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Prevalence of Hypertension and Perceived Stress among University Employees in Solapur, India (2022)

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Abstract

Background: Stress is an important psychosocial factor responsible for the hypertension. Globally, university employees reported a high prevalence of hypertension, and perceived stress; however, in Indian context, as few studies documented this association, we conducted a study documenting the prevalence of hypertension and perceived stress among employees of Solapur University.

Material and Methods: A cross-sectional study was conducted during June – September 2022 to screen 231 university employees for hypertension following International Society of Hypertension guidelines. Perceived psychological stress was assessed with Cohen's Perceived Stress Scale. Chi-square test and both univariate and multivariate logistic regressions were used to evaluate the hypotheses. The significance level for the p-value was set at ≤0.05, and statistical analysis was conducted using Stata 12.1.

Results: The overall prevalence of hypertension was 39%. More than half of employees (54%) were under moderate to high levels of stress, and they were more likely to be hypertensive than those under low stress. Staff with more than 30 years and in non-teaching posts were about two times more at higher risk of hypertension, and male staff, and those having moderate to high-stress levels were 2.5 times more likely associated with the risk of hypertension as compared to others.

Conclusions: University employees are under high levels of stress which are prone to developing hypertension. There is a need to screen more and more Indian university employees for the presence of hypertension and stress to design appropriate hypertension prevention programmes.

Keywords: Hypertension, Stress, Prevalence, Prevention, Employees, India.

Introduction

Hypertension is the most important modifiable risk factor for the development of cardiovascular illnesses, and it causes premature mortality and disability due to consequences such as stroke, renal failure, and heart attacks. [1] As per an estimate, a two hundred million adult Indian populations are hypertensive. [2] In Indian context, hypertension prevalence substantially increased to 24% in males and 21% in females as per the 2019-20 National Family Health Survey -V round (NFHS-V), which is much higher than previous NFHS-IV round values of 19% (males) and 17% (females). [3]

The latest study reported that around 1.7 million Indian populations (28%) had hypertension, of whom 37% received a diagnosis; 45% of those who received a diagnosis (18% of total with hypertension) reported taking medication, and 52% of those treated (that is only 8.5% of the total with hypertension) achieved blood pressure control. [4] Consequently, the alarming situation in India, which is characterized by an increased prevalence of hypertension, undiagnosed

cases of hypertension, and a poor control rate, requires targeted, decentralized solutions to enhance hypertension care. Uncontrolled hypertension can cause severe heart damage. Excessive pressure can harden the arteries and restrict blood, and oxygen flow to the heart. This increased pressure and decreased blood flow can cause chest pain, called angina. Heart attack occurs when the blood supply to the heart is blocked, and heart muscle cells die due to lack of oxygen. Heart failure, which happens when the heart is unable to pump enough blood and oxygen to other essential organs in the body, irregular heartbeat, which may result in sudden death, and heart damage increase with the length of time blood flow is stopped. Hypertension can cause arteries that supply blood and oxygen to the brain to burst or block, which can lead to a stroke. In addition, hypertension can cause kidney damage, which can lead to kidney failure. [5]

Stress was attributed to the development of hypertension. [6] Stress can cause hypertension either by developing maladaptive behavioural responses or physiological pathways. Maladaptive behavioral responses to stress include the initiation of smoking, the consumption of tobacco or alcohol, a poor diet, and a loss of physical activity. An additional mechanism by which stress induces hypertension is a physiological response of the body. A sympathetic nervous system reaction is initiated by stress, which results in the production of catecholamines and an increase in blood pressure, cardiac output, and pulse rate. Seven There is a need for screening people for hypertension and, at the same time, assessment of psychosocial factors, especially stress, present in them contributing to the development of hypertension. [6, 7]

Multiple studies done across the various regions of World show a high prevalence of hypertension among university employees. Many studies done across Asia [8-15], Africa [16-23] and Europe [21] reported an average prevalence (26.3%) of hypertension in university employees with a minimum of 8% (Uganda, N=156) [19] and a maximum of 64% (Ukraine, N=131) [21]. Only a single study so far reported from Indian context, which was carried out in a university, showed a hypertension prevalence of 37%. [14] Faculty, support staff, and researchers comprise university personnel. Twenty-two Throughout their lifetime, they endure variable levels of occupational stress as a result of a variety of factors, including interpersonal pressure, societal pressure, role ambiguity and conflict, burden, and workplace deadlines. [23, 24] Recent studies confirmed a positive association between perceived stress, and hypertension among university employees. [25-31] Worksite screening helps identify undiagnosed hypertension and early intervention, and treatment to reduce premature mortality and morbidity arising out of hypertension. [32] Based upon the scarcity of data on hypertension among Indian university employees, screening university employees across India for hypertension is necessary for identifying at-risk populations, and devising a population-based prevention program for the prevention and control of hypertension. [14] In order to record the prevalence of hypertension and its correlation with felt stress among university staff, we carried out a cross-sectional research at Solapur University, a state institution in Maharashtra, India.

Materials and Methods

The study was conducted at the health centre of Solapur University campus. The study was approved by Institutional Ethics Committee of Savitribai Phule Pune University (Ref No. SPPU/IEC/2019/07). A thorough and comprehensive list of every employee who has been working consistently since last year was supplied by the university administration. These staff members comprised daily pay workers, administrative, clerical, support, and all permanent and contract faculty. The sample size 288 was calculated using an Epi-info statistical calculator, which considered hypertension prevalence 25% with a 95% confidence interval, and 5% acceptable margin of error with a design effect of 1. University employees who were regular in their service were checked by their names on University roll-call or Muster only and were included in this study. Those who were on temporary contracts or hired hourly were excluded. Employees fitting the inclusion criteria were randomly selected, and called for health checkups at a health centre between June and September 2022. Out of these employees, only those who gave written consent were recruited for the study. Two hundred and thirty-one employees participated, with a response rate of 80%. A comprehensive medical history was obtained to determine the presence of any pre-existing comorbidities. We employed the WHO STEPS Q-by-Q Guide for Non-communicable Disease Risk Factor Surveillance to gather data on fundamental sociodemographic profiles and cardiovascular risk factors.[33] Anthropometric measurements like body mass index and waist-to-hip ratio were measured. Body mass index (BMI) was calculated using Quetelet's formula, and WHO BMI classification for Asian adult population was used to categorize the study participants.[34, 35]

Blood pressure readings were taken by helping OMRON-HBP1300 BP apparatus as recommended by STRIDE-BP. [36] We used the 2020 International Society of Hypertension (ISH) Global Hypertension Practice Guidelines for classifying employees as Grade I Hypertensive (SBP 140-159 mm Hg or DBP 90-99 mm Hg), Grade II Hypertensive (SBP ≥160 mm Hg or DBP ≥ 100 mm Hg) or Normal (SBP <130 mm Hg or

DBP < 85 mm Hg). [37]

Perceived stress was measured using Cohen's Perceived Stress Scale (PSS). It is the most widely used psychometrically validated and reliable measure of perceived stress. [38, 39] It consists of 10 items measured on a five-point Likert scale (0: never, 1: almost never, 2: sometimes, 3: fairly often, 4: very often). PSS identifies "general stressors" and "the ability to cope." The PSS score is obtained by summing the scores of all the items, with reverse coding for items 4, 5, 7, and 8 as they are positively stated. PSS score ranges from 0 to 40, with 40-point score representing the highest perceived stress level. [40]

Results

Table 1 presents the profile of university personnel. Among 231 university staff, 75% were male, 82% were non-teaching (administration and support personnel), and 74% were cadre III-IV staff (clerical and support personnel) that participated in the research. The median age of participants was 36 years (IQR=30, 41). About 54% of staff reported moderate to high perceived stress levels. Grade I and II hypertension were observed in 28% and 7% of staff, respectively (Table 1).

Table 1. Profile of university staff

Profile		Respondents (N=231)
		n (%)
Age	≤ 30 years	58 (25.1)
	> 30 years	173 (74.9)
	Median (IQR)	36 (30, 41)
Gender	Female	58 (25.1)
	Male	173 (74.9)
Type of staff	Non-teaching (Admin & Support Staff)	190 (82.3)
	Teaching (Faculties)	41 (17.7)
Cadre	Class I (Faculties & Officers)	49 (21.2)
	Class II (Section Heads)	11 (4.8)
	Class III (Clerical Staff)	98 (42.4)
	Class IV (Servants and Support Staff)	73 (31.6)
Perceived stress level	Low stress (Score: 0-13)	106 (45.9)
	Moderate stress (Score: 14-26)	117 (50.6)
	High stress (Score: 27-40)	8 (3.5)
	Score: Median (IQR)	15 (10, 19)
Hypertension	Normal (BP < 140/90 mmHg)	140 (60.6)
	Grade I (SBP: 140-159 mmHg or DBP: 90-99 mmHg)	75 (32.4)
	Grade II (SBP > 160 mmHg or DBP > 100 mmHg)	16 (6.9)
	Systolic blood pressure (mmHg): Median (IQR)	122 (118, 130)
	Diastolic blood pressure (mmHg): Median (IQR)	80 (74, 90)

(SBP-Systolic Blood Pressure, DBP-Diastolic Blood Pressure)

In all, 39.3% (95%CI=33%, 46%) of staff had hypertension (BP>140/90 mmHg), 43% (95%CI=36%, 50%) were aged more than 30 years, 43% (95%CI=36%, 51%) were male, 46% were teaching staff (95%CI=32%, 61%), 52% (95%CI=41%, 63%) were support staff and 45% (95%CI=32%, 59%) were officers staff.

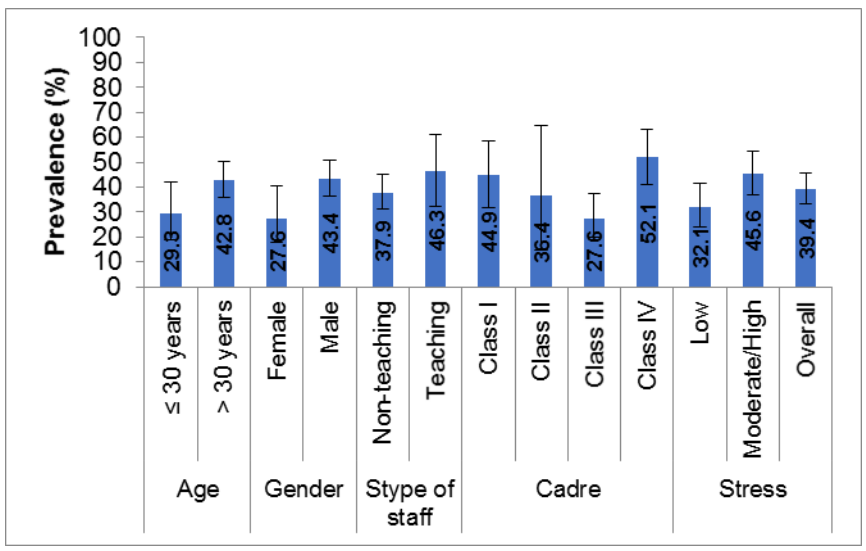

Fig. 1. Prevalence of hypertension in university staff

The prevalence of hypertension was observed as 46% (95%CI=37%, 54%) of staff who perceived moderate to high-stress levels. The prevalence of hypertension is shown in Figure 1. Hypertension was significantly higher in male staff (p-value=0.033), and Class IV (support staff) and Class I (faculties and administrative officers) staff (p-value=0.010). It was significantly higher among 46% of staff who perceived moderate/high-stress levels (p-value=0.036) (Table 2, 3).

Table 2. Prevalence of hypertension in university staff

Variables		Total respondents	Hypertension		P-value
			Normal (BP < 140/90)	Hypertension (BP >140/90)	
		N	n (%)	n (%)	
Total		231	140 (60.6)	91 (39.4)	0.001
Age	≤ 30 years	58	41 (70.7)	17 (29.3)	0.069*
	> 30 years	173	99 (57.2)	74 (42.8)	
Gender	Female	58	42 (72.4)	16 (27.6)	**0.033***
	Male	173	98 (56.6)	75 (43.4)	
Type of staff	Non-teaching	190	118 (62.1)	72 (37.9)	0.315
	Teaching	41	22 (53.7)	19 (46.3)	
Cadre	Class I	49	27 (55.1)	22 (44.9)	**0.010***
	Class II	11	7 (63.6)	4 (36.4)	
	Class III	98	71 (72.4)	27 (27.6)	
	Class IV	73	35 (47.9)	38 (52.1)	
Perceived stress level	Low stress	106	72 (67.9)	34 (32.1)	**0.036***
	Moderate-high stress	125	68 (54.4)	57 (45.6)	

Table 3. Prevalence of Stress in university staff

Variables		Total respondents	Perceived Stress		P-value
			Low	Moderate-High	
		N	n (%)	n (%)	
Total		231			
Age	≤ 30 years	58	22 (37.9)	36 (62.1)	0.1599
	> 30 years	173	84 (48.6)	89 (51.4)	
Gender	Female	58	19 (32.8)	39 (67.2)	**0.0167***
	Male	173	87 (50.3)	87 (49.7)	
Type of staff	Non-teaching	190	78 (41.1)	112 (58.9)	**0.0015***
	Teaching	41	28 (67.3)	13 (31.7)	
Cadre	Class I	49	31 (63.3)	18 (36.7)	**0.00017***
	Class II	11	9 (81.9)	2 (18.1)	
	Class III	98	44 (44.9)	54 (55.1)	
	Class IV	73	22 (30.1)	51 (69.9)	
BP level	Normal	140	72 (51.4)	68 (48.6)	**0.0361***
	Hypertension	91	34 (37.4)	57 (62.6)	

*p values significant at p<0.05 using chi square test

In univariate logistic regression, male (OR=2.01, 95%CI=1.049, 3.847) staff perceived moderate to high perceived stress levels (OR=1.78, 95%CI=1.036, 3.042) which were about two times significantly more likely associated with risk of hypertension. Conversely, clerical personnel (OR=0.47, 95%CI=0.228, 0.955) exhibited a substantially reduced likelihood of 53% in relation to the risk of hypertension. In the final multivariable logistic regression model, it was noted that staff over 30 years of age (AOR=2.13, 95%CI=1.094, 4.154) and non-teaching personnel (AOR=1.93, 95%CI=0.924, 4.030) exhibited about double the likelihood of being at an elevated risk for hypertension. However, male staff (AOR=2.47, 95%CI=1.249, 4.901), and the staff who perceived moderate to high-stress levels (AOR=2.45, 95%CI=1.356, 4.443) were 2.5 times more likely associated with the risk of hypertension compared to other staff. The results are shown in Table 4.

Table 4. Risk factors of hypertension in university staff

Variables		Univariate models		Multivariable model	
		OR (95% CI)	**P-value**	**AOR (95% CI)**	**P-value**
Intercept				0.10 (0.036, 0.265)	< 0.0001
Age	≤ 30 years	1.00			0.026
	> 30 years	1.80 (0.950, 3.421)	0.071	2.13 (1.094, 4.154)	
Gender	Female	1.00			0.009
	Male	2.01 (1.049, 3.847)	0.035	2.47 (1.249, 4.901)	
Type of staff	Non-Teaching	1.00			0.080
	Teaching	1.42 (0.717, 2.794)	0.317	1.93 (0.924, 4.030)	
Cadre	Class I	1.00			
	Class II	0.70 (0.182, 2.709)	0.607		
	Class III	0.47 (0.228, 0.955)	0.037		
	Class IV	1.33 (0.644, 2.755)	0.439		
Perceived stress	Low	1.00			0.003
	Moderate to high	1.78 (1.036, 3.042)	0.037	2.45 (1.356, 4.443)	

AOR: adjusted odds ratio, CI: confidence interval, OR: Odds ratio

Discussion

Against the background that hypertension is one of the critical risk factors of cardiovascular diseases and stress is attributed to the development of hypertension, our study aimed to document the prevalence of hypertension and perceived stress among employees of Solapur University, India. Our research findings revealed a substantial correlation between stress levels in university employees and hypertension, indicating that over fifty percent of employees experienced moderate to high stress levels, making them more susceptible to hypertension compared to those with lower stress levels. Further study results showed that being a university employee, being a man, having more than 30 years of age, being employed in non-teaching posts, and having moderate to high levels of stress led employees to a higher risk of hypertension. The study measured occupational stress following the cross-sectional, one-time measurement, but University employees were experiencing occupational stress throughout their work lives, possibly in terms of the increased workloads and urgent deadlines. However, simultaneously, the study revealed the unmet need for hypertension and stress screening for employees in workplaces, even in organized setups or institutions like universities.

In our study, the hypertension among university employees was prevalent in more than one-third of the employees (39%) , which was higher than the national (22.8%) as well as Maharashtra State (16.01%) averages. [32] The high prevalence of hypertension amongst the study population is similar to those reported from a similar population of university employees from a single study from China (37.9%) [15], and India (37%) [14], Zambia (40%) [43], two studies from South Africa (35.5% & 35%) [30, 42]. Other studies have reported lesser prevalence: one study from India (31%) [26], two studies from Pakistan (25% and 31.5%) [25, 45], a few studies from Saudi Arabia (22%, 31%, 12.4%) [10-12], one study from Ethiopia (20.9%) [18], Tanzania (23.1%) [42]. Still, these figures are higher than their national averages for Pakistan (18.9%) [46], Saudi (9.2%) [47], Ethiopia (18%) [48], and Tanzania (16.7%) [49]. Hypertension prevalence was higher in teaching employees (46.3%) as compared to non-teaching employees (37.9%), possibly because of a smaller number of participants from teaching staff (n=41) as compared to non-teaching staff (n=190). Another cause may be that instructors were assigned supplementary administrative duties owing to the university's personnel shortages. The additional job obligations may lead to work-related strain and occupational stress. A study conducted among Indian university teachers inferred that role overload, strenuous working conditions and unreasonable group pressure contributed to the stress. On this line, we need to examine the present employees of universities to determine the possible causes of stress in them. [23]

The levels of perceived stress among non-teaching employees (58.9%) were higher than those of teaching employees (31.7%). We observed a significant difference in perceived stress between teaching and non-teaching employees. ($p<0.0015$). The non-teaching staff has various occupation levels, ranging from officers to support staff such as clerks and sweepers. Their number is also on the higher side, and they are the ones who deal with day-to-day activities that involve an element of stress. These activities include handling student grievances, timely compliancewith government orders, and pressure from students and other organizations. These could be the source of occupational stress. Moreover, many non-teaching employees are employed contractually at university, and

there is job insecurity in their minds; this could be an additional stress source.

According to our research, 3.5% of workers reported severe stress and 51% reported moderate stress. These numbers are consistent with earlier research conducted in South Africa, which found that 50% of university employees felt moderate stress, compared to 61% of employees at a Nigerian institution [28] and 48% of employees at another Nigerian university. [29] We found a significant association between gender and perceived stress. Male employees perceived stress more than female employees. ($p<0.0161$). A relatively larger number of male participants, personality factors, personal habits and positional aspects could be the reason for higher perceived stress among male employees. Further, our study found that staff who perceived moderate to high stress were more likely to be hypertensive than the employees who perceived low stress. There is a significant association between higher perceived stress and blood pressure levels. ($p<0.0361$) A similar association was reported in studies across the globe. [25-30] Stress plays an integral part in the development of hypertension, and it should be considered as an integral part of devising any preventive and health-promotive workplace intervention programme. [6, 7]

The distribution of the employee population in the current investigation is not uniform. The number of non-teaching personnel in the study is significantly greater than that of the teaching staff. In the same vein, the number of female participants in the study is significantly lower than that of male participants. The statistical conclusions that can be deduced from the study may be affected by this distribution. Large cross-sectional surveys with larger sample sizes across Indian universities are needed to understand the accurate picture of hypertension prevalence and occupational stress among university employees.

Conclusion

Our study confirms a high prevalence of hypertension among university employees, which is found to be associated with perceived stress at the workplace. The significant incidence of hypertension, coupled with felt stress among university personnel, indicates an immediate need to evaluate the prevalence of stress and hypertension throughout a comparable demographic of university employees throughout India. There is a need to assess the causes of perceived stress and understand the socio-cultural aspects of hypertension. The findings of such studies can be used to develop comprehensive workplace hypertension and stress screening programmes with particular reference to identifying the persons at risk of developing hypertension and consequent CVDs.

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Conflict of interest

None declared.

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Ethical Considerations

The required administrative permissions for the conduct of this study in the university settings were taken from the Vice-Chancellor of Punyashlok Ahilyadevi Holkar University, Solapur , Maharashtra, India. Written informed consent was obtained from the respondents before they participated in the study. Interviews were conducted in local languages and at places convenient for the respondents to ensure privacy.

Code of Ethics

The Institutional Ethics Committee (IEC) of Savitribai Phule Pune University, India, approved this study and provided ethical clearance (Ref. No. SPPU/IEC/2019/07 dated 6 February 2019). This IEC follows Indian Council of Medical Research (ICMR) National Ethical Guidelines for Biomedical and Health Research Involving Human Participants Guidelines, 2017 for its rigorous monitoring of research. In the entire conduct of our study, we adhered to the Declaration of Helsinki as mandated by ICMR.

Authors' Contributions

Abhijeet Jagtap: Participated in conceptualisation and designing of the study, coordinated data collection and analysis of the study and drafted, revised and reviewed the manuscript. Uma Mahajan: Analysed the data and reviewed the manuscript. Abhay Kudale: Conceptualised the study, participated in the design and analysis of the study, and critically drafted, revised, and reviewed the manuscript. All authors have read, reviewed, and approved the final manuscript.

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