INDIAN SOCIETY OF HYPERTENSION

HYPERTENSION JOURNAL
www.hypertensionj.com

Original Research

Association of Depression with Blood Pressure in Young Adults in North India

Anup K. Dwivedi[1], Gauhar Hussain[2], Azhar Mahmood Farooqui[3], Bipin Kumar[1], Tanuj Mathur[4]

[1]Department of Physiology, K.D. Medical college, Hospital & Research centre, Mathura, UP, India
[2]Department of Physiology, Integral Institute of Medical Science And Research, Lucknow, UP, India
[3]Department of Psychiatry, Integral Institute of Medical Science And Research, Lucknow, UP, India
[4]Department of Physiology, Jawaharlal Nehru Medical College, AMU Aligarh, UP, India

ABSTRACT

Background: The majority of research surrounding hypertension has primarily focused on older demographics. Often, the younger population is overlooked, as it is generally perceived to be at a reduced risk for developing the condition. Nevertheless, earlier studies tend to concentrate more on the psychological factors influencing hypertension rather than on pre-hypertension.

Objectives: This study seeks to explore the connection between depression and blood pressure among young adults.

Methods: This is a cross-sectional study utilizing a questionnaire (DAAS-21). Blood pressure was assessed through an indirect method using a sphygmomanometer.

Results: The findings indicate a correlation between depression and blood pressure, suggesting that individuals suffering from depression are more likely to experience elevated blood pressure compared to those who do not face such psychological challenges.

Conclusion: The analysis using the chi-square test reveals a statistically significant link between depression and high blood pressure; however, the strength of this association is moderate. This implies that individuals with depression are at a higher risk of developing high blood pressure, indicating a need for further investigation.

Keywords: Depression, Stress, Prehypertension, Young Adults, students.

DOI: 10.61081/htnj/25v11i104

INTRODUCTION

The World Health Organization (WHO) identifies hypertension as a significant risk factor for early mortality globally. A report by Kearney and colleagues predicts that by 2025, the total number of adults suffering from hypertension will rise to 1.56 billion around the world.[1-5] Students often deal with the pressure of extensive curriculums, high competition levels, and the challenge of meeting their parents' elevated expectations after enrolling in their courses. This stress can adversely affect their mental health. As per the JNC-8 report, normal blood pressure is defined as a systolic blood pressure (SBP) under 120 mmHg and a diastolic blood pressure (DBP) below 80 mmHg, while pre-hypertension is characterized by a systolic BP between 120 and 139 mmHg and/or a diastolic BP from 80 to 89 mmHg.[6] Reports indicate that persistent high blood pressure is detrimental to the health of nearly 25% of young individuals, regardless of gender.[7] An alarming statistic reveals that over 50% of individuals with hypertension are unaware of their condition.[8] Despite extensive research into the causes of hypertension over recent decades, a complete understanding remains elusive, as it results from complex interactions between genetic and various environmental factors. Research conducted in India reveals that the prevalence of pre-hypertension in individuals aged 20 to 30 ranges from 24.6 to 65%. Approximately 20% of children and adolescents worldwide experience mental health challenges or disorders. This significant portion of the younger population faces a range of psychological difficulties that can affect their well-being and development.[9] Depression is a major and separate risk factor for the development of hypertension, particularly among young individuals.[10] Anxiety, depression, and stress are

Corresponding author
Dr. Anup Kumar Dwivedi,Department of Physiology, K.D. Medical college, Hospital & Research centre, Mathura, UP, India
Email: anoop9919540@gmail.com

prevalent mental health conditions, with most individuals who face these challenges receiving care through primary healthcare services. These mental health disorders often occur together and have been recognized both individually[11,12] and in combination[13,14] as significant risk factors for cardiovascular diseases. Research has shown that people with depression, anxiety, or stress are at a higher risk of developing hypertension.[15-19] Depression is a mental health condition marked by persistent feelings of sadness and hopelessness. It often involves a loss of interest or enjoyment in activities once found pleasurable, as well as a significant reduction in energy and motivation. Individuals with depression may experience low self-worth, difficulty concentrating, changes in appetite, and disruptions in sleep patterns. In severe cases, depression can also lead to thoughts of self-harm or suicide, posing serious risks to an individual's well-being.[20] Anxiety is a mental state marked by feelings of unease, nervousness, and excessive worry. It often triggers physical symptoms, including sweating, shaking, and an increase in heart rate or blood pressure. These responses are typically linked to stress or concerns about potential future events. Individuals experiencing anxiety may find it difficult to relax or focus due to the overwhelming sense of apprehension.[21-24]

The two primary diagnostic frameworks for mental health conditions are the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), published by the American Psychiatric Association, and the International Classification of Diseases, 11th Edition (ICD-11). While both systems serve to categorize and diagnose mental disorders, they differ in certain criteria, particularly when diagnosing conditions such as depression and anxiety.

DSM-5 Diagnostic Criteria for Major Depressive Disorder (DSM 5,2013, p.160-161).[25] To diagnose major depressive disorder (MDD), it is necessary for an individual to exhibit five or more of the following symptoms over a two-weeks period, marking a shift from their usual functioning. Among these, at least one symptom must be either (1) a persistently depressed mood or (2) a significant loss of interest or pleasure.

It is essential to note that symptoms attributable to other medical conditions should not be considered in this assessment.

Depressed mood for most of the day, almost every day, as experienced subjectively (e.g., feeling sad, empty, or hopeless) or noticed by others (e.g., appearing tearful) (In children and adolescents, irritability may be present instead). Marked loss of interest or pleasure in nearly all activities most of the day, nearly every day, as indicated by either subjective report or observation. Significant changes in weight or appetite, such as weight loss not related to dieting, weight gain, or a noticeable increase or decrease in appetite, with a change of more than 5% of body weight within a month. Insomnia or hypersomnia (sleeping too little or too much) on a near-daily basis. Psychomotor agitation or retardation, observable by others, nearly every day. This refers to either physical restlessness or noticeable slowing down of movement and speech. Fatigue or loss of energy, affecting the person nearly every day. Feelings of worthlessness or excessive guilt, which may be delusional, nearly every day. This differs from self-reproach or guilt associated with illness. Difficulty thinking or concentrating, or indecisiveness, nearly every day, as reported subjectively or observed by others. Recurrent thoughts of death, not merely a fear of dying, but also recurring suicidal thoughts, ideation without a plan, a suicide attempt, or a specific plan for suicide.

METHODOLOGY

This research was structured as a cross-sectional study utilizing the DASS-21 questionnaire to explore the relationship between depression and blood pressure. It took place in the Department of Physiology at the Integral Institute of Medical Science & Research in Lucknow, Uttar Pradesh, and received approval from the institutional ethical committee.

Sample Size and Participant Selection

The study involved first-year MBBS students from Integral University, Lucknow. The sample size was determined using the formula established by William G. Cochran, resulting in an estimated total of 90 participants. Data collection occurred from April 2024 to May 2024 via a self-administered questionnaire, which included items for evaluating levels of depression, anxiety, and stress (DASS-21). Blood pressure was assessed using an indirect method with a sphygmomanometer in the physiology department.

Inclusion Criteria: Participants were aged between 18 and 30 years, enrolled in a college course without any recent breaks in studies, and were medical students pursuing regular courses.

Exclusion Criteria: Participants with any psychiatric disorders, known cardiovascular diseases, endocrine disorders, renal diseases, or those who did not provide consent were excluded from the study.

Blood pressure

Volunteers were instructed to remain seated quietly for at least five minutes. They refrained from consuming caffeine, exercising, and smoking for a minimum of thirty minutes prior to the measurement. Blood pressure was measured in the right arm while the subject sat, using a standardized calibrated mercury sphygmomanometer (Diamond). Initially, using the palpatory method, the point at which the pulse disappeared was recorded as the systolic blood pressure (SBP). Following that, blood pressure was measured using the auscultatory method, which involves wrapping an inflatable bladder encased in a non-distensible cuff around a limb and inflating it until the pressure in the cuff surpasses that in the artery. As the pressure in the bladder is gradually released by opening a valve on the inflation bulb, pulsatile blood flow begins to emerge through the artery, creating repetitive sounds linked to the pulsatile flow. The pressure level in the inflatable bladder at which the first Korotkoff sound becomes audible indicates the peak pressure during each heart cycle, known as systolic pressure. Conversely, the pressure level at which the sounds cease completely, signifying that the artery is no longer compressed and blood flow has fully resumed, represents the resting pressure between heartbeats, referred to as diastolic pressure.

Psychological Factors

The psychological factors were assessed through the Depression, Anxiety, and Stress Scale-21 (DASS-21). Each of the three scales consists of seven items, categorized into subscales with related themes. The depression scale evaluates feelings of sadness, hopelessness, disregard for life, self-criticism, lack of interest or engagement, anhedonia, and inactivity. The anxiety scale measures physiological responses, effects on skeletal muscles, anxiety in specific situations, and personal feelings of anxiety. The stress scale reflects chronic nonspecific arousal levels,

Table 1: Catagories of final score of the study.

Categories	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–19
Moderate	14–20	10–14	20–25
Severe	21–27	15–19	26–33
Very Severe	28+	20+	34+

addressing challenges in relaxation, heightened nervousness, being easily disturbed or agitated, irritability, and impatience. To determine overall scores for depression, anxiety, and stress, the responses for the appropriate items are summed. Participants will respond using a Likert Scale from 0 to 3, where 0 indicates "not at all applicable," 1 means "somewhat applicable," 2 indicates "considerably applicable," and 3 signifies "very much applicable" most of the time. When interpreting the DASS scores, respondents select the statement that best reflects their experience over the past week. The total scores for each scale (D for Depression, A for Anxiety, S for Stress) are calculated. Since the DASS-21 is a condensed version of the original 42-item scale, the score for each subscale needs to be doubled to obtain the final score. According to the guidelines, these final scores are categorized as "normal," "mild," "moderate," "severe," or "extremely severe" (Table 1).

Data Analysis

Using SPSS version 25.0, the statistical package was utilized for social science analysis. Qualitative data was presented as a percentage, while the continuous variables were represented as either mean ± SD or range. Using two tailed, 95% confidence interval tests, a P-value of less than 0.05 was determined to be significant in all tests applied. To evaluate the distribution of participants who took supplements and those who didn't, a simple chi-square test of independence was conducted on categorical variables. P values were obtained for the individual cells by utilizing the Z scores generated during cross-tabulation. The Correlation between two variables was studied using Pearson coefficient.

RESULTS

This study involved a total 90 participants. This chapter presents the analysis of the collected data to investigate the association between depression with blood pressure among young adults.

1. Socio-Demographic Characteristics

The dataset consists of 90 respondents, equally distributed between males and females.

Table 2: Age distribution.

Male (N = 45)	Female (N = 45)
19.6 ± 0.56	18.8 ± 0.72

Table 2 displays the breakdown of participants by socio-demographic factors, specifically gender and age group. The sample comprised 90 participants, evenly split between males (N= 45) and females (N= 45). The age distribution showed a predominant concentration in the younger age bracket, with 92.2 (n = 83) of respondents aged between 18 and 21 years. A smaller proportion of the sample, 7.7 (n = 7), fell within the 22-26 age range. This distribution highlights a predominantly youthful cohort, with an equal representation of both genders.

2. Distribution of Depression Category

The levels of depression among respondents are summarized in the table below.

Table 3: Depression Category.

Psychological factors	N	Percentage (%)
Depression		
Normal	47	52.22
Mild	20	22.22
Moderate	16	17.77
Severe	4	4.44
Extremely severe	3	3.33

Table 3 represents the distribution of depression severity based on psychological factors:

- 52.22% of participants are categorized as Normal, indicating they don't experience symptoms of depression.
- 22.22% are classified as Mild, suggesting they have some depressive symptoms but they are not overwhelming.
- 17.77% fall under the Moderate category, showing a noticeable presence of depressive symptoms.
- 4.44% are considered to have Severe depression, with symptoms significantly impacting their well-being.
- 3.33% have Extremely severe depression, indicating a high level of distress.

3. Blood Pressure Measurements

The blood pressure of respondents is summarized as follows:

Table 4: Blood Pressure.

Blood Pressure	Mean	SD
Systolic	116.20	9.52
Diastolic	78.53	6.77

Table 4 presents the blood pressure measurements with their respective means and standard deviations.

For systolic blood pressure: The mean is 116.20 mmHg, suggesting the average systolic reading in this group is relatively normal (typically under 120 mmHg is considered normal). The standard deviation (SD) is 9.52, which shows there is moderate variability in the systolic blood pressures within the sample.

For diastolic blood pressure: The mean is 78.53 mmHg, which is within the normal range (generally considered normal if it's under 80 mmHg). The standard deviation of 6.77 indicates some variability, but it's not as large as the systolic, implying a slightly more consistent pattern of diastolic readings within the sample.

Table 5: The correlation between depression scores and blood pressure.

	Depression	SBP	DBP
Depression	1	-0.047797	-0.1021502
SBP	-0.047797	1	0.65386978
DBP	-0.1021502	0.65386978	1

Table 6: The chi-square test results for the association between depression with Blood Pressure

Variable	Blood Pressure High		χ^2	*p*-value
	Yes	No		
Non-Depressive	12	35	0.935180604	0.006614347
Depression	15	28		

4. Depression and Blood Pressure

Table 5 displays the correlation between depression scores and blood pressure (Systolic Blood Pressure, and Diastolic Blood Pressure). A negative correlation between depression scores and SBP (Systolic Blood Pressure) is suggested by the -0.0478 value. Although the correlation is weak, it shows that SBP can decrease slightly as depression scores increase.

The correlation between depression scores and DBP (Diastolic Blood Pressure) is -0.1022, also showing a weak negative correlation. Again, this implies a slight decrease in DBP with increasing depression, but the relationship is weak.

On the other hand, SBP and DBP show a stronger positive correlation of 0.6539, indicating a moderate positive relationship. As SBP increases, DBP tends to increase as well, which is consistent with general physiological patterns.

5. Association Analysis

Table 6 reveals the relationship between depression and high blood pressure, as determined by a chi-square test. The chi-square statistic (χ^2) is 0.9352, which quantifies the difference between the observed and expected frequencies in the contingency table. If the *p-value* falls below the standard 0.05 threshold, then the result is considered statistically significant with a *p-value* of 0.0066.

In terms of the data, the table shows the distribution of individuals with and without depression and their association with high blood pressure: Non-depressive individuals: 12 have high blood pressure, and 35 do not. Depressive individuals: 15 have high blood pressure, and 28 do not.

DISCUSSION

The standard deviation for males (N = 45) is 0.56 while the mean age for both groups is 19.6 years as shown in table 2. Mean age of females (N = 45) 18.8 years and standard deviation 0.72. The sum of the number of participants in each group is 45, as indicated by N = 45. For males, the average age is 19.6 years, and for females it is 18.8. Males in the sample are typically slightly older than females, as indicated by this fact.). Only 0.8 years is the relatively minor variation. The standard deviation (SD) measures how much the data is spread around the mean. The SD of male participants for ages was 0.56, which indicates that the age distribution is closely related to the mean. For females, the SD is 0.72, indicating a slightly higher age-ratio than males.

Table 3 presents the depression level distribution. Large "Normal" category: The fact that more than half of the sample falls under the "Normal" category is encouraging in the sense that a majority of individuals are not experiencing significant depressive symptoms.

Prevalence of Mild to Moderate Depression: The combined total of individuals in the mild and moderate categories (40%) shows that a significant portion of the population may be struggling with symptoms that could worsen if left unaddressed. This presents an opportunity for early intervention or prevention strategies targeting mild-to-moderate depression, potentially preventing further escalation into more severe forms.

Severe and Extremely Severe Depression: The lesser numbers in the severe category (4.44%) and extremely severe (3.33%) are worrying, as those in these latter categories may require more intensive mental health care. Even though these groups are numerically smaller, they often face more immediate risks to their well-being, including a higher likelihood of self-harm, suicidal ideation, or other psychological and physical health complications. Specialized treatment approaches would be necessary for these individuals.

Table 4 displays the mean and standard deviation (SD) for both systolic and diastolic blood pressure readings. The normal range for systolic pressure is 90-120 mmHg, while the normal range for diastolic pressure is 60-80 mmHg. The mean systolic pressure is 116.20 mmHg, which falls within the normal range but is slightly on the higher end.

The standard deviation (SD) is 9.52 mmHg, meaning there's some variation in systolic pressures among people. Some may have much higher or lower values than the average. The average diastolic pressure is 78.53 mmHg, which is also normal, but close to the upper limit of the normal range. The SD for diastolic pressure is 6.77 mmHg, which is lower than the systolic SD, indicating that diastolic pressures are more consistent in this group. Systolic pressure is near the higher end of the normal range, so there might be some risk for slightly elevated blood pressure. Diastolic pressure is normal, but again, close to the upper limit. The variation (SD) shows that systolic pressure has more spread (differences) among people, while diastolic pressure is more consistent. In short, the blood pressure values are mostly normal, but the systolic pressure is trending toward the higher end.

Table 5 presents the Correlation Between Depression Scores and Blood Pressure.

Depression and SBP (Systolic Blood Pressure): The correlation is -0.0478, which is very close to zero, indicating a very weak negative relationship between depression and SBP. This suggests that as depression scores increase, SBP may slightly decrease, but the effect is minimal. The negative correlation, although weak, implies that higher depression scores might be marginally associated with lower systolic blood pressure, but this relationship is unlikely to be clinically meaningful given the low coefficient.

Depression and DBP (Diastolic Blood Pressure): The correlation here is -0.1022, which is also a very weak negative correlation.

This implies that, similarly, higher depression scores are associated with slightly lower diastolic blood pressure. Again, the strength of this relationship is weak and unlikely to be significant in a clinical context.

SBP and DBP: The correlation between SBP and DBP is 0.6539, which is moderate and positive. This is consistent with what we typically expect—systolic and diastolic pressures tend to rise and fall together, as they are both part of the body's overall cardiovascular function. This moderate positive correlation indicates that people with higher SBP are also likely to have higher DBP.

Weak Correlations Between Depression and BP: Both depression scores and blood pressure (SBP and DBP) show weak negative correlations. The very small magnitudes of these correlations suggest that depression may not be a strong or direct predictor of blood pressure in this dataset.

Table 6 displays the results of the chi-square test used to examine the relationship between depression and high blood pressure (BP). The *p-value* of 0.0066, which is below the 0.05 threshold, indicates that there is a statistically significant link between depression and high blood pressure. This suggests that individuals with depression are more likely to experience high blood pressure. Although the chi-square value (0.935) is relatively small, it is important to recognize that the chi-square test is influenced by the sample size. The moderate chi-square value indicates a moderate association, but the significant *p-value* confirms that this relationship is meaningful, even if the strength of the association is not particularly strong.

Association Between Depression and High BP: In the Non-Depressive group, 12 out of 47 people have high blood pressure (roughly 25.5%). In the Depression group, 15 out of 43 people have high blood pressure (roughly 34.9%). This suggests that people with depression might have a higher likelihood of having high blood pressure than those without depression, though the difference in proportions (34.9% vs. 25.5%) is not enormous.

CONCLUSION

The chi-square test reveals a statistically significant connection between depression and high blood pressure, with a moderate strength of association. This implies that individuals with depression may be at an increased risk of developing high blood pressure, an issue that merits further investigation. Future research with larger sample sizes and more comprehensive controls could provide a clearer understanding of this relationship and its potential public health implications. Several factors may contribute to this link, including the impact of stress hormones (like cortisol) that are released during depressive episodes, which can raise blood pressure. Moreover, depression may lead to unhealthy lifestyle behaviors (such as inadequate physical activity, poor diet, or smoking), all of which are known risk factors for hypertension.

Abbreviations: Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Depression, anxiety and stress scale (DASS), Mean arterial pressure (MAP), Arterial blood pressure (ABP).

Limitations and Future Directions

This study is constrained by a small sample size, highlighting the need for additional replication to validate the findings. Furthermore, the research does not consider possible confounding factors like body mass index (BMI), eating patterns, and smoking, which could affect the results.

REFERENCES

1. Fahad SA, Ahmad HA, Akmal S. Hypertension in Pakistan: Time to take some serious action. *Br J Gen Pract.* 2010;60(576):536–541.
2. Mathur T, Annepu YR, Chaitanya PDK, Ranjan R, Verma DK, Verma N, Pandey S, Singh R. Correlation Between Salivary Cortisol Levels and Diurnal Variation in Spirometric Parameters in Apparently Healthy Adults. Cureus. 2024 Oct 14;16(10):e71493. doi: 10.7759/cureus.71493. PMID: 39552989; PMCID: PMC11563761.
3. Mathur T, Kumar B, Dubey M, Keerthi Annepu K, Annepu YR, C SG. Evaluating the Role of Glycemic Control in Modulating Pulmonary Function Among Smokers With Diabetes Mellitus: A Systematic Review. Cureus. 2024 Mar 25;16(3):e56895. doi: 10.7759/cureus.56895. PMID: 38659550; PMCID: PMC11042673.
4. Kumar, Bipin1; Mathur, Tanuj1; Annepu, Yoshita R.2; Annepu, Krishna K.1; Chaitanya, Perugu D. K.1. Exploring the Interplay of Smoking Behavior, Heart Rate Variability, Pulmonary Function Test Results, Diabetes, and Mood Disorders: A Systematic Review. Journal of Pharmacy and Bioallied Sciences 16(Suppl 4):p S3092-S3095, December 2024. | DOI: 10.4103/jpbs.jpbs_1287_24
5. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet.* 2005;**365**(9455):217–223.
6. Pilic, L., Pedlar, C. R., and Mavrommatis, Y. (2016). Salt-sensitive hypertension: mechanisms and effects of dietary and other lifestyle factors. Nutr. Rev 74, 645–658. doi: 10.1093/nutrit/nuw028.
7. Hildingh C, Baigi A. The association among hypertension and reduced psychological well-being, anxiety and sleep disturbances: a population study. Scand J Caring Sci. 2010;24(2):366–371.
8. Chockalingam A. World hypertension day and global awareness. Canadian J Cardiol. 2008;24(6):441–444.
9. WHO. Fact file. 10 facts on mental health. http://www.who.int/features/factfiles/mental_health/ mental_health_facts/en/. Accessed on October, 2015.
10. Yan LL, Lin K, Matthews KA, Daviglus ML, Ferguson TF, Kiefe CI. Psychosocial Factors and Risk of Hypertension: The Coronary Artery Risk Development in Young Adults (CARDIA) Study. Journal of American Medical Association 2003; 290(16): 2138-2148.
11. Cohen, B. E., Edmondson, D. & Kronish, I. M. State of the art review: Depression, stress, anxiety, and cardiovascular disease. Am. J. Hypertens. 2015; 28:1295–1302.
12. Moise, N. et al. Elucidating the association between depressive symptoms, coronary heart disease, and stroke in black and white adults: The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study. J. Am. Heart Assoc. 2016;5:7–9.
13. Correll, C. U. et al. Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls. World Psychiatry 2017;16:163–180 .
14. Hamer, M., Batty, G. D., Stamatakis, E. & Kivimaki, M. The combined influence of hypertension and common mental disorder on allcause and cardiovascular disease mortality. J. Hypertens. 2016;28:2401–2406
15. Meng, L., Chen, D., Yang, Y., Zheng, Y. & Hui, R. Depression increases the risk of hypertension incidence: A meta-analysis of prospective cohort studies. J. Hypertens. 2012;30: 842–851. 69

16. Nabi, H. et al. Trajectories of depressive episodes and hypertension over 24 years. Hypertension 2011;57:710–716.
17. Shah, M. T., Zonderman, A. B. & Waldstein, S. R. Sex and age differences in the relation of depressive symptoms with blood pressure. Am. J. Hypertens. 2013;26:1413–1420. 10. Hildrum B, Romild U, Holmen J. Anxiety and depression lowers blood pressure: 22-year follow-up of the population based HUNT study, Norway. Bio Med Central Public Health 2011; 11:601.
18. Singh R, Roy S, Ghildiyal A, Verma S. Association of Anthropometry With Nerve Conduction Parameters of Median Nerve: A Cross-Sectional Study in a North Indian Medical University Hospital. Cureus. 2024 Jul 6;16(7):e63946. doi: 10.7759/cureus.63946. PMID: 39105004; PMCID: PMC11299048.
19. Tiwari R, Singh S, Bajpai M, Verma N, Verma S. Impact of Osteocalcin on Glycemic Regulation and Insulin Sensitivity in Type 2 Diabetes Mellitus Patients. Cureus. 2024 Oct 17;16(10):e71675. doi: 10.7759/cureus.71675. PMID: 39553160; PMCID: PMC11568420.
20. Depression: A global crisis [Internet]. World Federation of Mental Health. 2012 Oct 12. Available from: who.int/mental_health/management/depression/wfmh_ paper_depression_wmhd_2012.pdf.
21. Craske MG, Rauch SL, Ursano R, Prenoveau J, Pine DS, Zinbarg RE. What Is an Anxiety Disorder? Focus. 2011 Jul 1;9 (3):369-88.
22. Tiwari R, Singh N, Singh S, Bajpai M, Verma S. Interplay of Adiponectin With Glycemic and Metabolic Risk Metrics in Patients With Diabetes. Cureus. 2024 Sep 30;16(9):e70543. doi: 10.7759/cureus.70543. PMID: 39479098; PMCID: PMC11524515.
23. Tiwari R, Verma S, Verma N, Verma D, Narayan J. Correlation of serum uric acid levels with certain anthropometric parameters in prediabetic and drug-naive diabetic subjects. Ann Afr Med. 2024 Jan-Mar;23(1):13-18. doi: 10.4103/aam.aam_40_22. PMID: 38358165; PMCID: PMC10922179.
24. Verma S, Tiwari R, Verma N, Singh S, Sharma A. Anthropometry and blood biomarkers of diabetes and their possible association with obesity and metabolic syndrome. J Diabetes Metab Disord. 2023 Oct 11;23(1):509-517. doi: 10.1007/s40200-023-01276-4. PMID: 38932840; PMCID: PMC11196461.
25. American Psychiatric Association, DSM-5 Task Force. (2013). Diagnostic and statistical manual of mental disorders: DSM-5™ (5th ed.). American Psychiatric Inc.. https://doi.org/10.1176/appi.books.9780890425596.

How to cite this article: Dwivedi AK, Hussain G, Farooqui AM, Kumar B, Mathur T. Association of Depression with Blood Pressure in Young Adults in North India. Hypertens J. 2025;11(1):11–16.

Source of support: Nil, **Conflicts of interest:** None