for dietary interventions (Sung Kyu Ha, 2014).

Early and comprehensive clinical evaluation of hypertensive individuals—especially younger patients—should include assessment of family history, diet, physical activity levels, comorbidities, and medication or substance use. Such holistic evaluations are vital for guiding both pharmacologic and non-pharmacologic treatment strategies (Battistoni et al., 2015).

MATERIALS AND METHODS

STUDY SETTING

This study was carried out in Kohat, a significant district located in the Khyber Pakhtunkhwa province of Pakistan. The region encompasses a mix of urban and semi-urban populations, making it an appropriate setting for investigating public health issues such as hypertension, which are influenced by lifestyle and environmental factors. Two prominent government educational institutions—Government Girls Postgraduate College, Kohat, and Government Girls Degree College No. 3, Kohat—were selected as study sites. These institutions were chosen due to their accessibility, administrative support, and sufficient enrollment to meet the study's sample size requirements. Importantly, both colleges represent a diverse cross-section of the local female student population and serve as key centers for women's education in the district.

STUDY DESIGN

A descriptive, cross-sectional study design was employed to determine the prevalence of hypertension and to assess its potential risk factors among young female college

students. This approach was selected to enable a snapshot of current blood pressure status and associated lifestyle variables within the defined population at a single point in time.

STUDY POPULATION AND SAMPLE SELECTION

The target population included female students between the ages of 17 and 22 years enrolled in the two aforementioned government colleges. This age group was specifically chosen as it spans late adolescence to early adulthood—a critical period when many behavioral and physiological risk factors for hypertension begin to manifest.

A total of 300 students were recruited using a convenience sampling technique. Participants were eligible for inclusion if they met the age criteria, were present during the data collection period, and provided informed verbal consent. Those unwilling to participate or absent during the survey were excluded. All ethical considerations, including participant confidentiality and voluntary participation, were upheld throughout the study.

DATA COLLECTION TOOLS AND PROCEDURES

Data were gathered using a semi-structured questionnaire designed to obtain comprehensive information across several domains. The instrument was divided into three main sections:

1. **Socio-demographic Data** – including age, socioeconomic status, residential background (urban vs. rural), and academic year.
2. **Hypertension Knowledge and Practices** – covering awareness of blood pressure, personal and family medical history (including hypertension and diabetes), and current medication use.

3. **Lifestyle and Behavioral Factors** – addressing dietary habits (especially salt intake), physical activity levels, sleep patterns, stress perception, and symptoms potentially related to elevated blood pressure, such as headaches or dizziness.

The questionnaire was administered in-person, and responses were recorded by trained data collectors to ensure consistency and minimize information bias.

BLOOD PRESSURE MEASUREMENT

Blood pressure was measured using a standard manual mercury sphygmomanometer (Yamasu Model YS-600), following guidelines set by international health authorities. Participants were instructed to rest for at least five minutes in a seated and relaxed position before the measurement. Two separate readings were taken for each individual at five-minute intervals, and the average value was used to determine their blood pressure status.

According to clinical classification, a systolic BP of ⩾140 mmHg and/or diastolic BP of ⩾90 mmHg was considered hypertensive. Values below this threshold but above 120/80 mmHg were categorized as prehypertension, while readings within the normal range were also documented.

DATA ANALYSIS

The collected data were systematically compiled and analyzed using Microsoft Excel. Descriptive statistics were used to summarize participant characteristics and frequency distributions of blood pressure categories. Relationships between BP levels and lifestyle factors were also explored to identify potential trends and associations, although no advanced inferential statistical methods were applied.

RESULTS

PARTICIPANT OVERVIEW

A total of 300 female students, aged between 17 and 22 years, were included in this study. Participants were enrolled from two institutions: *Government Girls Postgraduate College, Kohat* and *Government Girls Degree College No. 3, Kohat*. Demographic and lifestyle data were collected through structured questionnaires, while physical measurements included age, weight, and blood pressure. The students represented a mix of socioeconomic backgrounds and both urban and rural residential areas, providing a diverse sample for evaluating the prevalence of elevated blood pressure in young women.

BLOOD PRESSURE STATUS – GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT

Among the 150 students assessed at Government Girls Postgraduate College, Kohat, the majority resided in urban areas, with a smaller proportion from rural settings. In the urban group, 24.7% (n = 37) had normal blood pressure readings, 40.0% (n = 60) were found to be prehypertensive, and 8.7% (n = 13) were hypertensive. These figures indicate that nearly half of the urban participants had elevated blood pressure, with a significant portion falling within the prehypertensive category.

In contrast, the rural participants from the same institution showed a comparatively lower prevalence of elevated blood pressure. Among rural students, only 8.0% had normal blood pressure, while 16.7% were prehypertensive and 2.0% were hypertensive. Although the proportion of normotensive individuals was also lower in the rural group, the overall prevalence of both prehypertension and hypertension remained lower compared to their urban counterparts.

COMPARISON BETWEEN URBAN AND RURAL PARTICIPANTS

The findings reveal a clear disparity in blood pressure levels between urban and rural female students. Urban students exhibited higher rates of both prehypertension and hypertension, suggesting a possible link between urban living conditions and elevated blood pressure. Factors such as increased psychological stress, dietary habits high in sodium and processed foods, reduced physical activity, and a more sedentary lifestyle prevalent in urban areas may contribute to this observed trend. This highlights the need for early preventive measures and awareness programs, particularly targeting young women in urban environments, to address the growing risk of hypertension.

TABLE 1: BLOOD PRESSURE ASSESSMENT AT GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT

Area	Normal	Prehypertension	Hypertension
Urban	37 (24.7%)	60 (40.0%)	13 (8.7%)
Rural	12 (8.0%)	25 (16.7%)	3 (2.0%)

Chi square $\pi 2$, $p > 0.05$, not significant

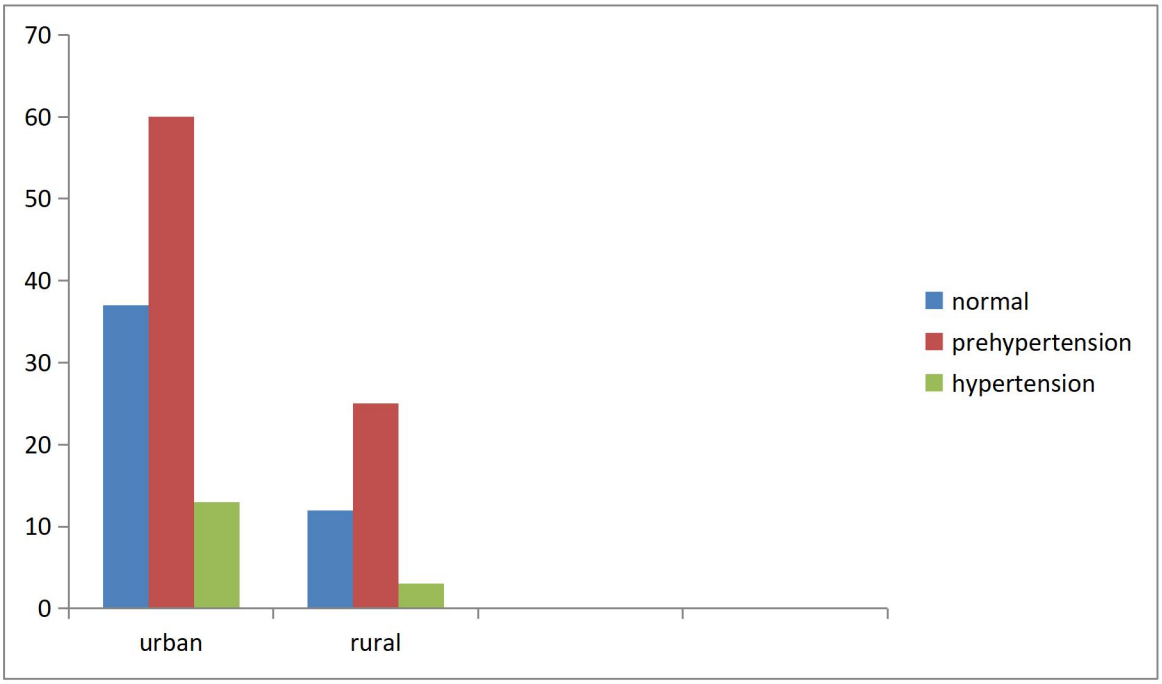

FIGURE 1: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS BELONGING TO URBAN AND RURAL AREAS AT GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT

AREA-WISE BLOOD PRESSURE MEASUREMENT (GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT)

Out of 150 participants at Government Girls Degree College No. 3 Kohat, 20.7% (n=31) had a normal blood pressure, 38.0% (n=57) were prehypertensive and 4.7% (n=7) were hypertensive and these girls belong to urban areas. While from rural areas the frequency of girls were less and the cases of prehypertension (22.7%) and hypertension (2.7%) were also less.

TABLE 2: BLOOD PRESSURE ASSESSMENT AT GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

Area	Normal	Prehypertension	Hypertension
Urban	31 (20.7%)	57 (38.0%)	7 (4.7%)
Rural	17 (11.3%)	34 (22.7%)	4 (2.7%)

Chi square $\pi 2$, $P > 0.05$, Not significant

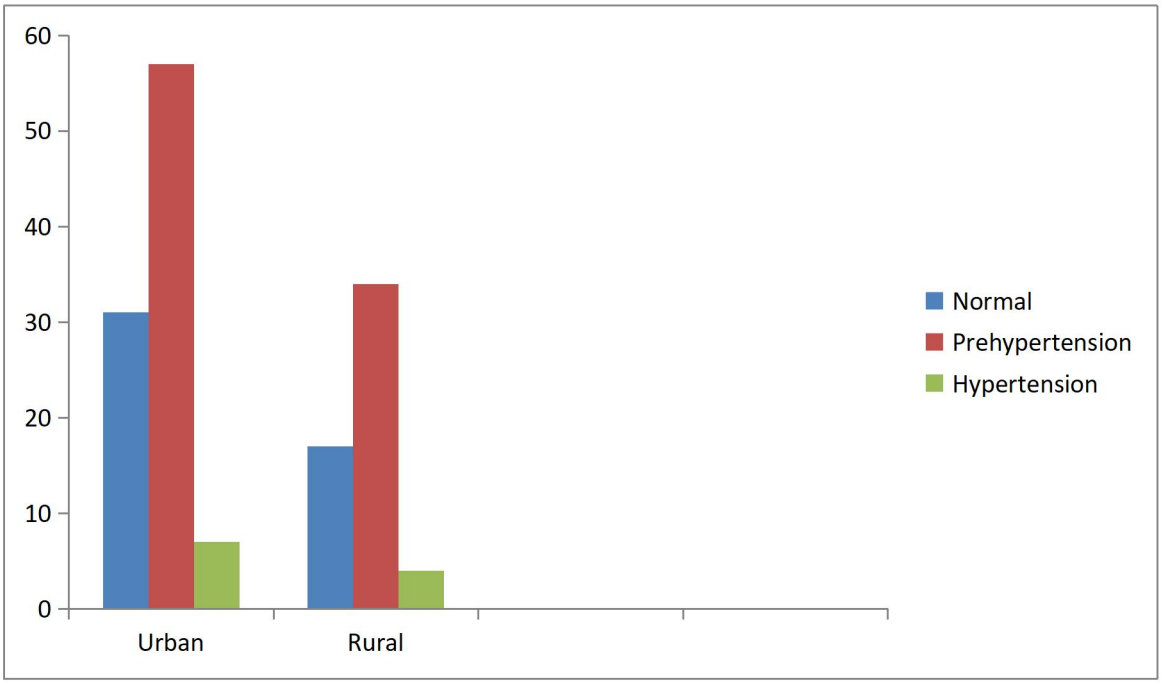

FIGURE 2: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS BELONGING TO URBAN AND RURAL AREAS AT GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

POOLED DATA OF THE TWO COLLEGES– GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT AND GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

Chi square test was applied and no significant association was found between the two colleges, therefore the data was pooled together. Out of 300 students, the girls who

were from urban area having normal blood pressure was 22.7% (n=68), 39.7% (n=117) were prehypertensive and 6.7% (n=20) were hypertensive. While those from rural area have 9.7% normal blood pressure, 19.7% prehypertensive and 2.3% hypertensive.

TABLE 3: OVERALL ASSESSMENT OF BLOOD PRESSURE AT GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT AND GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

Area	Normal	Prehypertension	Hypertension
Urban	68 (22.7%)	117 (39.7%)	20 (6.7%)
Rural	29 (9.7%)	59 (19.7%)	7 (2.3%)

Chi square $\pi 2$, P > 0.05, non significant

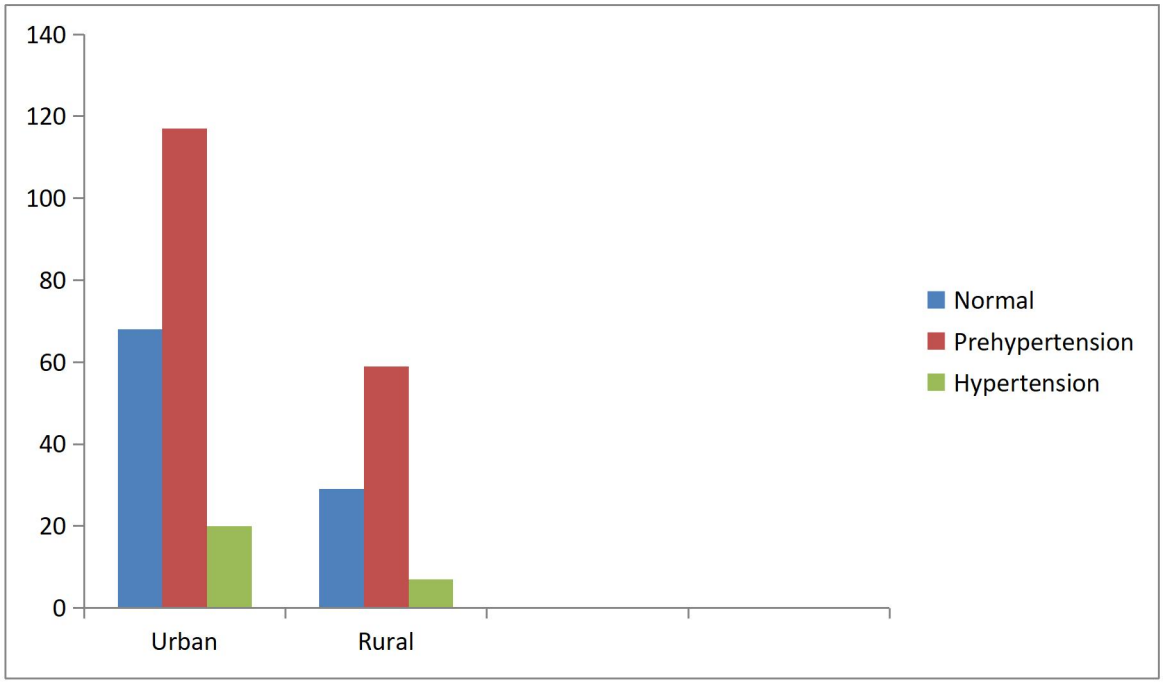

FIGURE 3: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS BELONGING TO URBAN AND RURAL AREAS

DISTRIBUTION OF THE STUDY POPULATION INTO NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE ACCORDING TO AGE (GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT)

Minimum age group in this study was 17 years and maximum age group was 22 years. Hypertension was highest among 19 year old students (2.0%). While least in 17 years (0.7%).

TABLE 4: AGE-WISE BLOOD PRESSURE DISTRIBUTION AT GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT

Age	Normal	Prehypertension	Hypertension
17	10 (6.7%)	14 (9.3%)	1 (0.7%)
18	9 (6.0%)	13 (8.7%)	2 (1.3%)
19	7 (4.7%)	15 (10.0%)	3 (2.0%)
20	6 (4.0%)	14 (9.3%)	2 (1.3%)
21	9 (6.0%)	13 (8.7%)	2 (1.3%)
22	5 (3.3%)	14 (9.3%)	2 (1.3%)

Chi square $\pi 2$, $P > 0.05$, Not significant

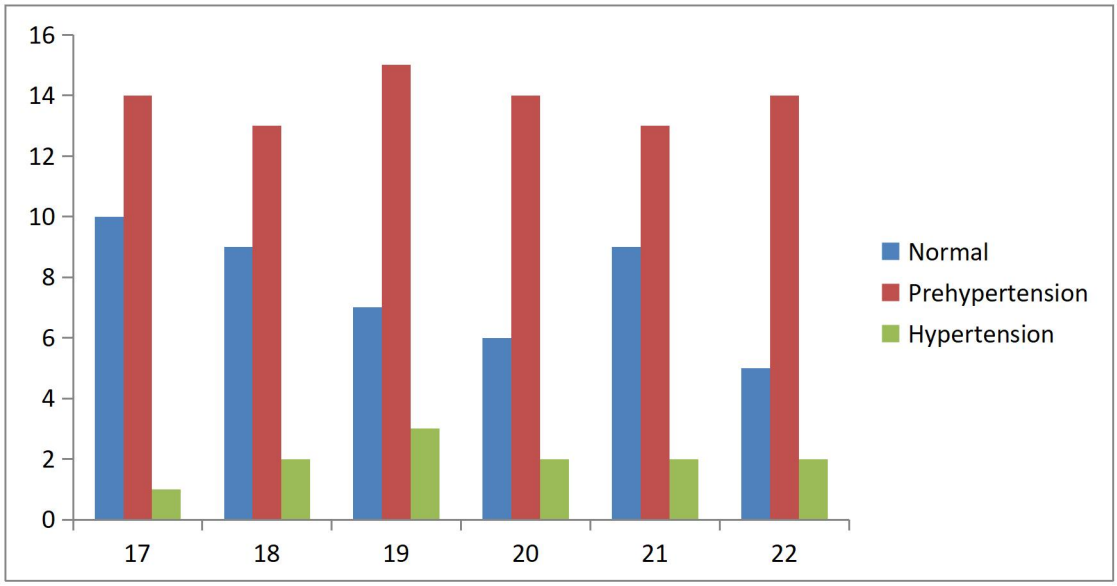

FIGURE 4: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS AMONG DIFFERENT AGE GROUPS AT GOVERNMENT GIRLS POSTGRADUATE COLLEGE, KOHAT

DISTRIBUTION OF THE STUDY POPULATION INTO NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE ACCORDING TO AGE (GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT)

The study population comprises 17-22 years students. Hypertension was most frequent among 22 year olds (2.7%) among the students of Government Girls Degree College No. 3, Kohat.

TABLE 5: AGE-WISE BLOOD PRESSURE DISTRIBUTION – GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

Age	Normal	Prehypertension	Hypertension
17	8 (5.3%)	15 (10.0%)	2 (1.3%)
18	8 (5.3%)	16 (10.7%)	2 (1.3%)

19	8 (5.3%)	15 (10.0%)	2 (1.3%)
20	8 (5.3%)	17 (11.3%)	3 (2.0%)
21	9 (6.0%)	15 (10.0%)	2 (1.3%)
22	10 (6.7%)	15 (10.0%)	4 (2.7%)

Chi square $\pi 2$, P > 0.05, Not significant

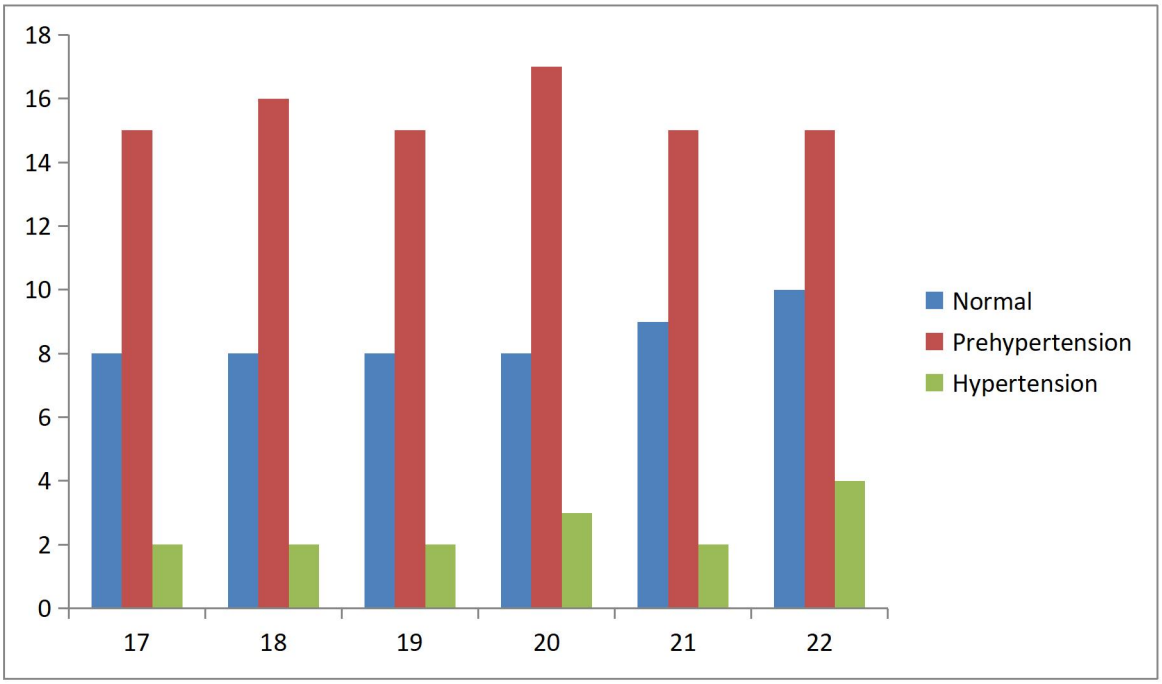

FIGURE 5: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS AMONG DIFFERENT AGE GROUPS AT GOVERNMENT GIRLS DEGREE COLLEGE NO. 3, KOHAT

OVERALL DISTRIBUTION OF THE STUDY POPULATION INTO NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE ACCORDING TO AGE

Hypertension was highest among students aged 22 years (2.0%). The chi-square test showed no significant association between age and blood pressure (p > 0.05).

TABLE 6: AGE-WISE DISTRIBUTION OF BLOOD PRESSURE AMONG THE STUDENTS OF TWO COLLEGES

Age	Normal	Prehypertension	Hypertension
17	18 (6.0%)	29 (9.7%)	3 (1.0%)
18	17 (5.7%)	29 (9.7%)	4 (1.3%)
19	15 (5.0%)	30 (10.0%)	5 (1.7%)
20	14 (4.7%)	31 (10.3%)	5 (1.7%)
21	18 (6.0%)	28 (9.3%)	4 (1.3%)
22	15 (5.0%)	29 (9.7%)	6 (2.0%)

Chi square $\pi 2$, $P > 0.05$, Not significant

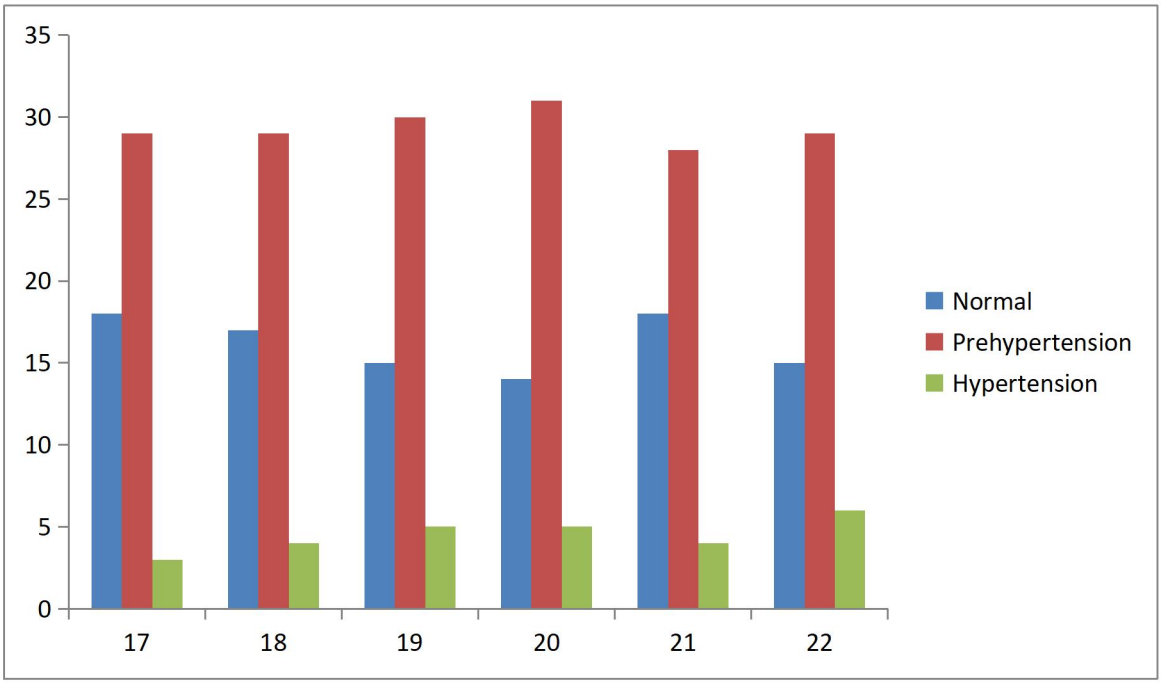

FIGURE 6: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS AMONG DIFFERENT AGE GROUPS

COMPARISON OF THE STUDY POPULATION INTO NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE ACCORDING TO SOCIOECONOMIC STATUS

Out of 300 students, 1.0% (n=3) had a normal blood pressure, 4.7% (n=14) were prehypertensive and 0.7% (n=2) were hypertensive. Chi square test was applied and a significant association was found between blood pressure and socioeconomic status. More cases of prehypertension (51.3%) and hypertension (8.3%) was observed among middle socioeconomic students.

TABLE 7: BLOOD PRESSURE AND THE SOCIOECONOMIC STATUS OF THE STUDENTS

Socioeconomic status	Normal	Prehypertension	Hypertension
Low	3 (1.0%)	14 (4.7%)	2 (0.7%)
Middle	83 (27.7%)	154 (51.3%)	25 (8.3%)
High	11 (3.7%)	8 (2.7%)	0 (0.0%)

Chi square $\pi 2$, $P < 0.05$, Significant

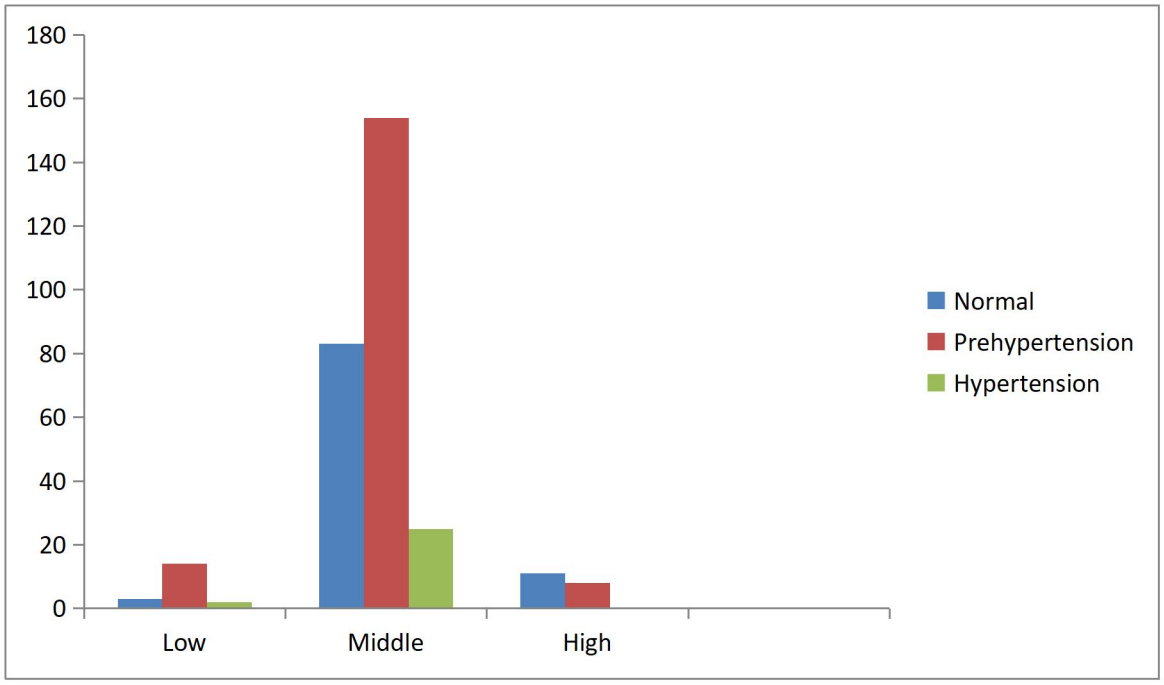

FIGURE 7: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS ACCORDING TO SOCIOECONOMIC STATUS

BLOOD PRESSURE OF THE STUDY POPULATION AND WEIGHT

Out of 300 students, the blood pressure distribution varied with weight categories. Among underweight students, 16.7% (n=50) had a normal blood pressure, 31.0% (n=93) were prehypertensive and 5.3% (n=16) were hypertensive. Among students with normal weight, 14.0% (n=42) had a normal blood pressure, 22.3% (n=67) were prehypertensive and 2.3% (n=7) were hypertensive. Among overweight students, 1.7% (n=5) had a normal blood pressure, 5.3% (n=16) were prehypertensive and 1.3% (n=4) were hypertensive. Chi square test was applied and no significant association was found between blood pressure and weight.

TABLE 8: BLOOD PRESSURE AND THE WEIGHT OF THE STUDENTS

Weight	Normal	Prehypertension	Hypertension
Underweight	50 (16.7%)	93 (31.0%)	16 (5.3%)
Normal	42 (14.0%)	67 (22.3%)	7 (2.3%)
Overweight	5 (1.7%)	16 (5.3%)	4 (1.3%)

Chi square $\pi 2$, $P > 0.05$, Not significant

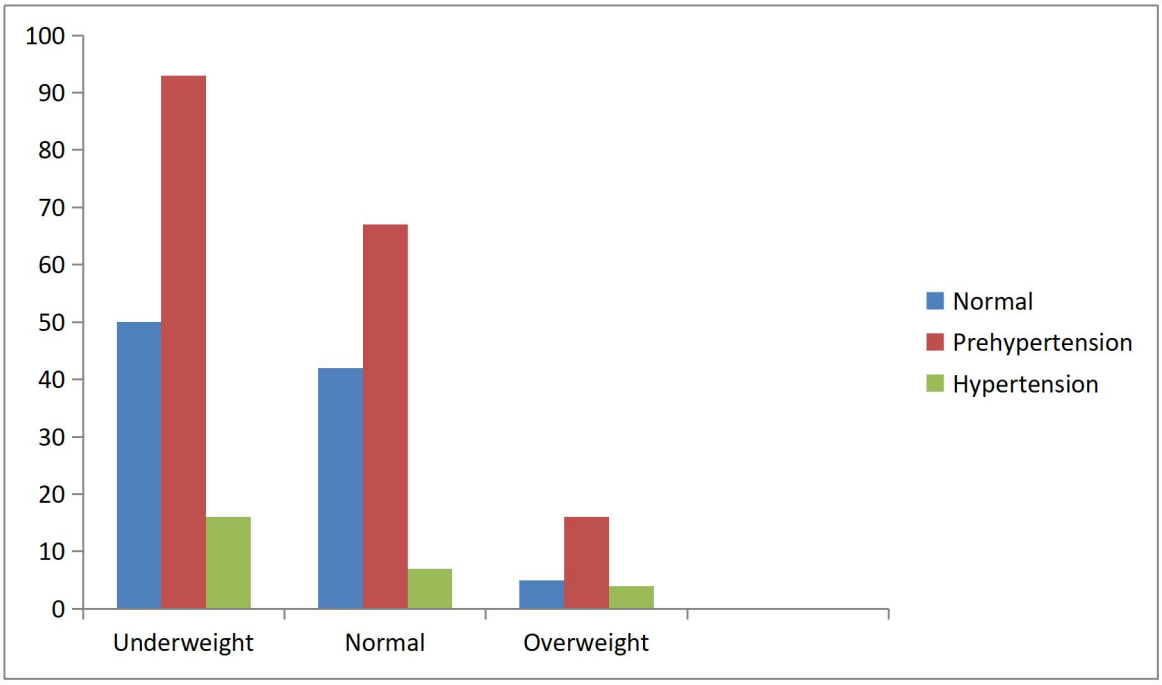

FIGURE 8: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS ACCORDING TO WEIGHT

COMPARISON OF GROUPS WITH PARENTAL HISTORY OF HYPERTENSION

Out of 300 students, having parental history of hypertension, 17.0% (n=51) had a normal blood pressure, 33.7% (n=101) were prehypertensive and 6.7% (n=20) were hypertensive.

TABLE 9: PARENTAL HISTORY OF HYPERTENSION AND BLOOD PRESSURE RECORDED AMONG STUDENTS

Parental history of Hypertension	Normal	Prehypertension	Hypertension
Yes	51 (17.0%)	101 (33.7%)	20 (6.7%)
No	46 (15.3%)	75 (25.0%)	7 (2.3%)

Chi square $\pi 2$, $P > 0.05$, Not significant

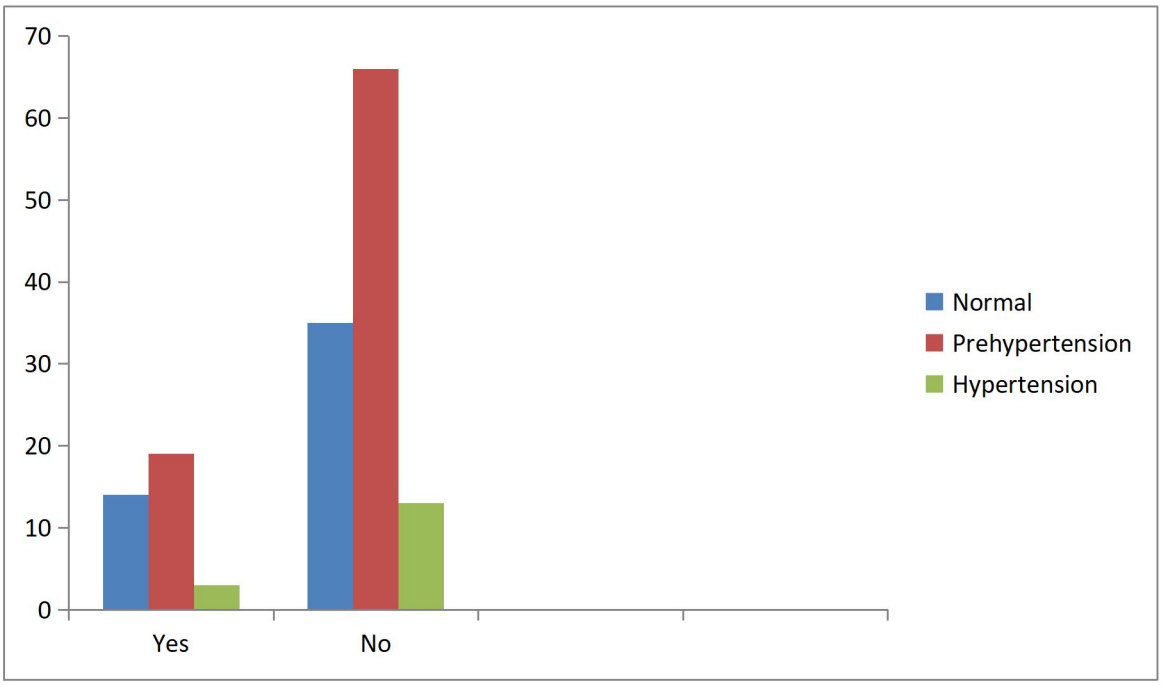

FIGURE 9: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS HAVING FAMILY HISTORY OF HYPERTENSION

COMPARISON OF GROUPS HAVING FAMILY HISTORY OF CARDIOVASCULAR DISEASES

Out of 300 students, having family history of cardiovascular diseases, 8.3% (n=25) had a normal blood pressure, 14.7% (n=44) were prehypertensive and 3.0% (n=9) were hypertensive.

TABLE 10: BLOOD PRESSURE AND THE FAMILY HISTORY OF CARDIOVASCULAR DISEASES

Family history of Cardiovascular diseases	Normal	Prehypertension	Hypertension
Yes	25 (8.3%)	44 (14.7%)	9 (3.0%)
No	72 (24.0%)	132 (44.0%)	18 (6.0%)

Chi square $\pi 2$, $P > 0.05$, Not significant

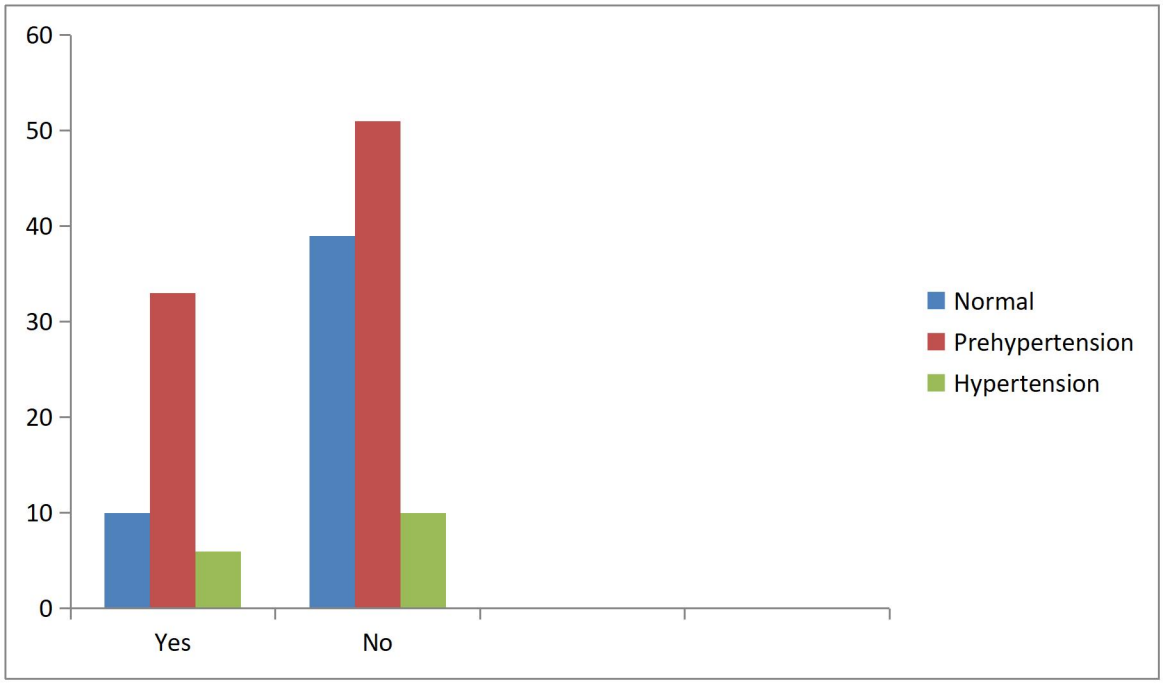

FIGURE 10: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS HAVING FAMILY HISTORY OF CARDIOVASCULAR DISEASES

BLOOD PRESSURE AND THE FREQUENT INTAKE OF SALTY FOOD

Out of 300 students, who take more salty food, 6.0% (n=18) had a normal blood pressure, 18.3% (n=55) were prehypertensive and 3.0% (n=9) were hypertensive.

TABLE 11: BLOOD PRESSURE ACCORDING TO FREQUENT INTAKE OF SALTY FOOD

Frequent intake of salty food	Normal	Prehypertension	Hypertension
Yes	18 (6.0%)	55 (18.3%)	9 (3.0%)
No	79 (26.3%)	119 (39.7%)	18 (6.0%)

Chi square $\pi 2$, $P > 0.05$, Not significant

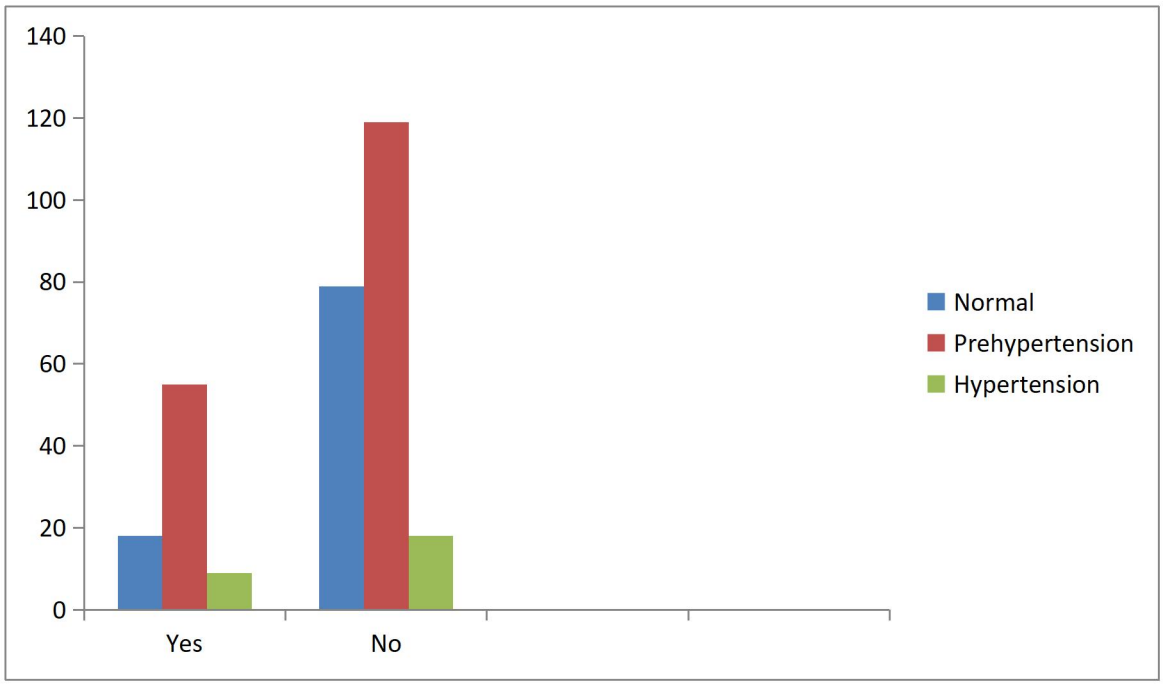

FIGURE 11: FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS HAVING CONSUMPTION OF SALTY FOOD

DIETARY INFLUENCE ON BLOOD PRESSURE

Students were divided into two categories i.e vegetarian and non-vegetarians, Among vegetarians, 13.7% (n=41) had a normal blood pressure, 23.3% (n=70) were prehypertensive and 3.0% (n=9) were hypertensive. While among non-vegetarians,

18.7% have normal blood pressure, 35.3% were prehypertensive and 6% were hypertensive.

TABLE 12: EFFECT OF DIET ON BLOOD PRESSURE

Diet	Normal	Prehypertension	Hypertension
Vegetarian	41 (13.7%)	70 (23.3%)	9 (3.0%)
Non-vegetarian	56 (18.7%)	106 (35.3%)	18 (6.0%)

Chi square $\pi 2$, $P > 0.05$, Not significant

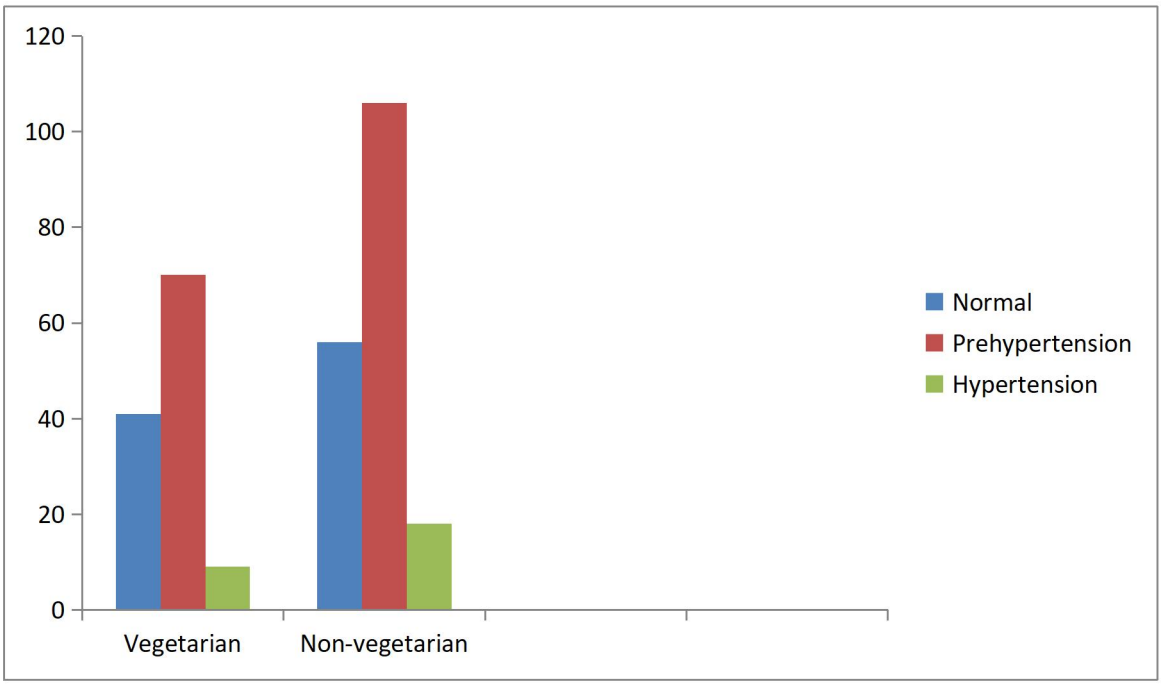

FIGURE 12: DIETARY INFLUENCE ON THE FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS

STRESS AND BLOOD PRESSURE

Out of 300 students, 20.3% (n=61) had a normal blood pressure, 38.3% (n=115) were prehypertensive and 6.0% (n=18) were hypertensive.

TABLE 13: INFLUENCE OF STRESS ON BLOOD PRESSURE

Stress/Anxiety	Normal	Prehypertension	Hypertension
Yes	61 (20.3%)	115 (38.3%)	18 (6.0%)
No	36 (12.0%)	61 (20.3%)	8 (2.7%)

Chi square $\pi 2$, $P > 0.05$, Not significant

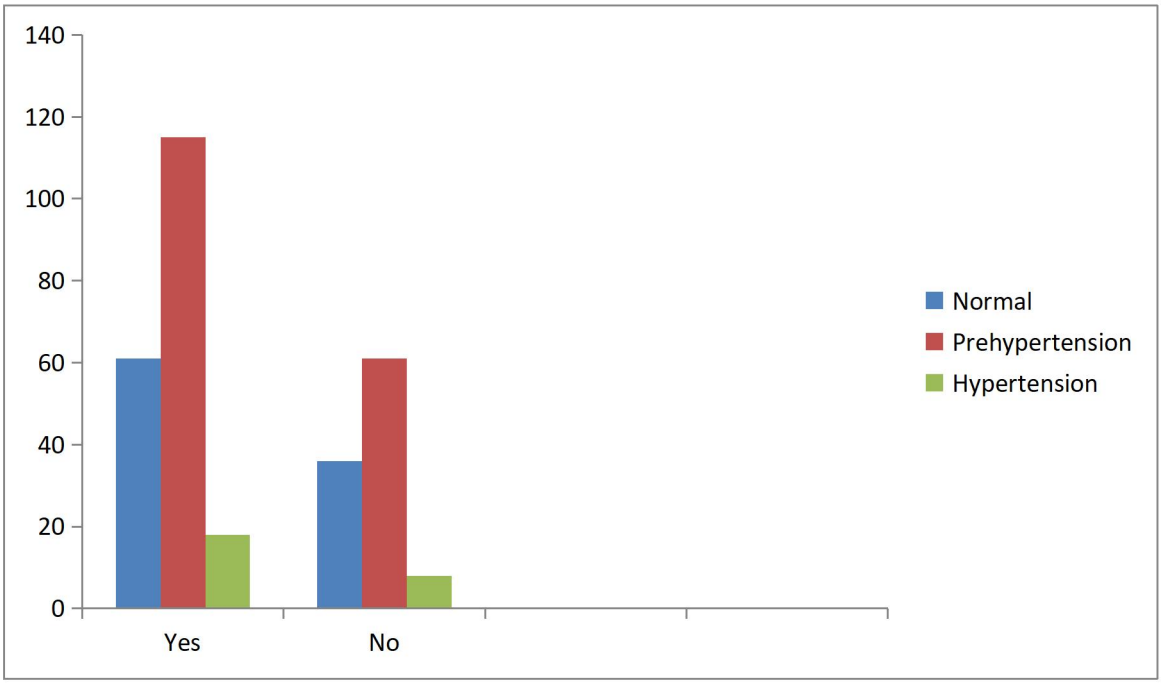

FIGURE 13: STRESS INFLUENCE THE FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS

EFFECT OF EXERCISE ON BLOOD PRESSURE

Out of 300 students, Majority of the students were not habitual of doing exercise. Among the girls who were doing exercise, 4.7% (n=14) had a normal blood pressure, 14.3% (n=43) were prehypertensive and 2.7% (n=8) were hypertensive. Chi square test was applied and non-significant association was found exercise and blood pressure.

TABLE 14: EFFECT OF EXERCISE ON BLOOD PRESSURE

Exercise	Normal	Prehypertension	Hypertension
Yes	14 (4.7%)	43 (14.3%)	8 (2.7%)
No	83 (27.7%)	133 (44.3%)	19 (6.3%)

Chi square $\pi 2$, $P > 0.05$, Not significant

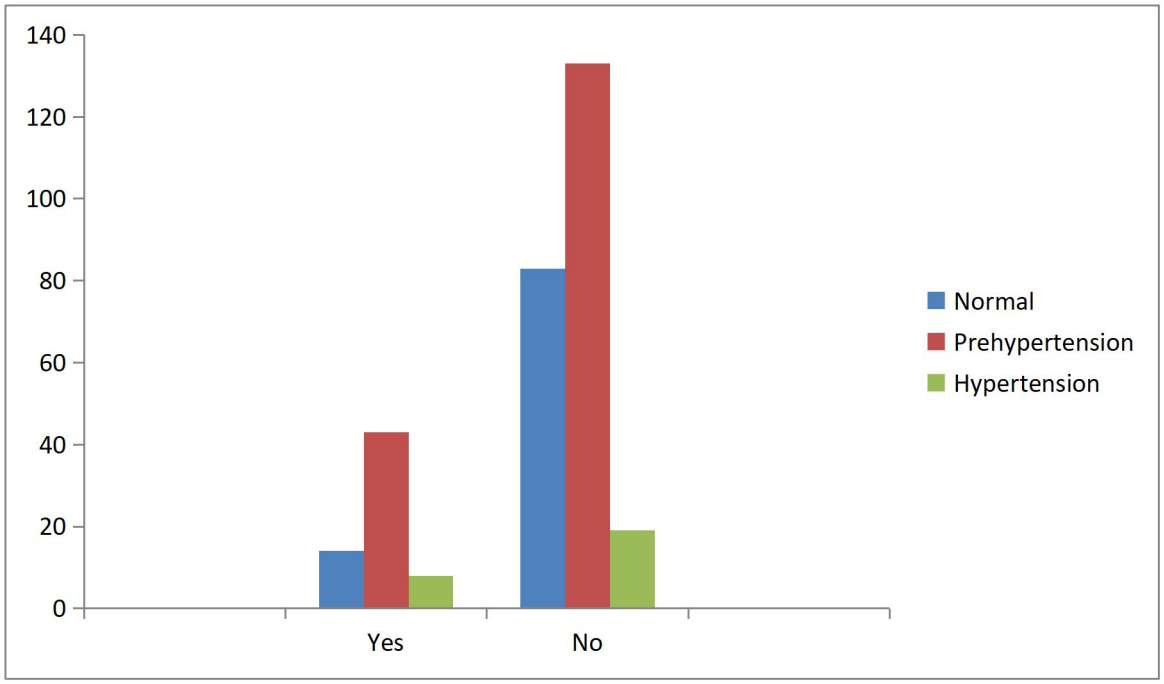

FIGURE 14: EFFECT OF EXERCISE ON THE FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS

AVERAGE SLEEP AND BLOOD PRESSURE

The girls with average sleep of 6-8 hours were more prehypertensive (31.7%). Among them; 17.7% (n=53) had a normal blood pressure and 4.3% (n=13) were hypertensive.

TABLE 15: AVERAGE SLEEP INFLUENCE ON BLOOD PRESSURE

Average sleep	Normal	Prehypertension	Hypertension
1-2 hours	0 (0.0%)	1 (0.3%)	0 (0.0%)

4-6 hours	17 (5.7%)	26 (8.7%)	2 (0.7%)
6-8 hours	53 (17.7%)	95 (31.7%)	13 (4.3%)
More than 8 hours	27 (9.0%)	54 (18.0%)	12 (4.0%)

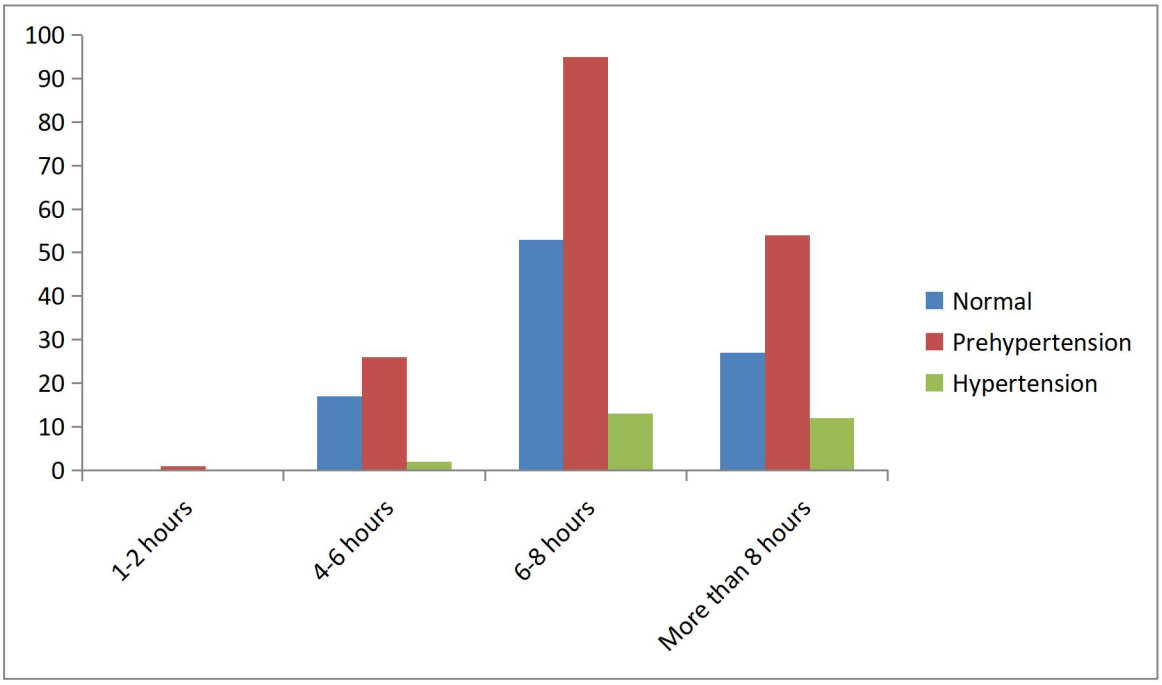

FIGURE 15: EFFECT OF AVERAGE SLEEP ON THE FREQUENCY OF NORMAL, PREHYPERTENSIVE AND HYPERTENSIVE GIRLS

SYMPTOMS

The most common symptom was headache, reported by 54% (n=81) of Degree 1 students and 39.33% (n=59) of Degree 3 students. Dizziness, fatigue, blurred vision, chest pain, and breathlessness were also noted with varying frequencies. A proportion of students, 12.66% (n=19) in Degree 1 and 12% (n=18) in Degree 3, reported no symptoms.

TABLE 16: VARIOUS SYMPTOMS OBSERVED AMONG STUDENTS

Symptoms	Headache	Dizziness	Fatigue	Blurred vision	Chest pain	Breathlessness	Asymptomatic
Degree 1	81 (54%)	13 (8.66%)	11 (7.33%)	9 (6%)	6 (4%)	3 (2%)	19 (12.66%)
Degree 3	59 (39.33%)	19 (12.66%)	20 (13.33%)	16 (10.66%)	7 (4.66%)	8 (5.33%)	18 (12%)
Percentage	46.66%	10.66%	10.33%	8.33%	4.33%	3.66%	12.33%

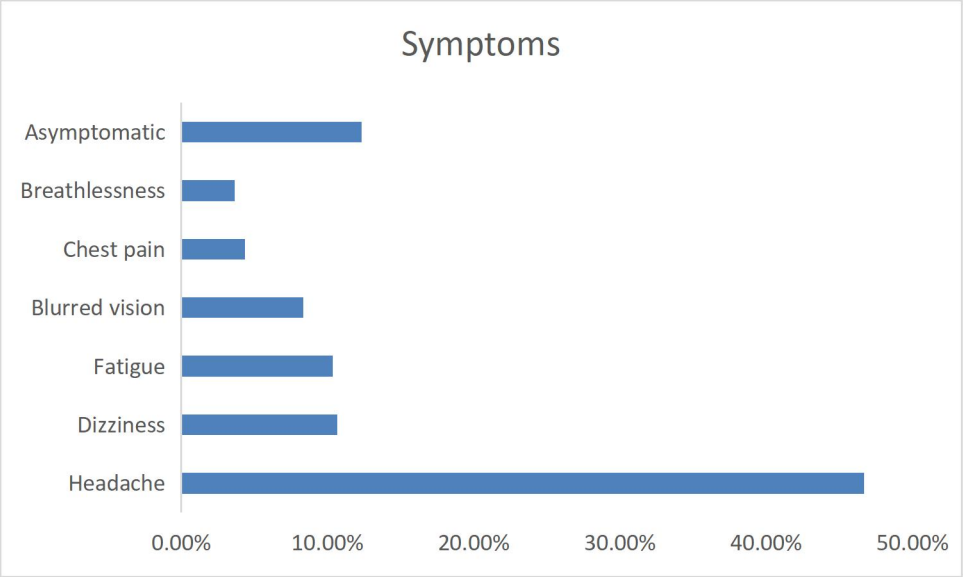

FIGURE 16: SYMPTOMS OBSERVED AMONG GIRLS HAVING PREHYPERTENSION AND HYPERTENSION

DISCUSSION

This study assessed the prevalence of prehypertension and hypertension and their associated risk factors among 300 female students from two government institutions in Kohat: *Government Girls Postgraduate College* and *Government Girls Degree College*

No. 3. The primary objective was to explore blood pressure patterns in young women and evaluate demographic, behavioral, and dietary influences that may contribute to elevated blood pressure levels in this age group.

The findings revealed that 67.7% of the participants had elevated blood pressure, with 58.7% classified as prehypertensive and 9.0% as hypertensive. The slightly higher prevalence at Government Girls Degree College No. 3 (68.0%) compared to Government Girls Postgraduate College (67.3%) indicates a widespread occurrence of abnormal blood pressure in this population. The predominance of prehypertension reflects a critical window for early intervention to prevent progression to hypertension and long-term cardiovascular complications. Urban students exhibited higher rates of both prehypertension (39.7%) and hypertension (6.7%) compared to their rural counterparts. These findings align with prior studies, such as those by Tabrizi et al. (2016) and Sani et al. (2022), which similarly reported greater hypertension prevalence in urban settings. Contributing factors may include increased consumption of processed foods, physical inactivity, and elevated psychological stress in urban environments. These lifestyle attributes collectively heighten susceptibility to cardiovascular risk. Among different age groups, students aged 22 years demonstrated the highest rates of prehypertension (9.7%) and hypertension (2.0%). This trend may reflect academic pressure, reduced physical activity, and unhealthy coping behaviors during the final academic year. Nwoke et al. (2024) and Syed et al. (2025) similarly reported elevated blood pressure in senior college students, suggesting a consistent relationship between age, academic stress, and blood pressure elevation during late adolescence and early adulthood.

Students from middle socioeconomic backgrounds exhibited the highest prevalence of elevated blood pressure, with 51.3% prehypertensive and 8.3% hypertensive. This may

be attributed to a combination of caloric excess, limited physical activity, and reliance on convenience-based diets. While our findings align with Kini et al. (2016), who reported a majority of participants from the middle class, Kar et al. (2020) found a greater prevalence of hypertension among individuals from lower socioeconomic strata. These discrepancies may reflect regional differences in dietary quality, healthcare access, and awareness of preventive health practices. Interestingly, in this study, underweight students demonstrated the highest proportion of elevated blood pressure (31.0% prehypertension, 5.3% hypertension). This observation diverges from previous reports by Majed and Sadek (2012) and Babu and Ganesh (2020), which associated overweight and obesity with increased hypertension risk. The contrasting results could be due to factors such as nutritional deficiencies, high perceived stress, or underlying metabolic imbalances in underweight individuals.

Students with a parental history of hypertension were more likely to have elevated blood pressure, with 33.7% prehypertension and 6.7% hypertension. This suggests a significant genetic and behavioral component in the development of hypertension. Similar patterns were observed in studies by Syed et al. (2025) and Kumar & Prasad (2025), both of which reported a strong association between family history and hypertension risk, highlighting the importance of early screening among genetically predisposed individuals. Conversely, students without a family history of cardiovascular disease surprisingly showed higher prevalence of elevated blood pressure (44.0% prehypertension, 6.0% hypertension) in our study. This may be due to a lack of awareness and preventive behavior in those not perceiving themselves at risk. Valerio et al. (2016) and Dhungana et al. (2016) reported stronger associations between family history and cardiovascular risk, indicating that the results of our study may be influenced

by sociocultural or behavioral differences in health management. Students consuming a non-vegetarian diet demonstrated a higher prevalence of elevated blood pressure (35.3% prehypertension, 6.0% hypertension). This finding is consistent with Arya et al. (2015) and Alrabadi (2012), both of whom reported higher blood pressure among individuals with mixed or non-vegetarian dietary patterns. The association may be linked to increased intake of saturated fats and cholesterol in animal-based diets.

Similarly, frequent salt consumption was associated with 18.3% prehypertension and 3.0% hypertension among students. High sodium intake is a well-established risk factor for elevated blood pressure, as supported by findings from Kini et al. (2016) and Haghighatdoost et al. (2012), both of whom observed significantly higher salt intake in prehypertensive individuals compared to normotensive counterparts. A clear association was observed between **stress** and elevated blood pressure, with stressed students exhibiting 38.3% prehypertension and 6.0% hypertension. This supports the widely recognized role of stress as a modifiable risk factor in hypertension pathogenesis. Kumar and Prasad (2025) and Chadha et al. (2023) similarly reported that students experiencing psychological stress had higher rates of prehypertension and hypertension, reinforcing the need for mental health interventions in academic settings.

Lack of physical activity was another prominent risk factor, with 44.3% of inactive students prehypertensive and 6.3% hypertensive. These results are in agreement with Bansal et al. (2024) and Dimitrijev et al. (2024), who observed that low physical activity levels were common among individuals with elevated blood pressure. Promoting physical exercise among students could play a pivotal role in mitigating the early onset of hypertension. Students who reported sleeping 6 to 8 hours per night exhibited the highest prevalence of elevated blood pressure (31.7% prehypertension, 4.3%

hypertension). Although these findings suggest a potential relationship between sleep patterns and blood pressure regulation, other studies have found that both shorter and longer sleep durations contribute to hypertension risk. For instance, Syed et al. (2025) and Yang et al. (2025) found that insufficient (<6 hours) or excessive (⩾9 hours) sleep was associated with abnormal blood pressure, suggesting the need for more nuanced sleep-quality assessments in future research. Among symptomatic participants, headache was the most frequently reported complaint (46.66%), followed by dizziness (10.66%), fatigue (10.33%), blurred vision (8.33%), chest pain (4.33%), and breathlessness (3.66%). Approximately 12.33% of the students were asymptomatic despite elevated blood pressure. These results are comparable with those of Kidwai et al. (2024) and Kowalski et al. (2023), who also found headache and fatigue as dominant symptoms in hypertensive individuals. The presence of asymptomatic cases further emphasizes the importance of routine blood pressure screening in young adults.

CONCLUSION

The present study assessed the blood pressure status among 300 female students from Government Girls Postgraduate College, Kohat and Government Girls Degree College No. 3, Kohat. The findings revealed that only 32.4% of the participants had normal blood pressure, while a considerable proportion, 58.7% were prehypertensive and 9.0% were hypertensive, which indicates an early onset of elevated blood pressure in this age group. Although no statistically significant associations were found between blood pressure and most variables such as age, weight, diet, and family history, a significant link was observed with socioeconomic status. Students from middle-income families showed the highest proportion of prehypertension (51.3%) and hypertension (8.3%).

Urban students had a higher prevalence of elevated blood pressure compared to rural students. Additionally, stress, lack of exercise, and irregular sleep patterns were common among those with abnormal blood pressure, though these associations were not statistically significant. These results highlight the growing risk of hypertension even in young female populations and underscore the importance of early awareness, lifestyle modification, and preventive health practices to reduce future cardiovascular risk.

REFERENCES

Ali, N & Feroz, A. (2020). "Prevalence of hypertension and its risk factors among cotton textile workers in low- and middle-income countries: a protocol for a systematic review". *Syst. Rev.*, **9** (1): 1–5.

Anwer, F & Malik, A. (2024). "Hypertension research in Pakistan: a scientometric analysis of two decades (2003–2022)". *Cureus*, **16** (5): 1–11.

Arya, M., et al. (2015). "Correlation of Dietary Habits, Physical Activity and Hypertension in Administrative Officers in Western Uttar Pradesh". *J. Evol. Med. Dent. Sci.*, **4** (66): 11493–11499.

Babu, D & Ganesh, N. (2020). "Prevalence and Risk Factors of Hypertension and Prehypertension among Young Adults". *Int. J. Contemp. Med. Surg. Radiol.*, **5** (3): C89–C92.

Bakris, G & Weber, M. (2024). "Overview of the evolution of hypertension: from ancient Chinese emperors to today". *Hypertension*, **81** (4): 717–726.

Bansal, S., et al. (2020). "Hypertension in Young Asymptomatic University Students: Impact of Parental History, Physical Inactivity, and Diet". *Cureus*, **12** (9): 1–9.

Bashir, U., et al. (2024). "A review on pathophysiological factor of hypertension in Pakistan, its regulation and management". *Palliat. Med. Care*, **5** (2): 32–44.

Battistoni, A. et al., (2015). "Hypertension in young people: epidemiology, diagnostic assessment and therapeutic approach". *High Blood Press. Cardiovasc. Prev.*, **22** (4): 381–388.

Bonita Falkner. (2010). "Hypertension in children and adolescents: epidemiology and natural history". *Pediatr Nephrol*, **25** (7): 1219–1224.

Carey, R., et al. (2018). "Prevention and control of hypertension: targeted vs population- based strategies". *J. Am. Coll. Cardiol.*, **72** (11): 1278–1293.

Chadha, V., et al. (2023). "Prevalence of prehypertension, hypertension, stress, anxiety among undergraduate medical students, and its association with cognitive failure: A cross- sectional study". *Asian J. Med. Sci.*, **14** (1): 94–98.

Dhungana, R., et al. (2016). "Prevalence and Associated Factors of Hypertension: A Community- Based Cross- Sectional Study in Municipalities of Kathmandu, Nepal". *Int. J. Hypertens.*, 1–10.

Dimitrijev, I., et al. (2016). "Demographic and Socioeconomic Predictors of Prehypertension and Hypertension in the Adult Population: Serbian National Health Survey". *Medicina*, **60** (5): 1–13.

Ekim Seven. (2015). "Overweight, hypertension and cardiovascular disease: focus on adipocytokines, insulin, weight changes and natriuretic peptides". *Dan. Med. Bull.*, **62** (11): 1–14.

Elahi, A., et al. (2023). "Challenges of managing hypertension in Pakistan – a review". *Clin. Hypertens.*, **29** (1): 1–14.

Hafsa K., et al. (2018). "Prevalence of clinical signs and symptoms of hypertension: a gender and age based comparison". *Palliat. Med. Care*, **5** (2): 1–8.

Haghighatdoost, F., et al. (2013). "Is the Association between Salt Intake and Blood Pressure Mediated by Body Mass Index and Central Adiposity?". *Arch. Iran. Med.*, **16** (3): 167–171.

Javeed, M., et al. (2024). "Prevalence of hypertension in diabetic patients in Pakistan". *J. Contemp. Pharm.*, **8** (1): 1–5.

Jordan, J., et al. (2018). "Arterial hypertension". *Dtsch Arztebl Int*, **115** (33- 34): 557–568.

Kar, S., et al. (2020). "High Prevalence of Prehypertension and its Association with Modifiable Risk Factors: Findings of Household STEPS Survey from Urban Puducherry, South India". *Int. J. Prev. Med.*, **11**: 1–9.

Kidwai, S., et al. (2024). "High Blood Pressure- Associated Symptoms: Insights From a Population- Based Study in Pakistan". *Cureus*, **16** (7): 1–7.

Kini, S., et al. (2016). "Pre- Hypertension among Young Adults (20–30 Years) in Coastal Villages of Udupi District in Southern India: An Alarming Scenario". *PLOS ONE*, **11** (4): 1–12.

Kowalski, S., et al. (2023). "Symptoms in Hypertensive Patients Presented to the Emergency Medical Service: A Comprehensive Retrospective Analysis in Clinical Settings". *J. Clin. Med.*, **12** (17): 1–12.

Kumar, D & Prasad, R. (2025). "Prevalence and Risk Factors of Hypertension Among Adults Aged 20–40 in Urban Bihar: A Cross- Sectional Study". *Int. J. Pharm. Qual. Assur.*, **16** (1): 582–588.

Majed, H & Sadek, A. (2012). "Pre- Hypertension and Hypertension in College Students in Kuwait: A Neglected Issue". *Journal of Family and Community Medicine*, **19** (2): 105–112.

Meher, M., et al. (2023). "Risk factors associated with hypertension in young adults: a systematic review". *Cureus*, **15** (4): 1–13.

Mills, K., et al. (2020). "The global epidemiology of hypertension". *Nat. Rev. Nephrol.*, **16** (4): 223–237.

Nwoke, O., et al. (2024). "Prevalence of Prehypertension, Hypertension, and its Determinants Among Young Adults in Enugu State, Nigeria". *Niger. Med. J.*, **65** (3): 241–254.

Riaz, T., et al. (2023). "The global epidemiology, risk factors and treatment of hypertension". *Int. Arch. Integr. Med.*, **10** (9): 10–18.

Sani, R., et al. (2024). "Rural- urban difference in the prevalence of hypertension in West Africa: a systematic review and meta- analysis". *J. Hum. Hypertens.*, **38** (4): 352–364.

Shah, N., et al. (2018). "The burden and high prevalence of hypertension in Pakistani adolescents: a meta- analysis of the published studies". *Arch. Public Health*, **76** (1): 1–10.

Singh, S., et al. (2017). "Prevalence and associated risk factors of hypertension: a cross- sectional study in urban Varanasi". *Int. J. Hypertens.*, **2017** (1): 1–13.

Sung Kyu Ha. (2014). "Dietary salt intake and hypertension". *Electrolyte Blood Press.*, **12** (1): 7–18.

Syed, R., et al. (2025). "Pre- hypertension and Associated Risk Factors Among Undergraduate Medical Students in Chengalpattu District: A Cross- sectional Study". *Cureus*, **17** (6): 1–17.

Tabrizi, J., et al. (2016). "Prevalence and Associated Factors of Prehypertension and Hypertension in Iranian Population: The Lifestyle Promotion Project (LPP)". *PLoS One*, **11** (10): 1–15.

Theodore A. Kotchen. (2011). "Historical trends and milestones in hypertension research: a model of the process of translational research". *Hypertension*, **58** (4): 522–538.

Valerio, L., et al. (2016). "Association of Family History With Cardiovascular Disease in Hypertensive Individuals in a Multiethnic Population". *J. Am. Heart Assoc.*, **5** (12): 1–9.

Yang, L., et al. (2025). "Association of Sleep Duration with Hypertension in Young and Middle- Aged Adults: A Systematic Review and Meta- Analysis". *Int. J. Cardiol.: Cardiovasc. Risk Prev.*, **25**: 1–13.