FREQUENCY AND RISK FACTORS OF PREHYPERTENSION AMONG PATIENTS AGED 35 YEARS AND ABOVE IN SAMANABAD LAHORE

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ABSTRACT

Background: Prehypertension often turns into Hypertension, putting a person at risk for heart disease and a stroke. **Objective:** The current investigation was planned to investigate prehypertension's prevalence and risk factors among individuals living in Samnabad, Lahore. **Methodology:** It is a descriptive-analytical study. The sample size was 192 individuals who were recruited via convenient and purposive sampling from the area of Lahore, Samanabad. Participants' blood pressure was recorded twice, and an average of the blood pressure record and other data in terms of demographic variables and risk factors were gathered by a self-developed questionnaire. The latest version of SPSS was utilized to analyze the data. Descriptive analysis, Chi-square, ANOVA, and Wilcoxon test were used to study the data. **Results**: the study findings revealed that the adjusted prevalence of prehypertension is 26%, there was higher prevalence of prehypertension in male as compared to females, and the frequency declined with age. A rise in BMI was associated with an increase in the prevalence of both prehypertension and hypertension. High cholesterol, diabetes, smoking, and an elevated heart rate were all found to be risk factors for both Prehypertension and Hypertension. Prehypertension was strongly linked to a high-calorie intake. Male gender, obesity, smoking, salt intake, and diabetes were all linked to prehypertension, $p< 0.05$. **Conclusion:** An alarming number of participants are pre-hypertensive, highlighting the need for early prevention programs to improve awareness, early screening, and lifestyle change to limit the rising burden of Hypertension and its associated problems.

INTRODUCTION

Hypertension is a significant contributor to Pakistan's high mortality rate for adults. Hypertension affects an estimated 1.5 billion individuals worldwide [1]. According to the World Health Organization, an estimated 9.4 million people die prematurely each year as a result of high blood pressure, which is anticipated to rise from 26% prevalence in 2000 to 29.2% by 2025 [2]. Prehypertension was designated in 2003 by the Seventh Joint National Committee on Preventing, Detecting, Evaluation, and Treating High Blood Pressure (JNC VII) as a risk factor for high blood pressure [3]. Prehypertension is characterized by elevated blood pressure readings [4]. World Health Organization (WHO), defined prehypertension as systolic blood pressure (SBP) ranging from 120-139 or diastolic blood pressure (DBP) ranging from 80-89 mm Hg [5]. Prehypertension is linked with high chances of death from cardiovascular disease (CVD), particularly stroke death and stroke morbidity [6]. The burden of cardiovascular disease (CVD) falls disproportionately on low- and under developed nations, which account for 80% of worldwide CVD-related fatalities and 87% of disability-adjusted life years lost. In under developed South Asian countries,

CVD is becoming a primary reason behind death and illness [7]. The risk of cardiovascular disease (CVD) can be lowered if Prehypertension and Hypertension are diagnosed and treated early [8]. A rise in 20-point of SBP or a rise in 10 point in DBP in persons aged 40 to 70 brings about a twofold increase in the risk of heart attack or stroke. As we become older, systolic blood pressure tends to rise steadily. Blood pressure (BP) rises with advancing years as a universal characteristic of human aging. After 40, SBP increases by about seven mmHg every decade, on average, in those who live in the United States [9].

Hypertension is more prevalent in developing nations, where CVD account for around 80% of all fatalities. One epidemiological research based on Pakistan's National Health Survey (1990–1994) revealed a prevalence of "19.1%", while another based on the northern rural areas (2001) found a prevalence of 14.4% [10]. According to a second survey done in Pakistan in 2010, "33%" of people aged 45 years and "18%" of all persons were hypertensive, and every 3rd hypertensive individual aged ≥40 years was prone to a range of illnesses. The study reported that barely 50% of the hypertensive individuals were ever treated, resulting in a prevalence of managed Hypertension of just 12.5% [11].

Many studies have been done to determine the factors contributing to Hypertension in Pakistan. However, the outcome from individual researches are inadequate to run a treatment judgments, and the rising incidence of Hypertension and Prehypertension raises further issues about the condition's prevalence and risk factors. Prehypertension prevalence and risk factors are primarily unknown in Pakistan. This study examined the prevalence and risk factors of prehypertension among patients age 35 and above in Samanabad Lahore who are 35 years old or older.

MATERIALS and METHODS

Study Design: Cross-sectional analytical design was used for this study.

Settings: The study was conducted in Samanabad, an area of Lahore.

Study duration: The study took about nine months to complete (Jan 2020-Nov 2020).

Sample size: 192 subjects were taken from Samanabad, Lahore. The sample size was calculated using the Prevalence of Prehypertension as 14.5%[58], taken 5% margin of error and 95% confidence level.

Sampling techniques: The sample was selected through random sampling, a part of the sampling technique in which each sample has an equal probability of being chosen.

Sample selection

The sample was selected according to the provided criteria

Inclusion Criteria: The following subjects were included in the study

1. Patients with the age of 35 years and above of both genders.

Exclusion Criteria:

1. Any person who does not understand the questions due to physical or mental impairment.
2. The patient was already taking antihypertensive drugs.
3. The patient was diagnosed with confirmed Hypertension on clinical judgment.
4. Pregnant ladies.
5. Patients diagnosed with cardiovascular disease (CVD)

Instruments: A questionnaire based on the literature review was administered to the study sample. Other equipment used for the study were a weighing machine, a measuring tape, a stethoscope, and a sphygmomanometer.

DATA COLLECTION PROCEDURE

The selected sample was briefed about the study's purpose and objective. After taking the informed consent from all the participants, the data were collected and recorded in the Performa. Prehypertension was defined, as per WHO criteria, as a SBP ranging from120–139 mmHg or DBP ranging from 80–89 mmHg over a sustained period. Socioeconomic factors included education level, which was categorized as no education, primary, secondary, higher secondary, higher, or postgraduate, and income level, defined as the individual's monthly financial earnings. Demographic factors included area of residence, classified as rural or urban, and distance to the health facility, measured in kilometers from the participant's residence to the nearest health center. Biological factors included Body Mass Index (BMI), calculated as weight in Kg divided by height in m^2, and classified as underweight ($\leq$18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese ($\geq$30 kg/m^2). Family history variables were defined as the presence of hypertension, stroke, or cardiovascular disease in any close relative. Lifestyle factors included tobacco use, defined as regular consumption of tobacco in any form; unhealthy diet, defined as little consumption of fruits and vegetables with high salt and sugar consumption; and adequate exercise, defined as physical activity performed for at least 30 minutes, three times per week.

A set of questions will be administered systematically to ensure the data quality remains intact. Risk factors associated with the prehypertension condition will be noted. If any previous medical records are available, the authenticity of the answers was confirmed. Two consecutive Blood Pressure readings were taken from the respondent with a One-minute gap after the first reading. Participants differed in the two readings that were less than 5 mm Hg, then noted the lower reading as clinic blood pressure. For the participants who had a difference in their two readings was more than 5 mm Hg, then the third measurement and lower value of the last two measurements were considered as clinic blood pressure. The participants were ensured of their confidentiality and privacy. The researcher informs them that their given data are just for research purposes, and when research is over, the personal information will be discarded. In the end, all the participants were thanked, and an email was

given to the participant for any query. Descriptive statistics such as means and standard deviations were calculated for continuous variables. Qualitative data were expressed in the forms of frequencies and percentages. Statistical tests such as chi-square tests were applied to compare different variables. Logistic regression was used for identification of the risk factors of prehypertension. The p-value ≤0.05 was considered statistically significant.

RESULTS

A total of 192 participants were included in the study, of whom 146(76%) were aged 35–50 years and 46(24%) were older. The majority were male 140(72.9%) while females accounted for 52(27.1%). Regarding BMI, 80(41.7%) participants had normal weight, 64(33%) were above normal, and 48(25%) were below average. Educational status showed that 76(39.6%) had middle-level education, 72(37.5%) had higher education, and 44(22%) had primary education. Most participants were non-working 111(57.8%) compared to 81(42.2%) working individuals, and 114(59.4%) lived in urban areas while 78(40.6%) were from rural settings. In terms of blood pressure status, 90(46.9%) were hypertensive, while 51(26.6%) were normotensive and 51(26.6%) prehypertensive. Socioeconomic distribution revealed 81(42.2%) in the middle class, 61(31.8%) in the higher class, and 50(26%) in the lower class.

The association analysis demonstrated statistically significant relationships ($p<0.001$) between blood pressure status and multiple variables including age, gender, education, BMI, occupation, lifestyle, socioeconomic status, knowledge, family history, stroke history, diabetes, cholesterol, smoking, dietary habits, calorie intake, exercise, and stress. Among hypertensive individuals, 67(74%) were aged 35–50 years compared to 39(76%) normotensive and 40(44%) prehypertensive individuals, while 68(75%) hypertensive participants were male compared to 40(44%) normotensive and 32(62%) prehypertensive. Obesity was more common among hypertensive individuals 37(41%) compared to 12(78%) normotensive and 15(29%) prehypertensive groups. Non-working individuals constituted 55(61%) of hypertensives compared to 28(54%) normotensive and 28(54%) prehypertensive groups, while urban residents accounted for 51(56%) hypertensive, 32(62%) normotensive, and 31(60%) prehypertensive individuals. Clinical factors such as diabetes were present in 59(65%) hypertensive, 37(72%) normotensive, and 36(70%) prehypertensive individuals, while cholesterol was reported in 62(68%), 31(60%), and 39(76%) respectively. Smoking prevalence was high across groups, with 76(84%) hypertensive, 39(76%) normotensive, and 41(80%) prehypertensive individuals. Dietary patterns showed vegetable intake in 36(40%) hypertensive, 44(86%) normotensive, and 32(63%) prehypertensive individuals, while high calorie intake was reported in 55(61%), 35(69%), and 21(41%) respectively. Exercise participation was observed in 37(41%) hypertensive, 23(45%) normotensive, and 20(39%) prehypertensive individuals, and stress was reported in 61(68%), 29(57%), and 28(55%) respectively.

Multinomial regression analysis showed that age 35–50 years (OR=1.429, p=0.001), male gender (OR=2.505, p=0.001), primary education (OR=0.436, p=0.001), obesity (OR=2.104, p=0.001), working status (OR=1.733, p=0.001), urban lifestyle (OR=1.635, p=0.001), lower socioeconomic status (OR=1.599, p=0.001), family history (OR=1.19, p=0.001), diabetes (OR=1.21, p=0.001), cholesterol (OR=1.01, p=0.001), raw salt intake (OR=1.23, p=0.001), smoking (OR=1.24, p=0.001), high calorie intake (OR=1.32, p=0.001), lack of exercise (OR=1.19, p=0.001), and stress (OR=1.18, p=0.001) were significantly associated with prehypertension. Multivariate regression analysis further confirmed these findings, showing that age 35–50 years (OR=1.429, 95% CI: 1.44–1.786, p=0.001), male gender (OR=2.505, 95% CI: 2.028–3.093, p=0.001), obesity (OR=2.104, 95% CI: 1.762–2.513, p=0.001), working status (OR=1.733, 95% CI: 1.247–2.408, p=0.001), urban lifestyle (OR=1.635, 95% CI: 1.384–1.930, p=0.001), lower socioeconomic status (OR=1.599, 95% CI: 1.368–1.868, p=0.001), raw salt intake (OR=1.232, 95% CI: 1.009–1.905, p=0.001), smoking (OR=1.248, 95% CI: 1.132–2.146, p=0.001), high calorie intake (OR=1.321, 95% CI: 0.923–1.543, p=0.001), exercise (OR=1.198, 95% CI: 1.002–1.976, p=0.001), and stress (OR=1.188, 95% CI: 0.950–1.510, p=0.001) remained independent predictors of prehypertension.

Table 1: Frequency, Percentage of the study variables (n = 192)

Variable	Categories	F(%)
Age	35-50	146(76)
	15-60	46(24)
Gender	Male	140(72.9)
	Female	52(27.1)
BMI	Below average	48(25)
	Normal	80(41.7)
	Above normal	64(33)
Education	Primary	44(22)
	Middle	76(39.6)
	Higher	72(37.5)
Job type	Working	81(42.2)
	Non-working	111(57.8)
Life style	Urban	114(59.4)
	Rural	78(40.6)
Status of patient	Hypertension	90(46.9)
	Normotensive	51(26.6)
	Prehypertension	51(26.6)
	Lower	50(26)

Socio-economic status	Middle	81(42.2)
	Higher	61(31.8)

Note: F=frequency, %= percentage

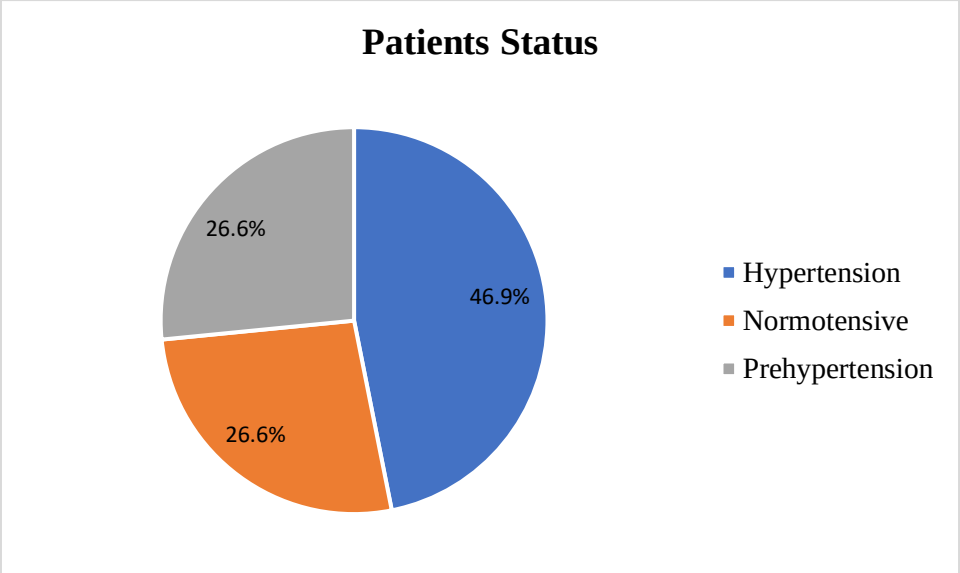

Figure 1: Graphical representation of status of patients.

Table 2: Characteristic of subjects according to BP status (n = 192)

Variables	Categories	HTN (90)	NHT (51)	PHT (51)	Chi-Square	p-value
Age	35 -50	67(74)	39(76)	40(44)	0.29	0.001
	51-65	23(25)	12(78)	11(21)		
Gender	Male	68(75)	40(44)	32(62)	3.77	0.001
	Female	22(24)	11(21)	19(37)		
Education	primary	19(21)	14(27)	11(21)	4.06	0.001
	middle	31(34)	22(43)	23(45)		
	Higher	40(44)	15(29)	17(33)		
BMI	Underweight	19(21)	15(29)	14(27)	3.88	0.001
	Normal	34(37)	24(47)	22(43)		
	Obese	37(41)	12(78)	15(29)		
Job type	Working	35(38)	23(45)	23(45)	2.85	0.001
	Non-working	55(61)	28(54)	28(54)		
Life style	Urban	51(56)	32(62)	31(60)	1.98	0.001
	Rural	39(43)	19(37)	20(39)		
Socioeconomic status	Lower	26(28)	14(27)	10(20)	2.78	0.001
	Middle	43(47)	20(39)	18(35)		
	higher	21(23)	17(33)	23(45)		
Knowledge	Yes	25(27)	16(31)	23(45)	4.51	0.001

Family history	Yes	45(50)	26(51)	26(51)	1.16	0.001
History of stroke	Yes	39(43)	21(41)	33(65)	7.42	0.001
Previous record	Yes	40(44)	22(43)	26(51)	1.14	0.001
Diabetes	Yes	59(65)	37(72)	36(70)	0.85	0.001
Cholesterol	Yes	62(68)	31(60)	39(76)	2.92	0.001
Headache	Yes	13(14)	4(7)	9(17)	3.57	0.001
Vision issue	Yes	30(33)	13(14)	15(31)	.971	0.000
Smoke	Yes	76(84)	39(76)	41(80)	1.39	0.002
Cigarettes	<5	35(38)	20((39)	22(43)	7.47	0.001
	5-15	48(53)	24(47)	23(45)		
	>15	7(8)	7(13)	6(11)		
Vegetables	Yes	36(40)	44(86)	32(63)	7.64	0.001
Fruit	Yes	59(65)	37(72)	35(69)	2.45	0.001
Calories	Yes	55(61)	35(69)	21(41)	8.63	0.001
Exercise	Yes	37(41)	23(45)	20(39)	0.38	0.001
Exercise time	<30mins	59(65)	40(78)	39(76)	3.39	0.011
	>30mins	31(34)	11(21)	12(23)		
Stress	Yes	61(68)	29(57)	28(55)	2.89	0.001

Note: NTN=normotensive, HTN=hypertension, PHT=prehypertension, p<0.001

Table 2 present the chi-square results as comparison of the groups depending on blood pressure groups, presented as a number (%) for the multiple comparisons, and the Wilcoxon-rank test was used to investigate the significance of hypothesis.

Table 3: The risk factor associated with prehypertension by multinomial regression analysis (n = 192).

Variables		**B**	**SE**	**Wald**	**PHT OR (95%Cl)**	**p-value**
Age	35 -50 51-65	0.76	0.03	6.78	1.429	0.001
Gender	Male Female	. 82	0.08	5.34	2.505	0.001
Education	primary middle Higher	0.86	0.35	4.21	0.436	0.001
BMI	Obese	0.92	0.38	5.34	2.104	0.001
Job type	Working	0.97	0.22	3.13	1.733	0.001

Life style	urban	0.54	0.61	4.31	1.635	0.001
Socioeconomic status	Lower	0.65	0.32	5.37	1.599	0.001
Family history	Yes	0.81	0.03	4.45	1.19	0.001
Diabetes	Yes	0.79	0.05	7.43	1.21	0.001
Cholesterol	Yes	0.82	9.03	6.43	1.01	0.001
Raw salt	Yes	0.94	0.12	5.21	1.23	0.001
Smoke	Yes	.0.95	0.41	6.75	1.24	0.001
Calories	Yes	0.91	0.43	6.54	1.32	0.001
Exercise	Yes	0.86	0.21	5.43	1.19	0.001
Stress	Yes	0.89	0.55	4.67	1.18	0.001

Note: OR= Odds ratios, PHT= Prehypertension, CI= Confidence Interval, p <0.001

Table 3 Illustrated the risk factors for Hypertension and Prehypertension. Age, Gender, Education, BMI, Job type, lifestyle, socioeconomic status, family history, diabetes, high cholesterol, raw salt, smoke, high calories, less exercise, and stress are the main factors of Prehypertension.

DISCUSSION

Pre-hypertension and its risk factors were examined in the study. The adjusted Prevalence of Prehypertension in our study population was 26%, that is in line with earlier studies performed among adults in various parts of the world and ranging from 26.9% to 50.57%[12, 13]. Another meta-analysis of 17 studies (n=227,741) estimated a pooled prehypertension prevalence of 27.98%**,** demonstrating similar results as our study [14].

A study from South Asia, from revealed high frequency of high blood pressure among adults: 43.2% in India**,** 35.1% in Bangladesh**,** and 25.2% in Nepal among adults from 18–49 years of age, that emphasize the substantial burden of prehypertension in South Asian region [15]. A Pakistani study, from Karachi reported a considerably higher prevalence of prehypertension **(**49.5%**)** among adult, reflecting the differences in urban lifestyle, age structure, and sampling methods in comparison with our study [16]. These nation-specific data underline the heterogeneity in prehypertension estimates even within the same country.

The prevalence of hypertension increased with age in the men in our sample. This study found a substantial correlation between male gender and prehypertension, which is consistent with worldwide studies that indicate a greater frequency among men than among women. Men had a larger pooled prevalence of prehypertension than women, according to meta-analysis, and they frequently have higher blood pressure and risk profiles [17]. This discrepancy may be caused by behavioral differences in males, such as greater rates of smoking, poor diets, and other lifestyle risk factors. Prehypertension was also linked to lifestyle and

socioeconomic characteristics, such as living in an urban area and having a lower socioeconomic position. Research has revealed that the prevalence of prehypertension and hypertension is often higher in urban individuals than in their rural counterparts, suggesting the impact of lifestyle and environment [18].

In our study, participants with PHT had moderate BMI, overweight or obesity, smoking, and diabetes rates, and these values rose considerably in parallel with BP. In this investigation, we found that obesity and overweight are significant risk factors for PHT. As a result, individuals with high blood pressure should place a higher emphasis on weight loss in order to reduce their risk of cardiovascular disease (CVD) [19].

According to our findings, current smokers have a higher than average chance of developing PHT, which has been reported in previous research as well. For both HTN and PHT, smoking has been found to be a substantial risk factor in previous research [20]. High levels of education are related to a lower risk for PHT, which we found to be true in our analysis, as well as in a prior Pakistani investigation. Those with higher education were expected to have a more in-depth understanding of high blood pressure (Hypertension), allowing them to make more informed lifestyle choices regarding their health [21].

Increased blood pressure led to an increase in the levels of FBG and SUA, as well as the Prevalence of diabetes and hyperuricemia in the population. It has been shown in previous studies that blood sugar levels of diabetes and hyperuricemia can predict high blood pressure (HTN) [22]. Disparities in research parameters, such as geographic location, participant age, and profession, may account for some of the discrepancies in findings. 76.0 percent of our survey participants were under the age of 50, working in less developed areas, and may not have been aware of the hazards of high blood pressure. Only around one-third of individuals who received antihypertensive treatment had their blood pressure under control, which was likely impacted by the hypertension patients' adherence to their medication [23].

In addition, we found that diabetic patients were more likely to develop Prehypertension and Hypertension than healthy individuals. Diabetes is a metabolic condition that affects all metabolic systems and high blood pressure. Prehypertension was associated with a sedentary lifestyle devoid of fresh vegetables, fruits, and physical activity [24]. Prehypertension and Hypertension can both be caused by stress, according to our research. BP fluctuations and the sympathetic nervous system's production of high amounts of vasoconstriction hormones contribute to Hypertension caused by stress. White coat hypertension the nature of the job, race, environmental circumstances, and emotional status are all factors that influence blood pressure through stress [25].

CONCLUSION

Urban areas in Samnabad have a high prevalence of Prehypertension and Hypertension. As a result, the residents in this region are at risk of developing a wide range of chronic diseases and health conditions.

Hypertension is more common in men than in women. Increased risk of Hypertension has been linked to an aging population. There is a need to improve health literacy among pre-hypertensive patients because their awareness of their condition was so low.

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