

Prevalence, Risk Factors and age of onset of Hypertension among School teachers in Punjab, Pakistan

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Abstract

Hypertension is the major contributor to morbidity and reduced quality of life, yet school teachers are rarely prioritized for screening in Pakistan. This study estimated the prevalence of hypertension, associated risk factors, and age of onset among school teachers in Punjab, Pakistan. The data was collected through a cross-sectional survey for this study, starting from September 2022 to April 2023. A structured questionnaire captured socio-demographic characteristics, medical history and possible risk factors. Of the two thousand approached teachers, 754 provided consent, and only 257 participated in the study. Results revealed 11.28% of adults are diagnosed with high blood pressure (11.11% of males, 11.76% of females). Moderate work pressure was reported by the majority of both males and females (51%). Males and females had different lifestyles, the amount of fatty foods eaten, the number of times medication is taken, using tobacco products, and getting ≤ 5 hours of sleep per night (19.12% females, 5.82% males). The average age for males being diagnosed with hypertension was 42.05 ± 9.79 years, and for females was 34.87 ± 6 .

Author Details

Keywords: Hypertension, Prevalence, Risk Factors, School teachers, Punjab, Pakistan

Received on 25 Dec 2025

Accepted on 26 Jan 2026

Published on 08 Feb 2026

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Introduction

A chronic disease lasts for at least three months and may worsen over time (Shaban et al., 2025; WHO, 2005). Chronic diseases like hypertension, diabetes, obesity, heart and renal diseases persist over time, often in older adults, gradually progress and do not resolve/cured spontaneously (Muhammad et al., 2025; Ullah et al., 2025). In the United State a study conducted by Ben-Shlomo and Kuh (2004) described that these

diseases were the leading cause of mortality, morbidity, disability and decreased the quality of life. The statistical data in the USA reveal that at least 65% of total deaths in the U.S. are due to prolonged diseases, and 84% of health spending was on non-communicable diseases (Anderson, 2012; Control & Prevention, 2014). Hypertension or elevated blood pressure is one of the chronic diseases that has critical health challenges and is a leading modifiable factor for cardiovascular diseases, stroke, and renal diseases (Mills et al., 2020). According to WHO, 1.28 billion adults aged 30–79 are living with hypertension, and nearly two thirds are belonging to low or middle-income countries (WHO, 2025). Often asymptomatic and silent in nature, hypertension has a low detection and control rate. This contributes to the high burden of worldwide morbidity and mortality (Forouzanfar et al., 2017).

Being a densely populated South Asian country, Pakistan faces a double burden of both noncommunicable and infectious diseases (Atiq, 2017; Iqbal et al., 2024; Mehmood et al., 2020). Now, CVDs are the leading cause of death in Pakistan (Zubair et al., 2018). Hypertension serves as the primary risk factor for CVDs, and various studies suggested one-thirds adult population is affected, although this figure varies widely (Jafar et al., 2020; Riaz et al., 2021). Unfortunately, a substantial population with hypertension remain undiagnosed, or the treatment rate is very low. This phenomenon is often termed the “rule of halves” (Dhungana et al., 2021).

Unhealthy diet, excessive intake of energy, sedative life style and use of tobacco are the most vital risk factors for chronic diseases. Diabetes, non-standard lipids of blood (especially low-density lipoprotein – LDL cholesterol), overweight (body mass index 25 kg/m^2) and obesity (body mass index 30 kg/m^2) are included as intermediate risk factors. The consumption of alcohol contributes to the global chronic disease. (Nawaz et al., 2020; WHO, 2005).

School teachers are particularly vulnerable to hypertension due to prolonged standing or sitting, large class sizes, high cognitive demands, time pressure, limited opportunities, workplace and psychosocial stress. Limited or no activity further add in this condition. The other cardiovascular risk factors, such as obesity, unhealthy diet and poor sleep, elevated the blood pressure (Balachandran et al., 2025).

Empirical studies from different regions report a large burden of hypertension among school teachers with a wide range of risk factors. For example, a study conducted in Kerala (India) neighbor of Pakistan, on the prevalence, awareness, treatment and control of hypertension. It also discussed the risk factors such as poor diet, physical inactivity and being overweight in school teachers (Mini et al., 2020). Another study conducted on the school teachers of Patna, India have similar findings and focused on the screen programs (Kumar et al., 2024). Despite the growing literature, important gaps still remains such as many studies are limited to regions. The risk factors may also vary regions to region and even palce to place. Therefore, this study was designed to evaluate the prevalence, age of onset, and risk factors of chronic diseases in school teachers of Okara, Punjab, Pakistan.

Materials and Methods

Collection of Data

This study was conducted on teachers of different schools from September 2022 to April 2023. Both male and female schools of all grades, i.e. primary, elementary, secondary and higher secondary were included. A consent form was sent to more than 2000 teachers, 754 gave their consent, and only 257 participated in the study.

Data was collected with the help of a questionnaire, which includes different sections. The first section has socio-demographic characteristics, medical and family history of participants related to chronic diseases, questions on smoking, soft drinks consumption and physical activities. Other sections' questions were related to hypertension and related diseases. Individual and socio-demographic information, as well as a history of chronic conditions such as hypertension, diabetes, and renal

issues, were also queried. Furthermore, lifestyle variables such as smoking pattern (chain smoker or occasional smoker), exercising, and eating vegetables and fruits were questioned.

Statistical Analysis

Data was analyzed statistically with the help of GraphPad Prism 9. Results were represented in the mean and standard deviations (SD). The Chi-square and P-values were calculated. The age of onset of the disease was also recorded.

Results

A total of 257 teachers were involved in this study, 73.44% (189) male and 26.56 % (68) female. There was a significant difference in males and females in terms of age group, marital and smoking status and a non-significant difference among level of education, monthly income, residence, chronic conditions and self-perceived health (table 1).

Table 2 shows a comparison of some of the risk factors associated with hypertension. The 12.70% males 16.18% females were under stress due to job, 51.32% male 51.47% female think job stress is moderate, and 35.98 % males 32.35% females reported that they performed less work. 13.23% males and 13.24% female felt the departmental stress. 31.75% males and 26.47% females were under stress due to family issues. The 52.38% males and 52.94% females were worried about child education, and 34.92% males and 36.76% females were worried about child disobedience. The 34.92% males and 32.35% females had moderate economic conditions, respectively. Only 23.81% males and 13.24% were very social. The 13.76% males and 8.82% females took food and vegetables in excess. 7.41% males and 1.47% females, took excess fatty foods in their diet. 8.47% male and 1.47% female, use excess salt. 6.35% males and 1.47% females use excess medicine. 43.39% males and 32.35% females took 8 hours sleep, 50.79% males and 48.53% females 6 hours and 5.82% males and 19.12% females took 5 or less than 5 hours sleep. 20.11% males and 17.65% females were obese, and others 79.89% males and 82.35% females were normal. The prevalence of hypertension was recorded 11.11% in males and 11.76 % in females (Figure 1). The age of onset of the disease can be found by the equation derived by regression. Age on set of disease was 42.05 ± 9.79 (males), 34.87 ± 6 (Females).

Table 1: Demographic characteristics of respondent teachers in Punjab, Pakistan

Participant Characteristics	Overall N (%)	Gender		P-value
		Male	Female	
Gender	257	189(73.44)	68(26.56)	
Age				
18-25 years	32	12 (6.35)	20 (29.41)	<0.0001****
26-35 years	118	84 (44.44)	34 (50.00)	
36-45 years	45	39 (20.63)	06 (8.82)	
46-60 years	62	54 (28.57)	08 (11.76)	
Marital Status				
Single	70	41 (21.69)	29 (42.65)	0.0009***
Married	187	148 (78.31)	39 (57.35)	
Level of Education				
Under Graduate	13	07 (3.70)	06 (8.82)	
Graduate	55	43 (22.75)	12 (17.65)	
Post Graduate	189	139 (73.54)	50 (73.53)	0.2019 ^{ns}

Monthly Income				
0-50000	185	130 (68.78)	55 (80.88)	0.1469 ^{NS}
50000-1 Lac	59	49 (25.93)	10 (14.71)	
Above 1 Lac	13	10 (5.29)	03 (4.41)	
Residence				
Urban	173	126 (66.67)	47 (69.12)	0.71 ^{NS}
Rural	84	63 (33.33)	21 (30.88)	
Chronic Condition				
Hypertension	29	21 (11.11)	08 (11.76)	0.26 ^{NS}
			01 (1.47)	
Diabetes	18	17 (8.99)		
Heart disease	11	10 (5.29)	01 (1.47)	
Obesity	09	08 (4.23)	01 (1.47)	
Renal Disease	02	02 (1.06)	0 (0.00)	
No	188	131 (69.31)	57 (83.82)	
Self-perceived health				
Good	166	123 (65.08)	43 (63.24)	0.28 ^{NS}
Moderate	85	60 (31.75)	25 (36.76)	
Poor	06	06 (3.17)	0 (0.00)	
Smoking Status				
Occasionally	22	21 (11.11)	01 (1.47)	0.0007***
Daily	19	19 (10.05)	0 (0.00)	
Never	216	149 (78.84)	67 (98.53)	

NS = Non-significant (P>0.05); *= Significant (P<0.05); ** highly significant (P<0.01) SD = Standard deviation; SE = Standard error

Table 2 Comparison of risk factors for hypertension in male and female school teachers

Character	Male N (%)	Female N(%)	χ^2	P value
1- Job Stress?				
Excess	24 (12.70)	11 (16.18)		
Moderate	97 (51.32)	35 (51.47)	0.6322	0.73 ^{NS}
Less	68 (35.98)	22 (32.35)		
2- Departmental stress?				
Excess	25 (13.23)	9 (13.24)		
Moderate	100 (52.91)	36 (52.94)	3.38	>0.99 ^{NS}
Less	64 (33.86)	23 (33.82)		
3- Family issues?				
Yes	60 (31.75)	18 (26.47)	0.66	0.42 ^{NS}
No	129 (68.25)	50 (73.53)		
4- Child Education?				
Yes	99 (52.38)	36 (52.94)	0.006	0.94 ^{NS}
No	90 (47.62)	32 (47.06)		
5- Child obedience?				
Excellent	66 (34.92)	25 (36.76)		
Good	107 (56.61)	42 (61.76)	3.98	0.14 ^{NS}
Poor	16 (8.47)	1 (1.47)		

6- Economic conditions?				
Excellent	19 (10.05)	9 (13.24)		
Good	104 (55.03)	37 (54.41)	0.56	0.75 ^{NS}
Moderate	66 (34.92)	22 (32.35)		
7- Social Status?				
Very Social	45 (23.81)	9 (13.24)		
Average	124 (65.61)	49 (72.06)	3.70	0.16 ^{NS}
Below Average	20 (10.58)	10 (14.71)		

NS = Non-significant (P>0.05)

Table 3 Comparison of risk factors and dietary habits related to hypertension in male and female school teachers

Character	Male N(%)	Female N(%)	χ^2	P= value
8- Intake of fruits or vegetables?				
Excess	26 (13.76)	6 (8.82)	1.138	0.57 ^{NS}
moderate	138 (73.02)	52 (76.47)		
Less	25 (13.23)	10 (14.71)		
9- Fatty Foods?				
Excess	14 (7.41)	1 (1.47)	7.025	0.03*
moderate	105 (55.56)	31 (45.59)		
Less	70 (37.04)	36 (52.94)		
10- Usage of Salt?				
Excess	16 (8.47)	1 (1.47)	4.278	0.12 ^{NS}
moderate	115 (60.85)	42 (61.76)		
Less	58 (30.69)	25 (36.76)		
11- Usage of medicines?				
Excess	12 (6.35)	1 (1.47)	5.85	0.05*
moderate	58 (30.69)	14 (20.59)		
Less	119 (62.96)	53 (77.94)		
12- Smoking?				
Chain Smoker	5 (2.65)	0 (0.00)	13.51	0.001**
Moderate	33 (17.46)	1 (1.47)		
No	151 (79.89)	67 (98.53)		
13- Sleep Status?				
8 hours	82 (43.39)	22 (32.35)		
6 hours	96 (50.79)	33 (48.53)	11.02	0.004**
5 or less than 5 hours	11 (5.82)	13 (19.12)		
14- Obesity				
Yes	38 (20.11)	12 (17.65)	0.1929	0.66 ^{NS}
No	151 (79.89)	56 (82.35)		

NS = Non-significant (P>0.05); *= Significant (P<0.05); ** highly significant (P<0.01) SD = Standard deviation; SE = Standard error

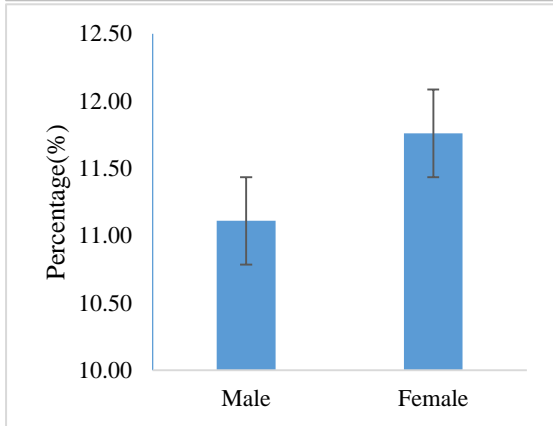
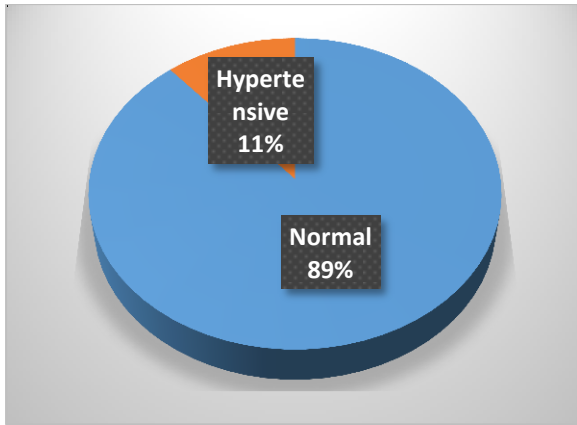


Figure 1: Prevalence of Hypertension (a) and comparison of male and female (b) hypertensive teachers

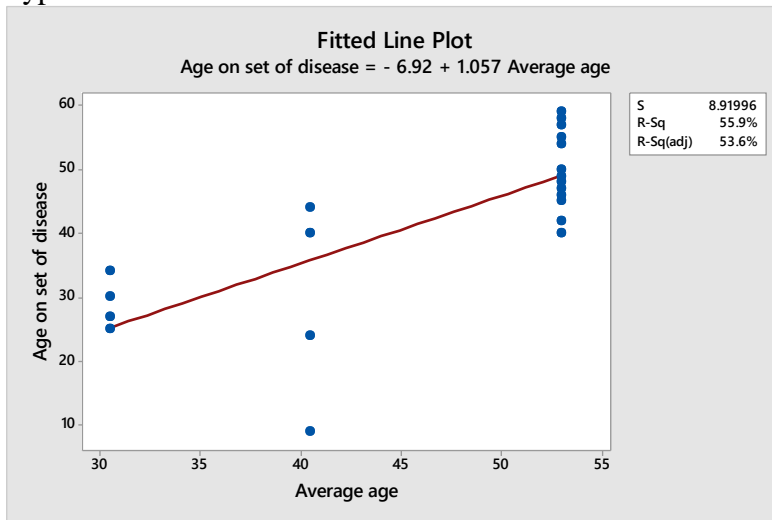


Figure 2: Age of onset of hypertension in male teachers

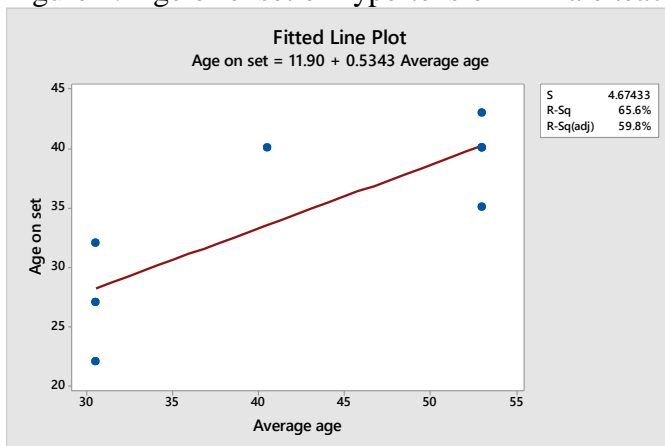


Figure 3: Age on set of hypertension in female teachers

Table 4: Demographic characteristics linked with hypertension in school teachers

Character	Hypertension		
	Total N (%)	Male N (%)	Female N (%)
Age			
18-25 Years	-	-	-
26-35 Years	07 (2.72)	04(2.12)	03(4.41)
36-45 Years	05 (1.95)	04(2.12)	01(1.47)
46-60 Years	17(6.61)	13(6.88)	04(5.88)
Material status			
Single	01(0.39)	01(0.53)	-
Married	27(10.50)	20(10.58)	07(3.70)
Education			
Under Graduate	04(1.56)	03(1.59)	01(1.47)
Graduate	11(4.28)	09(4.76)	02(1.06)
Post Graduate	14(5.45)	09(4.76)	05(7.35)
Income			
0-500000	14(5.45)	11(5.82)	03(4.41)
50000-1 Lac	11(4.28)	07(3.70)	04(5.88)
Above 1 Lac	04(1.56)	03(1.59)	01(1.47)
Residency			
Urban	27(10.51)	20(10.58)	07(10.29)
Rural	02(0.78)	01(0.53)	01(1.47)

Discussion

The study based on the prevalence or burden of specific disease in a particular nation or target population is very important because it provides the true picture of load (Ahmed et al., 2016; Shaban et al., 2025). The datasheet collected will help identify high-risk groups (Saeed et al., 2025; Umar et al., 2025). It also guides the health professional for the target screen and prevention strategies (Mehmood et al., 2025). In addition to this, cross-sectional studies also provide the baseline for monitoring trends over time and their impact on the public health intervention policy changes (Anees et al., 2025; NAWAZ et al., 2022; Rafique et al., 2021).

This study assessed the prevalence of hypertension, its risk factors and age of onset in both sexes among the 257 school teachers, including 75.44% male and 26.56% female. Overall, the prevalence of hypertension was similar in both sexes, i.e. male (11.11%) and females (11.76%). This suggests a comparatively small sex differential in the teaching occupational cohort. Although hypertension is commonly associated with age, diet, adiposity, and physical inactivity, however, near equal prevalence in both sexes in this studied population may reflect shared workplace exposures as risk profile between male and female teachers (Farrar & Frieden, 2025). The observed prevalence of hypertension ranged from 11-12%. It appears lower than many community-based studies in Pakistan, which report substantially higher prevalence, with one-third of adults in older age groups (Shafi & Shafi, 2017). The lower prevalence in the current study may be related to differences in age structure, level of awareness, occupational health and selection factors. However, direct comparison should be made to estimate the sensitivity to age distribution, diagnostic criteria and measurement protocols.

If the results of this study are compared with other countries of south Asian region, such as in Kerala, India, the prevalence is higher, such as 14.6%. Although the Kerala study highlights that hypertension increased with advancing age and increasing

weight (Mini et al., 2020). Variation in the results among teachers from different regions is expected due to age composition and risk-factor patterns. However, the findings reinforce that teachers are an important working group for screening and prevention. This study reported stress as an important risk factor for hypertension, as most of the respondents reported high job stress ($\approx 51\%$ in both sexes). These stresses include departmental issues and family concerns, such as children's education and disobedience. Most of the studies reported that occupational stress is linked to high blood pressure in teachers (Chetia et al., 2018).

Sleep duration is another risk factor, and 19.12% women reported less than 5 hours of sleep compared to 5.82% men. Half of both sexes reported 6 hours of sleep. Different studies reported that short sleep duration is associated with prevalent hypertension in different working male and female age groups (Wang et al., 2012). Short sleep duration in a high proportion of female teachers could plausibly contribute to CVDs and align with the earlier estimated age of onset in women (34.87 ± 6 years). This interpretation should remain cautious because the study design and available data do not allow causal inference.

The dataset of the current study also indicated that a relatively small proportion of the target population used excess intake of vegetables/food, salt and fatty food. Excess salt use was commonly reported by men. The excess intake of sodium has a well-established link with elevated blood pressure, and the WHO recommended less than two grams of sodium per day to reduce the risk of cardiovascular diseases (WHO, 2018).

The current study further reports 20.11% obesity in men and 17.65% in women. Obesity also has a strong link with elevated blood pressure via multiple pathways (Shariq & McKenzie, 2020). The coexistence of obesity with moderate stress and short sleep-in professional groups can be linked with hypertension and the need for interventions such as health diet, good hygiene condition, better sleep and stress management. As hypertension is often underdiagnosed and asymptomatic, it is highly recommended that school-based occupational screening may be a good strategy for the good well-being of the teachers. It will also reduce the risk of CVDs and premature deaths (Farrar & Frieden, 2025). Therefore, it is feasible for school teachers to measure BP at school; referral of the confirmed cases and health promotion programs can be good interventions.

This study concluded that hypertension affected roughly one in nine teachers in this studied population and comparable prevalence in men and women. The data suggest a pattern of moderate-to-high perceived stress, short sleep, obesity, and dietary habits, all of which are consistent with established modifiable determinants of elevated blood pressure and support the value of routine screening and comprehensive workplace health programs for teachers.

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