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Prevalence of prehypertension, hypertension, stress, anxiety among undergraduate medical students, and its association with cognitive failure: A cross-sectional study

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ABSTRACT

Background: Research shows that both hypertension and prehypertension accelerate the decline in standardized global cognitive performance. Two important risk factors for development of elevated BP are stress and anxiety. Hence, the study also focuses on assessing stress and anxiety in undergraduate medical students using validated questionnaires. **Aims and Objectives:** Hypertension and prehypertension are on a rise in undergraduate medical students and are proposed to accelerate cognitive failure. This study aims to provide prevalence of hypertension, prehypertension, anxiety, stress, and its association with cognitive failure among 1st year medical students in a medical college in North India. **Materials and Methods:** The study is a cross-sectional study conducted in the Department of Physiology of a Medical College on 1st year medical students. Google form was given to the whole batch of 150 medical students. Out of them, 111 students voluntarily participated. Hence, we have included them in our study. Standard questionnaire prescribed by Cohen et al., Spitzer et al., and Broadbent et al., for stress, anxiety, and cognitive failure respectively was given to students. Google documents were used as a platform to create online questionnaires that were automatically posted through a unique URL. Password protected access to URL link and a unique study ID gave students round the clock access. Unique study ID ensured confidentiality of all self-reported data. Student's response was secured using a "cloud" database, where data were automatically sorted, scaled, and scored by custom Excel formulas. Blood pressure of all the students was measured and a Google form consisting of items from these three questionnaires was filled by the students. Data were organized and statistically analyzed by Chi-square test. **Results:** In the present study, the prevalence of prehypertension was 46.8% and hypertension was 7.2%. Perceived stress score was moderate in 71.2% of subjects and high in 10.8% of subjects. Moderate-to-severe anxiety was recorded in 21.6% of students. Cognitive failure score was high (>43) in 24.3% of students. A Chi-square test of independence was performed to examine the relation between blood pressure and cognitive failure. Relationship between these variables was significant X^2 (1, n = 111) = 7.08, P = 0.029. Patients with hypertension are likely to develop cognitive failure than those with normal blood pressure. **Conclusion:** The prevalence of prehypertension and hypertension is rising in medical students. Anxiety and stress being the major causes need to be addressed so as to maintain cognitive well-being of the undergraduate medical students.

Key words: Anxiety; Cognition; Hypertension; Prehypertension; Stress

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INTRODUCTION

Joint National Committee-7 (JNC-7) guidelines define prehypertension, also known as Stage 1 hypertension as systolic blood pressure (SBP) of 120–139 mm Hg and/or diastolic blood pressure (DBP) of 80–89 mm Hg. Values of SBP above 139 mm Hg and DBP above 89 mm Hg are hypertension. Prehypertensive patients are at twice the increased risk for progression to hypertension than those with lower values.[1] Research shows that both hypertension and prehypertension accelerate the decline in standardized global cognitive performance.[2] Cognitive failure is a cognitive error occurring during the performance of a task that a person would normally execute successfully in everyday life. Cognitive failure is characterized by concentration problems, memory loss, and decreased perception. So to preserve cognitive function, prehypertension and hypertension must be prevented, diagnosed, and treated in adults irrespective of their age.[3] This study aims to record the prevalence of prehypertension and hypertension among undergraduate medical students and their association with cognitive failure.

These two important risk factors for development of elevated BP are stress and anxiety.[4] Anxiety is a feeling of fear, dread and uneasiness presenting as sweat, and feeling of restless or increased heart rate. Stressful events are life situations appraised as threatening or demanding when coping resources become insufficient to meet the demand.[5] Hence, the study also focuses on assessing stress and anxiety in undergraduate medical students using validated questionnaires.

Aims and objectives

The objectives of this study were to find the prevalence of hypertension and prehypertension in medical students, to record the prevalence of stress, anxiety, and cognitive failure among medical students and to report the association of BP with cognitive failure.

MATERIALS AND METHODS

It was a cross-sectional study done on undergraduate MBBS students studying at a Medical College in Uttar Pradesh. Google form was given to the whole batch of 150 medical students. Out of them, 111 students voluntarily participated. Hence, we have included them in our study. Google documents were used as a platform to create online questionnaires that were automatically posted through a unique URL. Password protected access to URL link and a unique study ID gave students round the clock access. Unique study ID ensured confidentiality of all self-reported data. Student's response was secured using a "cloud" database, where data were automatically sorted, scaled, and scored by custom Excel formulas.

Students on antihypertensive or antidepressant medications were excluded from the study. The Institutional Ethical Committee clearance was obtained (RMCHRC/Estt./Dean/2021/12562A dated November 25, 2021). Written informed consent was taken according to Helsinki Declaration (2013).

Two readings of blood pressure were taken at 2 min interval using a mercury sphygmomanometer in sitting position in departmental laboratory after the subject had rested for 5 min.[1]

Following this, a questionnaire using Google form was given to these 150 MBBS students of 1st year. One hundred and eleven students voluntarily returned the completed questionnaire. The questionnaire included items of Cohen's perceived stress scale (PSS), generalized anxiety disorder 7 item (GAD-7), and cognitive failures questionnaire (CFQ).

PSS is most widely used psychological instrument for measuring stress perception. It assesses the degree of stress a person perceives in his daily life situations. Perceived stress is the outcome variable that measures stress as a function of objective stressful events, coping processes, and personality. Items are designed to understand how unpredictable, uncontrollable, and overloaded respondents find their lives. The items ask about feelings and thoughts during past month. Respondents are asked how often they felt a certain way during the last month. The scoring is taken as 0=never, 1=almost never, 2=sometimes, 3=fairly often, and 4=very often. PSS scores are obtained by reversing responses (e.g., 0=4, 1=3, 2=2, 3=1, and 4=0) to the four positively stated items (items 4, 5, 7, and 8) and then summing across all scale items. Internal consistency reliability for the PSS-10 total scores was (α=0.82) and the score demonstrated good convergent validity.[5,6]

GAD-7 asks seven questions which are the symptoms related with anxiety in past 2 weeks. If score is greater than 10 it is taken as a case of GAD. This is calculated by assigning scores of 0 – not at all, 1 – several days, 2 – more than half the days, and 3 – nearly every day. GAD-7 total score for the seven items ranges from 0 to 21. Cutoff points of 5, 10, and 15 are interpreted as representing mild, moderate, and severe levels of anxiety on the GAD-7 scoring system.[7]

The CFQ validated by the British Association of Psychology was also filled out by the students. It is a self-report questionnaire with 25 items testing deficits regarding perception, memory, attention, and motor functioning in

day-to-day life. The questions are about minor mistakes that happen time to time, but some of them occur more often than others. It records how often certain things have happened with a person in past months using the scale 0–4 where 0=never, 1=very rarely, 2=occasionally, 3=quite often, and 4=very often. Scores on the scale show episodes of absent-mindedness including forgetting names or things in the shopping list or work related gaps in memory. Total CFQ score ranges from 0 to 100. Higher the CFQ score more is the subjective cognitive failure.[8] If the score of item 1, 2, 5, 7, 17, 20, 22, and 23 are added, it will yield a subscale score for forgetfulness that is a tendency to let go from one's mind something which is known or planned such as words and names. Subscale score of items 8, 9, 10, 11, 14, 19, 21, and 25 represents distractibility which means absentmindedness or easy disturbance in a subjects focused attention in social situations or interaction with people. Subscale score of items 2, 3, 5, 6, 12, 18, 23, and 24 represents false triggering that is interrupted processing of a sequences of motor and cognitive actions.[9]

Statistical analysis

After collecting the data, it was categorized into groups according the standard guidelines. Low, moderate, and high perceived stress were categorized as 0–13, 14–26, and 27–40 with the maximum score of 40.[5] Minimal, mild, moderate, and severe anxiety were taken as 0–4, 5–9, 10–14, and 15–21 with a maximum of 21.[7] CFQ score of 0–42 is taken as low and score of 43–100 is high CFQ.[8] The data were analyzed using SPSS software version 20. A Chi-square test was used for the analysis of these categorical variables.

RESULTS

In the present study, the prevalence of prehypertension was 46.8% and prevalence of hypertension was 7.2%. Perceived stress score was moderate in 71.2% of subjects and high in 10.8% of subjects. Moderate-to-severe anxiety was recorded in 21.6% of students and CFQ score was high in 24.3% of students. Relationship between blood pressure and cognitive failure was significant X^2 (1, n=111)=7.08, P=0.029 (Tables 1-3).

Table 1: Demographic data (n=111)

Variables	Frequency	%
Age		
18–20	57	51.3
21–23	44	39.6
24–27	10	09.1
Gender		
Male	68	61.3
Female	43	38.7
BP		
Normal	51	46
Prehypertension	52	46.8
Hypertension	8	7.2

n: Total number of subjects included in the study

Table 2: Scores table (n=111)

Cohen's perceived stress score	Frequency	%
Low	20	18.0
Moderate	79	71.2
High	12	10.8
GAD-7 score		
Anxiety		
Minimal	47	42.3
Mild	40	36.1
Moderate	17	15.3
Severe	07	6.3
CFQ score		
Low	84	75.7
High	27	24.3

GAD: Generalised anxiety disorder, CFQ: Cognitive failures questionnaire

Table 3: CFQ scores and hypertension (n=111)

Category	CFQ-low		CFQ-high	
	Frequency	%	Frequency	%
Normal	39	35.14	12	10.81
Prehypertensive	42	37.84	10	9
Hypertensive	3	2.7	5	4.5

* X^2=7.08, P=0.029

DISCUSSION

Subjects in the study were between 18 and 26 years of age with males more than females. In this study, 47% of undergraduate medical students are found to be prehypertensive and 7% are hypertensive. Recently conducted community-based study in South India shows that the prevalence of prehypertension in young adults between the age group of 20–30 years was 45.2%. The researcher attributed this to pre-obesity, obesity, family history, sedentary lifestyle, high cholesterol, low fruit and vegetable intake, high dietary fat, refined cooking oil, and higher salt intake.[10] In international studies, the prevalence of prehypertension has been found ranging from 37.5% to 77.1% in adults less than 44 years of age.[11] Untreated prehypertension increases the risk of hypertension, coronary heart disorder, and renal disorder. Furthermore, the prevalence of prehypertension in our study was similar to other studies conducted among medical undergraduates within Agartala (45%)[12] and Chennai (46.7%).[13] Major risk factors proposed for prehypertension are overweight, increased abdominal girth, waist circumference, hyperglycemia, dyslipidemia, alcohol consumption, smoking, and hyperuricemia.[14]

Analysis of generalized anxiety scores shows that 12.6% of subjects suffer from moderate-to-severe anxiety and

according to Cohen's score prevalence of severe stress as 10.8%. As stated in a meta-analysis, where data from 49 studies including 40,348 medical students were compiled and analyzed, the global prevalence of anxiety among medical students was 33.8% and the prevalence was maximum in the Middle East and Asia.[15] The prevalence of stress was 63% in a study performed in Saudi Arabia.[16] In accordance with the previous studies, academic performance, pressure to succeed, post-graduation plans, academic burden, financial load, and exposure to deaths of patients are main reasons leading to anxiety and stress.[17]

Cognition failure was seen in 24.3% of students. A Chi-square test of independence was performed to examine the relationship between blood pressure and cognitive failure. The relationship between these variables was significant, X^2 (1, n=111) =7.08, P=0.029. Hypertensives and prehypertensives were more likely to have cognitive failure than individuals with normal blood pressure as found in similar studies conducted by Walker et al.,[18] and the American heart association.[19] Possible mechanisms suggested for this are cerebral vascular remodeling, endothelial dysfunction, oxidative stress, and genetic factors.[20]

Limitations of the study

Limitations of this study have been the number of students from whom the data were collected. More extensive study can be done taking into consideration each aspect of cognitive skills such as verbal reasoning, spatial reasoning, abstract reasoning, quantitative reasoning, and effect of hypertension in each of them can be analyzed separately.

CONCLUSION

We conclude that prevalence of prehypertension and hypertension is rising alarmingly in medical students. Anxiety and stress are the major causes behind this and need to be addressed.

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VC- Concept and design of the study, prepared first draft of manuscript; **SR-** Statistical analysis and interpretation; **SC-** Reviewed the literature and manuscript preparation; **MC-** Concept, coordination, preparation of manuscript; **HSS-** Interpreted the results; **QRA-** Revision of the manuscript.

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