A lay epidemiological study on coexistent stress in hypertension: Its prevalence, risk factors, and implications in patients' lives

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Abstract

Introduction: Hypertension poses a global challenge in terms of morbidity and mortality. Worldwide prevalence of hypertension is over 40%. Management of hypertension targets blood pressure control to prevent disease complications. Though stress and hypertension are closely related, stress management is often overlooked in the treatment of hypertension. **Aims:** (1) To estimate the prevalence of stress in hypertensive patients and (2) to study the associated risk factors of stress and its implications in disease management. **Materials and Methods:** It was a hospital-based, cross-sectional study done in Western India for 1 year. Data were collected from 400 hypertensive patients attending the selected health institutions using a pretested questionnaire. Chi-square tests were done using Medcalc 10.4.8.0. **Results:** The prevalence of stress in hypertensive patients was found to be 84.3%. Only 2.4% of these patients sought help from any health professional for stress. The most common stressors found in the patients were financial dependence on others, living in rented house, having a daughter of marriageable age because of associated dowry, death of a loved one, sleep-related problem, and owing a debt among others. Significant statistical association ($P < 0.05$) of stress was observed with the type of family and socioeconomic status. A highly significant association ($P < 0.001$) of stress with religion and residential area (whether urban non-slum, slum, or rural) was observed. Stress in individuals leads to poorer compliance with treatment and blood pressure control. **Conclusion:** Coexistent stress should be diagnosed and managed in patients of hypertension for proper disease management and control.

Keywords: Blood pressure, cardiovascular disease, comorbidity, mental health, noncommunicable disease

Introduction

Hypertension (HT) is a chronic cardiovascular disease characterized by persistently raised blood pressure (BP > 140/90 mm Hg) and leading to various detrimental effects in most organs and systems of the body. Being a major cause of morbidity and mortality, HT poses a public health threat across the globe.[1,2] The synergistic effect of both genetic and environmental factors plays a causal role in its development and progression. Among the environmental factors, various psychosocial factors, like psychological stress, are believed to be important causes of its etiology.[3] Health of a hypertensive patient is adversely affected, directly through neuroendocrine mechanisms or indirectly through their association with faulty lifestyle, on exposure to such a risk factor.[4] This hypothesis has been supported by findings of various epidemiological

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studies like the Framingham study,[5] INTERHEART study done across 52 countries,[6] and the MRFIT (Multiple Risk Factor Intervention Trial).[7] This association is a cause of concern as rapid urbanization and modernization, industrialization, migration, occupational, and educational challenges in the competitive world have led to increase in stress level in individuals which can lead to HT, if prolonged. Again, better quality of life and healthcare has led to increased lifespan that makes way for the development of chronic diseases related to senility such as HT, and the awareness of one's hypertensive state can give birth to stress.[8] This forms a vicious cycle of stress and HT: one leading to or aggravating the other. Though the prevalence of both stress and HT is quite high in the community, very few studies have been done to find out their coexistence and associated factors, and the presence of stress is often overlooked in hypertensive patients resulting in poor disease outcome. This study has been designed to fill this gap so that better management of HT and comorbid chronic stress can be done. This study aimed at (1) estimating the prevalence of stress and various stressors in hypertensive patients, (2) assessing the associated risk factors of stress, and (3) studying its implications in the disease (HT) management.

Materials and Methods

A quantitative, hospital-based, cross-sectional study was conducted in Jamnagar, a coastal district is in the westernmost part of India for 1 year, from July 2013 to June 2014.

Sample size calculation and sampling technique: sample size (N) was calculated using the formula $4pq/L^2$ where p is anticipated population proportion, q is 100 – p, and L is relative precision. At 95% confidence level, taking prevalence (p) as 50%[9,10] and L as 10% of p, a sample size of 400 was calculated. Out of the total sample size, half of the study subjects were selected from the tertiary care hospital of the study district and remaining 200 were selected from Community Health Centers (CHCs) of the study district. There were 11 CHCs in the study district, of which 50% (5 CHCs) were chosen through simple random sampling technique. Thus, 40 patients from each of CHCs were taken for the study.

Study population

Hypertensive patients attending NCD clinics at the Guru Govind Singh Government Hospital (GGH) and the selected CHCs of Jamnagar district formed the study population.

Inclusion criteria:
1. Patients aged ≥30 years
2. Patients already diagnosed as having HT.

Exclusion criteria:
1. Patients who do not satisfy the inclusion criteria
2. Patients not willing to participate
3. Critically ill patients
4. Pregnant patients.

Operational definitions: "control of HT" was defined as BP <140/90 mm Hg in a subject on regular antihypertensive therapy.[11] "Socioeconomic status (SES)" was estimated on the basis of *Modified Prasad's Classification (1961)* which was modified according to *AICPI (All India Consumer Price Index)* of the year 2013 using AICPI.[12] "Stress" was defined as "feeling irritable, filled with anxiety, or as having sleeping difficulties as a result of conditions at work or home."[6]

Data collection

Data collection was done through by personal interview carried out using a predesigned, pretested, semistructured pro forma comprising questions about sociodemographic factors, history, family history, any other comorbid condition, or existing risk factors, including probing about stress and sleep-related problems, his/her knowledge and attitude about HT, and their practices to control the disease. Anthropometric measurements and clinical examination were done. Data were collected from patients only on their first visit after the onset of the study. If a patient had been already included in the study, then the next patient was taken up for the study to avoid repetition.

Statistical analysis

The data entry was done using Microsoft Office Excel 2007 and data analysis was done using Medcalc 10.4.8.0. The Chi-square test was used as the test of significance where $P < 0.05$ was considered significant.

Ethical consideration

The study protocol was reviewed and approved by The Institutional Ethical Committee of Shri M.P. Shah government Medical College, Gujarat. Informed consent was taken from all participants of the study after fully explaining the purpose of the study and assuring them of full confidentiality. The interview was conducted in a language they well understood.

Results

Of the 400 enrolled patients in the study, 228 (57%) of the hypertensive patients were females, and the ratio between male and female patients was 1: 1.33. More than half (207) of the patients were from the 40–59 years age group succeeded by the geriatric age group of 60 and above. Most of the patients enrolled in the study were Hindus (80.8%), married (86.5%), literate (74%), housewives (45.3%), and belonged to nuclear families (61%). As per Modified Prasad classification, the highest proportion (36.3%) of participants in this study belonged to the lower middle class (IV) and the least 23 (5.8%) were from the lower class (V). Three hundred and four (76%) patients were from urban areas. Only 116 (29%) of the hypertensive patients had achieved control of BP though compliance with treatment was seen in 359 (89.8%) of the patients. A large number of patients, 337 (84.3%), suffered from stress [Table 1]. We found that only 8 (2.4%) of the
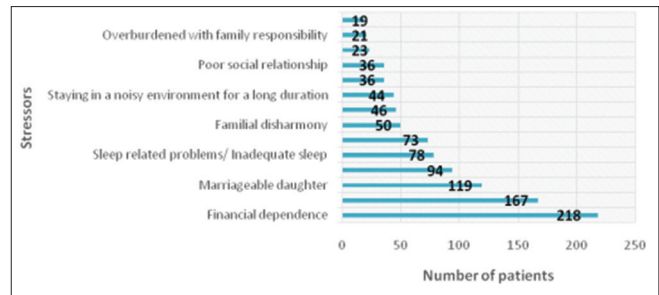
Table 1: Patients' characteristics

Variables	Frequency (*n*)	Percentage (%)
Sex		
Male	172	43
Female	228	57
Age (in completed years)		
30-39	30	7.5
40-49	102	25.5
50-59	105	26.3
≥60	163	40.7
Religion		
Hindu	323	80.8
Muslim	75	18.7
Others	2	0.5
Marital status		
Married	346	86.5
Single	54	13.5
Type of family		
Nuclear	244	61
Joint	156	39
Education		
Illiterate	104	26
Up to primary	195	48.7
Secondary and above	101	25.3
Occupation		
Laborer	63	15.8
Businessman	34	8.4
Housewife	181	45.3
Retired	42	10.5
Others	80	20
Socioeconomic class		
I (upper class)	37	9.2
II (upper middle class)	105	26.2
III (middle class)	90	22.5
IV (lower middle class)	145	36.3
V (lower class)	23	5.8
Residential area		
Urban non-slum	215	53.8
Urban slum	89	22.2
Rural	96	24
Perceived stress status		
Stress "+"	337	84.3
Stress "-"	63	15.7
Treatment compliance		
Compliant	359	89.8
Noncompliant	41	10.2
Status of BP control		
Controlled	116	29
Not controlled	284	71

BP: Blood pressure

Figure 1: Self-reported stressors in patient's lives (*n* = 337) *(multiple answers)*

337 patients suffering from stress sought help from any health professional.

The most common stressors found in the patients were financial dependence on others in 218 (64.6%), living in rented house and not owning a place to live in 167 (49.5%), having a daughter of marriageable age because of associated dowry in 119 (35.3%), death of a loved one in 94 (27.8%), sleep-related problems like inadequate or disturbed sleep in 78 (23.1%), and owing a debt in 73 (21.6%) among others [Figure 1]. We found that only 8 (2.4%) of the 337 patients suffering from stress sought help from any health professional.

On studying the association between perceived stress in hypertensive patients with various sociodemographic features, significant statistical association ($P < 0.05$) of stress was observed with the type of family (whether nuclear or joint) and SES. Highly significant statistical association ($P < 0.001$) of stress with religion and residential area (whether urban non-slum, slum, or rural) was observed, whereas sex, age, marital status, education, and occupation of the patient did not show any significant statistical association ($P > 0.05$) with stress [Table 2]. We also studied the impact of stress on disease management and control and found out that stress in individuals led to poorer compliance with treatment (88.7%) than patients with no stress (95.2%), though it did not show any significant statistical association. Similarly, better BP control was seen in patients with no stress (76.2%) as compared with those with stress (20.2%) and this had a high statistical association [Table 3]. We observed that patients with severe perceived stress were more likely to be noncompliant. There were 11 such patients in our study, and we observed that only 2% of them were compliant and this association was statistically significant ($P = 0.0038$).

Discussion

This study showed a predominance of female patients (57%) over males which might be attributed to the fact that a large number (40%) of patients belonged to the geriatric age group of 60 years and above during which period, because of menopause, the risk of having HT in females becomes higher than males.[13] More than half of the patients belonged to 40–59 years, the age group that forms the "workforce" of a community. A majority of the participants in this study were married (86.5%) and were housewives (45.3%). Similar to our study, Jesus *et al.* in their study conducted in Sau Paulo observed a higher number of female patients; a majority of their patients were in 50s and also, most were married and were housewives.[14] We observed a higher rate of compliance with hypertensive treatment (89.8%) than most other studies[9,11,12] conducted in various countries of the world, but unfortunately, it did not get reflected in the BP status and a large number of patients (71%) had uncontrolled BP. This may be because of other associated factors, like high prevalence (84.3%) of coexistent stress, which were observed in the patients. Though the prevalence of coexistent stress was high in the patients, only 2.4% of the stressed individuals showed health-seeking behavior.

Table 2: Association between perceived stress and sociodemographics

Variables	Stress (%) n=337	No stress (%) n=63	Test statistic
Sex			χ^2=0.091, P=0.762*
Male	146 (84.9%)	26 (15.1%)	
Female	191 (83.8%)	37 (16.2%)	
Age (in completed years)			
30-39	25 (83.3%)	5 (16.7%)	χ^2=5.041, P=0.168*
40-49	91 (89.2%)	11 (10.8%)	
50-59	82 (78%)	23 (22%)	
≥60	139 (85.3%)	24 (14.7%)	
Religion			
Hindu	262 (81.1%)	61 (18.9%)	χ^2=12.431, P=0.0004‡
Others	75 (97.4%)	2 (2.6%)	
Marital status			
Married	291 (84.1%)	55 (15.9%)	χ^2=0.041, P=0.839*
Single	46 (85.1%)	8 (14.9%)	
Type of family			
Nuclear	195 (79.9%)	49 (20.1%)	χ^2=8.848, P=0.0029†
Joint family	142 (91%)	14 (9%)	
Education			
Illiterate	86 (82.7%)	18 (17.3%)	χ^2=0.304, P=0.8589*
Up to primary	166 (85.1%)	29 (14.9%)	
Secondary and above	85 (84.1%)	16 (15.9%)	
Occupation			
Laborer	58 (92%)	5 (8%)	χ^2=3.653, P=0.455*
Businessman	28 (82.3%)	6 (17.7%)	
Housewife	151 (83.4%)	30 (16.6%)	
Retired	35 (83.3%)	7 (16.7%)	
Others	65 (81.2%)	15 (18.8%)	
Socioeconomic class			
I (upper class)	31 (83.8%)	6 (16.2%)	χ^2=11.266, P=0.0237†
II (upper middle class)	82 (78%)	23 (22%)	
III (middle class)	71 (78.9%)	19 (21.1%)	
IV (lower middle class)	131 (90.3%)	14 (9.7%)	
V (lower class)	22 (95.6%)	1 (4.4%)	
Residential area			
Urban non-slum	163 (75.8%)	52 (24.2%)	χ^2=26.129, P=0.0000‡
Urban slum	81 (91%)	8 (9%)	
Rural	93 (96.9%)	3 (3.1%)	

*P>0.05 (not significant), †P<0.05 (significant), ‡P<0.001 (highly significant)

Table 3: Perceived stress and its implications in disease management

Variables	Stress "+" (n=337)	Stress "-" (n=63)	Test statistic
Treatment compliance			
Compliant	299 (88.7%)	60 (95.2%)	χ^2=2.448, P=0.117*
Noncompliant	38 (11.3%)	3 (4.8%)	
Status of BP control			
Controlled	68 (20.2%)	48 (76.2%)	χ^2=80.877, P=0.0000†
Not controlled	269 (79.8%)	15 (23.8%)	

*P>0.05 (not significant), †P<0.001 (highly significant), BP: Blood pressure

This shows the need for awareness about the impact of stress on disease control in patients and detailed history-taking by the healthcare providers. Other available literature shows that health-seeking behavior is generally poor in patients suffering from any mental health problem.[15] Also, at this point, it is important to mention that not only the health-seeking behavior

is poor but also the awareness regarding stress as a risk factor for HT is as low as 34.5% in the patients.[16]

In this study, patients belonging to a religion other than Hinduism suffered from more stress than their Hindu counterparts and this was statistically highly significant. Though some studies elicit the association of religiosity and better stress coping mechanisms, there is no literature on the association of any particular religion with stress.[17] This study exhibited a significant statistical association between the type of family and coexistent stress. Patients residing in joint families suffered from increased stress than those living in nuclear families, this may be attributed to the stressors like familial discord or feeling overburdened with responsibility, etc. Generally, families act as a buffer to stressful situations; however, when family relationships are unstable or troubled, they turn into a risk factor for stress instead.[18]

Patients belonging to the lower middle class and lower class had a higher level of perceived stress than other SES, and the association between SES and the presence of psychological stress was statistically significant. Low SES is generally associated with distress, prevalence of mental health problems, and health-impairing behaviors that are also related to stress.[19] Patients from urban non-slum areas had a lesser prevalence of stress than their counterparts from urban-slum and even rural areas. This was supported by a study done in Malaysia where they found that participants from rural area were more likely to be depressed, whereas urbanites had lower physical activities and more likely to be stressful.[20] Interestingly, sex, age, marital status, educational status, and occupation were not found to be risk factors for stress in this study. However, no consensus is there regarding the higher prevalence of stress in a specific age group. While Aldwin[21] believed that stress-generating problems, like marriage, divorce, starting new jobs, or having children, are more prevalent in younger age groups, Rodin[22] argued that older people should be more stressed as they are coping with chronic illness and disability, the loss of friends and family members, and their own impending mortality. With regards to the association between stress and sex, a study done in Jerusalem among young medical students of an average age of 25 years observed a greater level of stress was found among the males.[23] No consistent data were found on the relationship of stress with marital status.[24]

It was seen that only 68 (20.2%) out of 337 of patients with perceived stress had controlled BP as compared with 76.2% with no stress. Stress and control of BP showed a highly significant statistical association. The findings of this study were in agreement with the INTERHEART study[6] in which after adjusting for age, gender, geographic region, and smoking, they found that those who reported "permanent stress" at work or home had >2.1 times the risk for developing a myocardial infarction (MI), a complication of HT that is causally associated with poor BP control. Similarly, in a study by Vaccarino *et al.*, after adjusting for sociodemographic and lifestyle factors, coronary artery disease severity, and depression, a higher incidence of mental stress-induced MI was observed in young

women.[25] Similar data are available for males in the MRFIT where the investigators found that chronic work stress and marital dissolution increased the risk of cardiovascular mortality in males who were followed for 9 years.[7] A 2.15-fold increased risk for new coronary heart disease, another complication of HT often related with inadequate BP control, was observed in males who experienced a mismatch between effort and reward at work in the Whitehall II study.[26] Compliance was higher in patients with no perceived stress (95.2%) than in patients with stress (88.7%). However, there was no significant statistical association between the two variables. We observed that patients with severe perceived stress were more likely to be noncompliant. There were 11 such patients in our study; we observed that only 2% of them were compliant and this association was statistically significant. This was supported by an Iranian study where higher levels of stress in patients with HT had an independent impact on compliance with medication.[27]

Strengths and limitations

The study included participants from urban non-slum, slums, and rural region providing a wide representation of the population; however, being a hospital-based study, it might not be representative of the community.

Conclusion

Though "stress" is often ignored by the health professionals and the patients in treatment of HT, we found high prevalence of coexisting stress in the hypertensive patients. The findings of this study emphasizes that the treating family physicians should never overlook stress as an aggravating or inducing factor in HT and consider diagnosis and management of coexistent stress while treating HT for better disease control and management. Keeping in mind the common risk factors elicited in this study, there should be targeted interventions in these risk groups so that the burden of complications is reduced. Patients should also be made aware of the various stress-relieving therapies or nonpharmacological interventions like exercise, yoga, and meditation to aid the treatment of HT.

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Conflicts of interest

There are no conflicts of interest.

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