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Prevalence of Hypertension and Associated Risk Factors Among Young Adults at Saidu Group of Teaching Hospital, Saidu Sharif, Swat: A Cross-Sectional Study

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Abstract

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Hypertension is an emerging public health problem among young adults and a major risk factor for cardiovascular disease. To assess the prevalence of hypertension and associated risk factors among young adults aged 18–44 years, and to classify participants into elevated blood pressure, Stage I, and Stage II hypertension categories. A cross-sectional study was conducted at Saidu Group of Teaching Hospital, Saidu Sharif, Swat from January 2025 to January 2026, enrolling 145 participants via convenience sampling. Data were collected using a structured questionnaire and analyzed using IBM SPSS v.27 and MS Excel 2019. Mean age was 34.5±7.0 years; 72.4% were female. Mean systolic and diastolic blood pressures were 145.17±14.08 mmHg and 87.50±8.34 mmHg, respectively. Stage II hypertension was most prevalent (64.1%), followed by Stage I (26.9%) and elevated blood pressure (9.0%). Smoking status, duration, and daily cigarette count were significantly associated with systolic blood pressure ($p<0.05$). Physical activity showed significant inverse correlations with systolic ($r=-0.26$, $p=0.002$) and diastolic blood pressure ($r=-0.21$, $p=0.01$). Smoking and physical inactivity are significant modifiable risk factors for hypertension among young adults. Early screening and lifestyle interventions are warranted.

INTRODUCTION

Hypertension is a major global public health problem and a leading contributor to cardiovascular morbidity and mortality. Traditionally considered a disease of older adults, hypertension is increasingly being reported among young adults due to changing lifestyles, urbanization, unhealthy dietary habits, obesity, smoking, physical inactivity, psychosocial stress, and excessive screen time. Its asymptomatic nature often delays diagnosis and management, resulting in long-term complications such as stroke, heart disease, kidney failure, and premature death. According to the World Health Organization (WHO), nearly 1.4 billion adults worldwide are affected by hypertension, with a substantial burden occurring in low- and middle-income countries.1 Recent evidence indicates that elevated systolic blood pressure among young adults contributes significantly to disability-adjusted life years and cardiovascular mortality globally.2Hypertension develops through complex interactions between genetic predisposition, environmental exposure, and behavioral factors. Non-modifiable factors include age, gender, ethnicity, and family history, whereas modifiable factors include smoking, obesity, unhealthy diet, excessive salt intake, alcohol use, stress, poor sleep quality, and sedentary lifestyle.3 Among Asian populations, including Pakistanis, the risk of hypertension and cardiovascular disease occurs at comparatively lower body mass index (BMI) levels, highlighting the importance of early identification and prevention strategies.4.Young adults often underestimate their susceptibility to hypertension and rarely undergo routine medical screening, leading to underdiagnosis and delayed treatment. Persistent hypertension at a young age increases lifetime exposure to vascular damage and substantially raises the risk of future cardiovascular events.5 Furthermore, hypertension-mediated

organ damage may silently affect the heart, kidneys, brain, eyes, and blood vessels before clinical symptoms become apparent.6

In Pakistan, limited awareness regarding hypertension and its associated lifestyle risk factors further contributes to the increasing disease burden, particularly in rural and underserved populations. Despite the growing prevalence of hypertension among younger age groups, most local studies primarily focus on older adults.7 Therefore, this study was conducted to assess blood pressure levels and associated risk factors among young adults presenting to Saidu Group of Teaching Hospital, Saidu Sharif, Swat. The findings may help in identifying modifiable determinants and support the development of targeted preventive interventions to reduce future cardiovascular complications.

MATERIALS AND METHODS

This cross-sectional study was conducted at Saidu Group of Teaching Hospital, Saidu Sharif, Swat, a 1100-bed tertiary care teaching hospital. The study period extended from January 2025 to January 2026.A non-probability convenience sampling technique was used. The sample size was calculated using the OpenEpi calculator with an anticipated frequency of 9.2%, a 95% confidence level, and a 5% margin of error. The initial calculated sample size was 129, which was increased by 5% for non-response, yielding a final sample of 145 participants. Participants aged 18–44 years who provided written informed consent and were permanent residents of Swat were included. Individuals above 44 years of age, those with secondary hypertension, and those currently on antihypertensive treatment were excluded. Data were collected using a structured questionnaire covering demographic characteristics, lifestyle factors (smoking, physical activity, and diet), screen time, family history, and socioeconomic status. Blood pressure was measured using a calibrated sphygmomanometer and Welch Allyn Spot Vital Signs

monitor. Two readings were taken five minutes apart, and the mean was recorded. BMI was calculated from standard height and weight measurements. Ethical approval was obtained prior to data collection. Data were analyzed using IBM SPSS version 27 and Microsoft Excel 2019. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Independent t-test, chi-square test (with Fisher's exact test where applicable), Pearson's correlation, and simple linear regression were applied. Statistical significance was set at $p<0.05$.

RESULTS

Demographic Characteristics

A total of 145 participants were enrolled with a mean age of 34.5±7.6 years (range 18–44). Females constituted 72.4% of the sample. Most participants were married (77.2%) and unemployed (80.0%). Regarding educational attainment, 38.6% had no formal education, 27.6% had completed secondary education, and 22.1% had higher education. More than half of the participants resided in rural areas (58.6%), and the majority belonged to low- and middle-income socioeconomic groups. Detailed demographic data are presented in Figure 1.

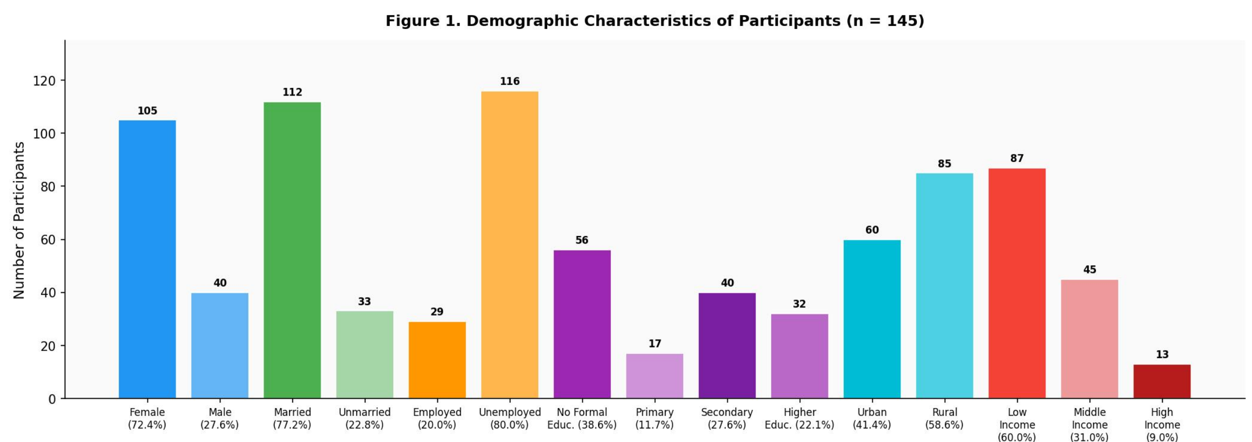

Figure 1. Demographic Characteristics of Participants (n = 145). Bar heights represent frequency counts; percentages shown above each bar.

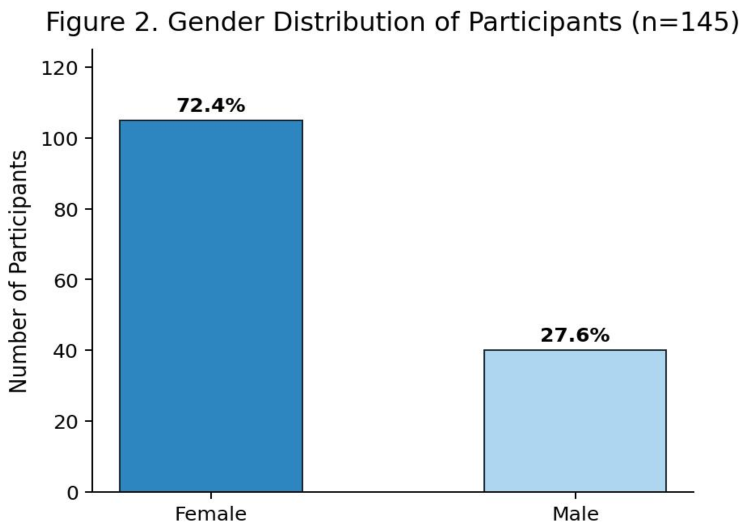

Figure 2. Gender Distribution of Study Participants (n = 145). Females constituted the majority (72.4%).

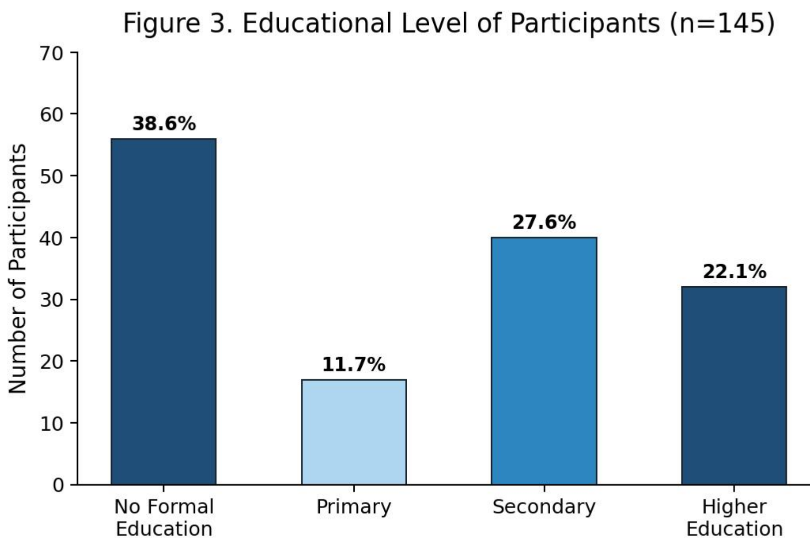

Figure 3. Educational Level of Study Participants (n = 145). The largest proportion had no formal education (38.6%).

Blood Pressure Classification

The mean systolic blood pressure (SBP) was 145.17±14.08 mmHg and mean diastolic blood pressure (DBP) was 87.50±8.34 mmHg. Based on the 2025 AHA/ACC classification, 64.1% of participants had Stage II hypertension, 26.9% had Stage I hypertension, and 9.0% had elevated blood pressure (Figure 2). Descriptive statistics for blood pressure and age are summarized above.

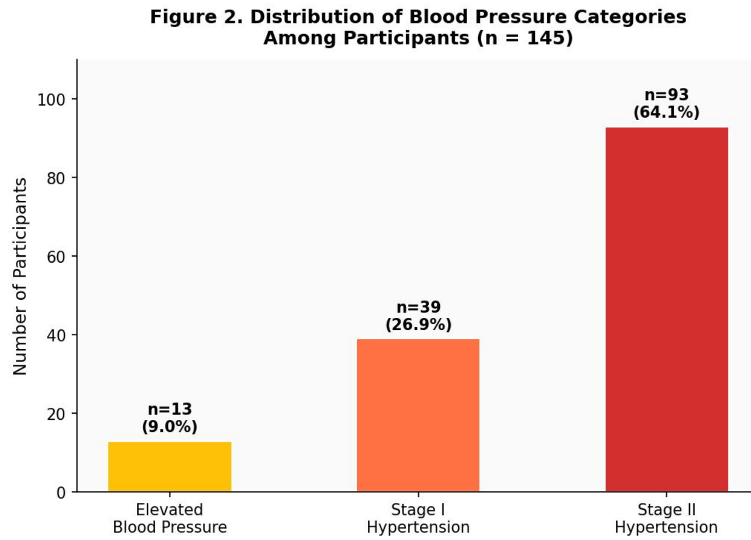

Figure 2. Distribution of Blood Pressure Categories Among Participants (n = 145). Stage II hypertension was the most prevalent category (64.1%).

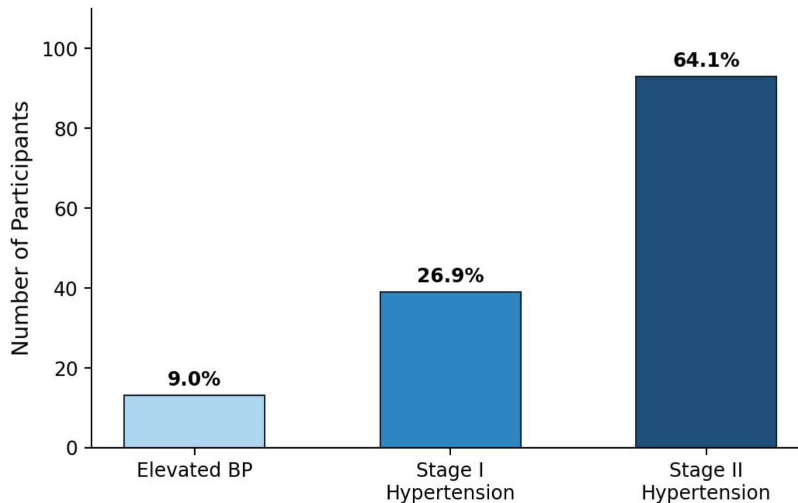

Figure 1. Distribution of Blood Pressure Categories Among Participants (n = 145). Stage II hypertension was the most prevalent category (64.1%).

Association of Risk Factors with Blood Pressure

Smoking status was significantly associated with higher systolic blood pressure (p=0.001; Figure 4). Duration of smoking (r=0.31, p=0.002) and daily cigarette count (r=0.29, p=0.002) showed significant positive correlations with

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SBP. Physical activity demonstrated significant inverse correlations with both SBP (r=−0.26, p=0.002) and DBP (r=−0.21, p=0.01; Figure 5). BMI (p=0.04) and exercise frequency (p=0.01) showed significant associations with blood pressure categories. Variables including age, screen time, sleep duration, and sitting time showed no significant correlations. Full results are presented in Figure 3.

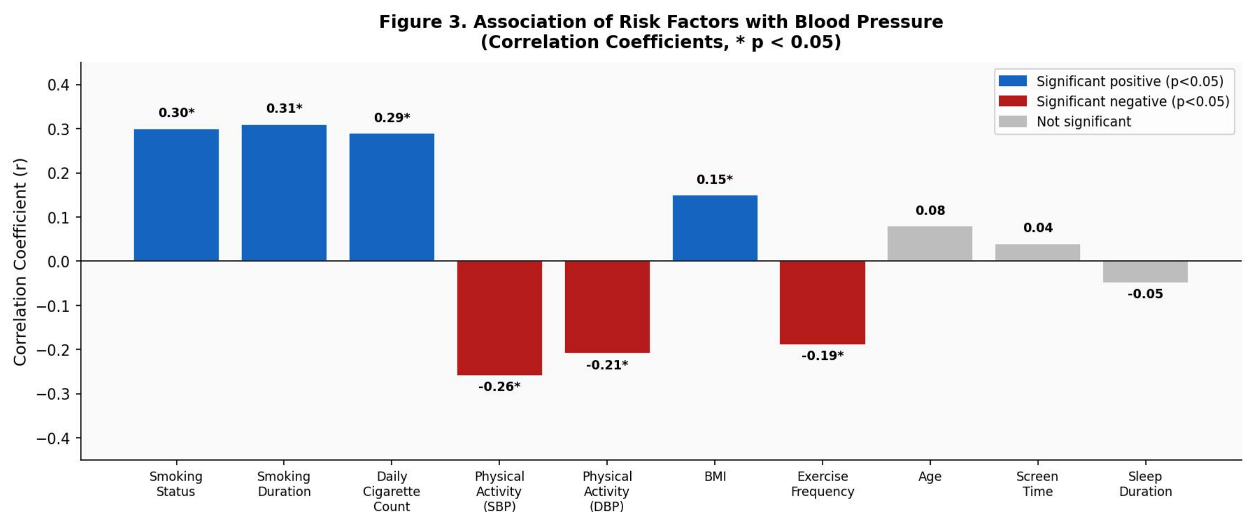

Figure 3. Association of Risk Factors with Blood Pressure (n = 145). Blue bars indicate significant positive correlations, red bars significant negative correlations, and grey bars non-significant associations (p < 0.05).*

DISCUSSION

This study assessed the prevalence of high blood pressure and associated risk factors among young adults, classifying participants into elevated blood pressure, Stage I, and Stage II hypertension. The mean SBP (145.17±14.08 mmHg) and DBP (87.50±8.34 mmHg) were both in the hypertensive range. Stage II hypertension was the most frequent category (64.1%), followed by Stage I (26.9%) and elevated BP (9.0%). These values are notably higher than those reported in community-based studies, which may be attributed to a clinical setting recruitment bias, as participants presenting to a tertiary care hospital are more likely to have elevated blood pressure readings.8In this

study, males showed slightly higher SBP and DBP than females; however, the difference was not statistically significant. This is consistent with findings reported by Zahid et al. (2024) and Mughal et al. (2025), who similarly observed no significant sex-based difference in blood pressure among younger Pakistani adults.9,10 The predominance of female participants (72.4%) in this study reflects patterns of healthcare-seeking behavior in the region.Smoking status was significantly associated with higher SBP (p=0.001), and both smoking duration and daily cigarette count demonstrated significant positive correlations with systolic blood pressure. These findings align with established evidence that nicotine and other tobacco constituents promote sympathetic activation, endothelial dysfunction, and arterial stiffness, thereby elevating blood pressure.11,12 The present findings corroborate previous studies conducted in Pakistan and other low- and middle-income countries where smoking is a major preventable cardiovascular risk factor.7,13Physical activity demonstrated a protective effect, showing significant negative correlations with both SBP (r=−0.26, p=0.002) and DBP (r=−0.21, p=0.01), consistent with evidence from WHO-endorsed guidelines recommending regular physical activity for cardiovascular risk reduction.3 BMI and exercise frequency were also significantly associated with blood pressure categories (p=0.04 and p=0.01, respectively), reinforcing the role of body weight and habitual activity in blood pressure regulation.14

Other variables — including diet, family history, stress, sleep quality, screen time, and sitting time — did not demonstrate statistically significant associations with blood pressure in this study. This may reflect limitations in sample size or the cross-sectional design, which precludes causal inference.15 Overall, the findings underscore the importance of modifiable lifestyle factors — particularly smoking cessation and increased physical activity — in the prevention and management of hypertension among young adults in Pakistan.

CONCLUSION

The mean systolic and diastolic blood pressures of the study participants fell within the hypertensive range, with Stage II hypertension being the predominant category. Smoking-related variables — including duration of smoking and daily cigarette count — along with physical inactivity, were identified as significant modifiable risk factors for elevated blood pressure among young adults. These findings highlight the critical need for targeted screening programs, health education initiatives promoting smoking cessation, and structured physical activity interventions among the young adult population in Pakistan.

RECOMMENDATIONS

Regular blood pressure screening in young adults is strongly recommended for early detection and timely management. Health education programs should emphasize smoking cessation, increased physical activity, and comprehensive lifestyle modification. Routine monitoring of BMI and cardiovascular risk factors should be integrated into primary care settings. Clinicians should consider early therapeutic initiation for patients with Stage II hypertension, rather than relying solely on lifestyle modification. Future longitudinal studies with larger, community-based samples are needed to establish causal relationships and evaluate long-term outcomes.

STRENGTHS AND LIMITATIONS

Strengths. The study utilized the updated 2025 AHA/ACC blood pressure classification guidelines, ensuring application of current international standards. Data were collected from a major tertiary care hospital in Swat, providing access to a clinically relevant population.

Limitations. Echocardiographic assessment was not performed; therefore, target organ damage such as left ventricular hypertrophy could not be evaluated. Lipid profile data were not collected, limiting assessment of

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metabolic associations. Additionally, the convenience sampling technique and hospital-based setting limit the generalizability of findings to the broader community. The final sample size was slightly lower than calculated due to time constraints and limited patient flow in the cardiology outpatient department.

ETHICAL APPROVAL

Ethical approval was obtained from the institutional review board prior to data collection. All participants provided written informed consent. Confidentiality of participant data was maintained throughout the study.

AUTHOR CONTRIBUTIONS

Azhar Ayub: Data collection, blood pressure measurement, echocardiographic technical support, and critical review of the manuscript.

Inam Ullah: Conceptualization, study design, supervision, statistical analysis, manuscript writing.

Saif Ullah: Participant recruitment, questionnaire administration.

Niaz Ali: Data entry and literature review.

Ashiq Khan: Cardiology investigations support, vital signs monitoring, data validation and corresponding author responsibilities.

Sajid Ali: Methodology review, interpretation of health sciences data, and manuscript revision.

Yaseen Salih: Pharmacological data review, assessment of medication-related exclusion criteria, and critical appraisal of the manuscript.

Hamza Ullah: Field data collection, participant coordination, and administrative support during data acquisition.

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