

Prevalence of Common Mental Disorders among Adults with Non Communicable Diseases in a Rural South Indian Population

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Abstract

Background and Objectives:

Common Mental Disorders are increasingly recognized as comorbid conditions in patients with Non-Communicable Diseases, exacerbated by social and systemic factors. This study aimed to estimate the prevalence of Common Mental Disorders among adults with DM and/or HTN and identify sociodemographic and clinical factors associated with mental health status.

Methodology:

A cross-sectional study was conducted between 2023 and 2024 among 303 adults diagnosed with diabetes mellitus and/or hypertension residing in the Sarjapur Primary Health Centre area of Bengaluru Urban District. The study tool consisted of sociodemographic characteristics, lifestyle factors, clinical parameters, out-of-pocket expenditure, and the Patient Health Questionnaire-9 and Generalised Anxiety Disorder Scale-7, which were administered. Data analysis included descriptive statistics and bivariate and multivariable analyses.

Results:

The mean age of participants was 61.9 years, with the majority having no education; most men were retired, while most women were homemakers. Catastrophic Health Expenditure was reported in 77% of those with both Diabetes and Hypertension. Participants with uncontrolled diabetes and hypertension were found to be 46.9% and 50.2% respectively. Depression and anxiety were prevalent in 40.9% and 44.6% of participants. Common Mental Disorders were significantly associated with female gender, low socioeconomic status, consumption of fried or junk food, alcohol use with dependence, and CHE.

Conclusion:

Depression and anxiety are highly prevalent among adults with Non-Communicable Diseases in this rural setting, with significant associations to gender, lifestyle, and economic burden. Routine screening for common mental disorders is recommended in primary care settings.

INTRODUCTION

Non-communicable diseases (NCDs) such as Diabetes Mellitus (DM) and Hypertension (HTN) are major public health concerns worldwide. (1) Approximately 88 million people throughout Southeast Asia have diabetes, of which 77 million reside in India in 2022. (2, 3) Around 207 million adults suffer from hypertension in India. (4) Both diabetes and hypertension are significant risk factors for cardiovascular disease (CVD) (5, 6, 7), which is the leading cause of global mortality. It is estimated that in India, the

prevalence of diabetes is around 11%. (8) The prevalence of hypertension in India is slightly lower than the global average of 31%. (9) According to a study that used data from the Jaipur Heart Watch Studies and forecasting, hypertension prevalence in India is projected to increase to 44% by 2030. (10) Burden of diabetes has increased by 80% in the last two decades, probably because of a combination of genetic, physiological, environmental, and behavioural factors.(11)(12) Complications of diabetes and hypertension result in catastrophic medical expenditure for families. (4) Depression and anxiety, collectively known as common mental disorders (CMDs), are highly prevalent among individuals with chronic illnesses, with the prevalence of anxiety disorder and depression in those with diabetes and hypertension ranging from 3.9–44% and 8–44%. (13) CMDs are responsible for 7.4% of global disability-adjusted life years (DALYs) and 22.9% of years lived with disabilities (YLDs), making them the fifth leading cause of DALYs and YLDs. (14) Approximately 280 million people in the world have depression according to the WHO. (15) CMDs are one of the known major contributors to the NCD burden. There have been debates to include CMDs such as depression and anxiety under the umbrella of NCDs. The prevention and control of both diseases remain separate and independent. However, anxiety and depression, just like NCDs, cause limitations in daily activities. (16) CMDs and NCDs are interlinked and highly comorbid. The pathway of comorbidity is bidirectional in nature. (17, 18) For example, diabetes elevates the risk of depression and vice versa. (19) Concomitant hypertension with depression and or anxiety increases the chance of cardiovascular mortality and morbidity. (20) Poor organizational and system-level integration difficulties alongside manpower deficits, financial, and infrastructure issues further compound the problem of mental healthcare delivery in NCD clinics in our country. (21) There is a dearth of studies on the prevalence of Depression and Anxiety among people living with Hypertension and Diabetes Mellitus in the rural population of South India, specifically in rural Karnataka. The study aimed to estimate the prevalence of depression and anxiety and identify associated sociodemographic, lifestyle, clinical and economic factors among adults with diabetes mellitus and hypertension in a rural South Indian population, thereby addressing a key evidence gap and generating contextually relevant evidence for integrated NCD–mental health care.

METHODOLOGY

Study settings:

Our study area was 7 villages (Kuthaganahalli, Bovipalya, Kammanahalli, MC Halli, Doddathimmasandra, Bilapura and Burugunte) served by the Kuthaganahalli sub-centre of Sarjapur Primary Health Centre, Anekal taluk, Bengaluru Urban district. These villages are located around 30 kilometers from Bangalore City with adequate transport facilities and connections. These villages are served by the Government Health System and Private health care facilities for primary care. Our institution provides primary and community health care services through our Community Health Training Centre, located near these villages.

Ethics approval:

Approval was obtained from the Institutional Ethics Committee (TH-89/2023, 9 April 2023). All participants received an information sheet and gave written informed consent. All participants screened positive for CMDs were referred to our Weekly Manasi Clinic (Mental Health Clinic), which offers community mental health services by a community medicine physician and psychiatrist at the Community Health Training Centre. Our community health workers were instructed to follow up on these patients.

Study design:

A cross-sectional study was conducted in the villages from 2023 to 2024. Eligible residents were adults (≥ 18 y) recorded in the Health Management Information System (HMIS) of our institution as having diabetes mellitus (DM) and/or hypertension (HTN). Moribund individuals and those unable to comprehend the questionnaire were excluded. The sample size for the study was calculated based on an estimated prevalence of depression/anxiety of 27% as reported by Raval et al. (22). Using a 95% confidence level and a 5% margin of error, the sample size was determined to be 303. From 521 eligible HMIS records, proportionate stratified random sampling allocated quotas to each village, then selected individuals by random-number generation.

Study tools:

The study was done by visiting households, administering a structured interview schedule in Kannada, performing anthropometry, and measuring random blood glucose using a portable digital glucometer (Accu Chek Active 4 New-Gen kit) via a finger-prick capillary blood sample (regardless of the time of the last meal). Blood pressure was measured twice in a seated position using a calibrated digital sphygmomanometer (Omron HEM 7124). The average of the two readings was taken as the final value. Two repeat visits were made on different occasions (times and days) to meet the selected study participant.

The interview schedule was developed specifically for this study after an extensive review of literature and expert consultation, and incorporated components adapted from previously validated instruments where appropriate. The schedule captured socio-demographics, socioeconomic status (modified BG Prasad 2023 and Standard-of-Living Index), (23, 24) medical history, clinical examination and anthropometry, complications, health expenditure, diet, physical activity, tobacco use (Fagerström FTND/FTND-ST) and alcohol use (CAGE). (25–27) Body mass index and waist–hip ratio was measured using standardised anthropometric methods. Physical activity was assessed based on self-reported activity patterns and categorised as adequate or inadequate. Depression and anxiety were screened with validated Kannada versions of PHQ-9 and GAD-7 (28). Scores were categorised according to standard cut-offs to indicate severity. A score of ≥ 10 on either scale was considered indicative of clinically significant depression or anxiety. Participants who scored ≥ 10 were counselled and referred for further evaluation and management in accordance with standard clinical guidelines. The prepared data

collection tool was used after pilot testing to understand the flow and time taken to complete the interview. The English version of the interview schedule is provided as Supplementary File 1.

Data analysis:

Data were entered in EpiCollect5 Software, exported to Excel and analysed with Jamovi 2.6.44. Categorical variables were summarised as frequencies and percentages, while continuous variables were described using means with standard deviation or medians with inter-quartile range, as appropriate. Exposure variables included disease status (diabetes mellitus only, hypertension only, and coexisting diabetes mellitus and hypertension) and selected sociodemographic, socioeconomic, lifestyle, and clinical factors. Outcome variables were depression and anxiety, assessed using PHQ-9 and GAD-7, respectively. Associations between exposure and outcome variables were examined using χ^2 or Fisher's exact tests. Variables with $p < 0.05$ and those considered clinically relevant were entered into multivariable logistic regression models. Adjusted odds ratios with 95% confidence intervals were reported. A two-tailed p -value < 0.05 was considered statistically significant.

RESULTS

A total of 303 adults with diabetes mellitus and or hypertension were included in the study. The sociodemographic and socioeconomic characteristics of the participants are presented in Table 1.

Clinical, behavioural and disease profile

As shown in Table 2, 152 participants (50.2%) had both DM and HTN.

Prevalence of depression and anxiety

The prevalence of depression and anxiety by disease group is shown in Table 3. Overall, 124 participants (40.9%) screened positive for depression and 135 (44.6%) screened positive for anxiety. Both depression and anxiety were present in 71 participants (23.4%).

Factors associated with depression and anxiety

The results of the multivariable logistic regression analysis are presented in Table 4. After adjustment for relevant covariates, female sex was independently associated with depression (AOR 2.3, 95% CI 1.2–4.3). Low Standard of Living Index was associated with both depression (AOR 1.2, 95% CI 1.0–1.9) and anxiety (AOR 1.2, 95% CI 1.0–2.3). Frequent consumption of fried or oily food was associated with higher odds of depression (AOR 1.6, 95% CI 1.2–2.5). Alcohol dependence was significantly associated with both depression (AOR 1.8, 95% CI 1.1–3.6) and anxiety (AOR 2.1, 95% CI 1.3–3.5).

Participants with both diabetes mellitus and hypertension had higher odds of depression compared to those with a single condition (AOR 1.7, 95% CI 1.3–2.8), while hypertension alone was strongly associated with anxiety (AOR 5.4, 95% CI 2.2–13.5). Peripheral neuropathy was inversely associated with

depression (AOR 0.4, 95% CI 0.3–0.9). Uncontrolled blood pressure was associated with increased odds of both depression (AOR 1.4, 95% CI 1.1–2.2) and anxiety (AOR 1.5, 95% CI 1.2–2.3).

DISCUSSION

Our study shows a substantial and often unrecognised mental health burden within routine NCD care in rural primary care settings. Depression was present in 124 participants (40.9%) and anxiety in 135 participants. (44.6%) These prevalences are comparable to those reported in earlier Indian studies among individuals with cardiometabolic illnesses, where depression and anxiety have been reported in the ranges of 8–46% and 3.9–44%, respectively. (29) The relatively higher prevalence observed in this rural cohort compared to several prior Indian studies may be attributable to older age distribution, high multimorbidity burden and substantial financial strain related to chronic disease care.

The mean age of the study participants was 61.9 years, with a long duration of illness, averaging 8.3 years for diabetes mellitus and 9.6 years for hypertension. Prolonged disease duration may contribute to a higher prevalence of depression and anxiety through chronic inflammation, hypothalamic–pituitary–adrenal axis dysregulation, and autonomic imbalance associated with long-standing non-communicable diseases. (18) The observed burden of common mental disorders may reflect the cumulative psychosocial stress, functional limitations and long-term treatment demands associated with ageing and multimorbidity in chronic non-communicable diseases.

Suicidal ideation was reported by 51 participants (16.8%), which is higher than estimates from the National Mental Health Survey general population sample. (30) This finding highlights the importance of routine mental health screening in non-communicable disease clinics to facilitate early identification, counselling, and referral.

The PHQ-9 and GAD-7 were found to be feasible screening tools in this primary care setting, consistent with previous validation studies. (31, 32) Their use by trained frontline health workers at the time of diagnosis and during follow-up visits may enable early psychosocial support and appropriate referral.

Several determinants identified in this study are consistent with global and Indian evidence. Diabetes and hypertension were both associated with depression and anxiety, reflecting the shared biological and behavioural pathways between non-communicable diseases and common mental disorders. Female participants had significantly higher odds of depression compared to males. This gender difference likely reflects social and structural determinants, including caregiving responsibilities, reduced financial autonomy, and barriers to accessing health care, rather than biological vulnerability alone. (33)

Occupation and education also showed important associations. Homemakers and daily wage workers had higher odds of depression and anxiety, while higher educational attainment appeared protective, consistent with earlier findings linking socioeconomic disadvantage to poor mental health outcomes. (34).

Dietary and lifestyle factors were significantly associated with mental health outcomes. Frequent consumption of fried or oily food was associated with depression, while frequent intake of sweets or junk food was associated with anxiety. These findings support emerging evidence linking unhealthy dietary patterns to neuroinflammation and altered reward pathways. (35) Alcohol dependence and high nicotine dependence were strongly associated with both depression and anxiety, underscoring the need for integrated substance-use interventions within non-communicable disease programmes. (36)

Lower Standard of Living Index and higher out-of-pocket health expenditure were associated with anxiety and depression. These findings are consistent with studies showing that financial strain and catastrophic health expenditure adversely affect mental well-being and contribute to psychological distress. (37) Infrequent healthcare utilisation was also associated with poorer mental health, suggesting barriers to access or low perceived need for care.

Hypertension alone was independently associated with higher odds of anxiety. (38) Depression and anxiety also showed a bidirectional relationship, sharing neurobiological pathways and reinforcing each other over time. (39)

An inverse association was observed between peripheral neuropathy and depression. Participants with peripheral neuropathy were more likely to visit health centres frequently for symptom management, resulting in greater interaction with health-care providers and increased opportunities for counselling and reassurance. This increased health system contact may have contributed to the lower observed prevalence of depression in this subgroup. (40) This hypothesis requires confirmation through longitudinal studies examining patterns of healthcare utilisation and psychological outcomes.

Finally, uncontrolled blood pressure and blood glucose were associated with both depression and anxiety, highlighting the bidirectional relationship between poor biomedical control and psychological distress. These findings emphasise the need for integrated care models that address both physical and mental health needs simultaneously.

CONCLUSION

This study identified a high prevalence of depression and anxiety among adults with diabetes mellitus and or hypertension in a rural South Indian population. Depression affected 124 participants (40.9%) and anxiety affected 135 participants (44.6%), indicating a substantial mental health burden among individuals living with chronic non-communicable diseases. Female gender, low socioeconomic status, unhealthy dietary patterns, alcohol dependence, uncontrolled blood pressure, and coexisting diabetes and hypertension were significantly associated with these outcomes.

These findings underscore the importance of routine mental health screening within non-communicable disease care, particularly for high-risk groups such as women, individuals with low socioeconomic status, and those with poor disease control. Validated tools such as the PHQ-9 and GAD-7 can be effectively administered by trained primary care health workers to facilitate early detection and referral.

In keeping with the conclusions of the larger thesis, this study highlights the need for convergence and integration of mental health services with existing diabetes and hypertension programmes at the primary care level. Strengthening coordination between non-communicable disease and mental health programmes can improve holistic care delivery, reduce unmet mental health needs, and enhance long-term outcomes in rural and underserved populations.

Strengths and limitations:

Our study has several limitations. Although proportionate stratified random sampling was used, selection was limited to individuals recorded in the institutional HMIS, which may affect generalisability. Our cross-sectional study design offered little insight into the causality and temporality of the observed association. The study villages might not be representative of typical Indian villages, due to their proximity to Bangalore City. Villages proximal to our Community Health Training Centre, with its Manasi (Mental Health clinic and outreach services), could have affected our CMD prevalence rates. Our community health workers have excellent rapport with the community, and our participatory services could have made our study findings not applicable to other areas. However, our study offers clear insights into the bidirectional relationship between NCDs and CMDs. The results indicate that the burden of NCDs will increase due to the co-occurrence of CMDs, underscoring the urgent need to integrate CMD care with NCD care. It also offers directions for policymakers on the feasibility of screening for CMDs in primary care settings to ensure secondary prevention of CMDs in NCD patients. There is no conflict of interest.

Declarations

Ethics approval and consent to participate:

The study was approved by the Institutional Ethics Committee of St. John's Medical College, Bangalore, India (TH-89/2023, 9 April 2023). Written informed consent was obtained from all participants prior to enrolment. All procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee and with the 2013 revision of the Declaration of Helsinki.

Consent for publication:

Not applicable, since no identifiable data is published

Competing interests:

The authors declare that they have no competing interests.

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Author Contribution

K.M.D. conceptualised the study, developed the protocol, conducted data collection, performed the analysis and wrote the main manuscript text. B.R.G. contributed to conceptualisation, protocol development and critically reviewed the manuscript. J.P. contributed to conceptualisation and critically reviewed the manuscript. N.A. contributed to conceptualisation, protocol development and critically reviewed the manuscript. All authors reviewed and approved the final manuscript.

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None

Data Availability

The datasets generated and/or analysed during the current study are not publicly available due to ethical and confidentiality considerations but are available from the corresponding author on reasonable request.

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Tables

Table 1. Sociodemographic and socioeconomic characteristics of study participants (n =303)

Variable	Category	n (%)
Age (years)	Mean $\pm$ SD	61.9 $\pm$ 9.8
Sex	Male	119 (39.3)
	Female	184 (60.7)
Marital status	Married	253 (83.5)
	Widowed or single	50 (16.5)
Education status	Illiterate	202 (66.7)
	Primary education	49 (16.2)
	Secondary education and above	52 (17.1)
Occupation	Retired or homemaker	177 (58.4)
	Daily wage worker	70 (23.1)
	Salaried	33 (10.9)
	Self-employed	23 (7.6)
Religion	Hindu	275 (90.8)
	Muslim	28 (9.2)
Type of family	Nuclear	182 (60.1)
	Joint	82 (27.1)
	Three-generation	39 (12.8)
Socioeconomic status (modified BG Prasad classification 2023)	Class I or II	74 (24.4)
	Class III	80 (26.4)
	Class IV or V	149 (49.2)
Standard of Living Index	High	33 (10.9)
	Medium	82 (27.1)

Variable	Category	n (%)
	Low	188 (62.0)

Table 2. Clinical, behavioural and disease profile of study participants (n = 303)

Variable	Category	n (%)
NCD diagnosis	Diabetes mellitus only	106 (35.0)
	Hypertension only	45 (14.9)
	Diabetes mellitus and hypertension	152 (50.2)
Duration of illness (years)	Diabetes mellitus, mean	8.3
	Hypertension, mean	9.6
Body mass index category	Normal	121 (39.9)
	Overweight	129 (42.6)
	Obese	53 (17.5)
Central obesity (waist–hip ratio)	Present	222 (73.3)
Physical activity	Inadequate	126 (41.6)
Dietary habits	Fried or oily food ≥ 5 times per week	60 (19.8)
	Sweets or junk food ≥ 3 times per week	131 (43.2)
Alcohol use	Current	35 (11.5)
	Past	29 (9.6)
Alcohol dependence (CAGE ≥ 2)	Present	17 (5.6)
Tobacco use	Current	38 (12.5)
	Past	31 (10.2)
High nicotine dependence	Present	25 (8.3)
Macrovascular or microvascular complications	Present	132 (43.5)
Out-of-pocket expenditure on NCD care	$>10\%$ of total income	61 (20.1)
Healthcare utilisation	≥ 1 visit per year	278 (91.8)

Body mass index (BMI) was categorised using standard cut-offs: normal (18.5–22.9 kg/m²), overweight (23.0–24.9 kg/m²), and obese (≥ 25.0 kg/m²).

Central obesity defined using waist–hip ratio cut-offs as per WHO guidelines, * cut off-<0.9 for males, and <0.85 for females

Physical activity was categorised as adequate or inadequate based on self-reported duration and intensity of activity in accordance with recommended guidelines.

Alcohol dependence was defined as a CAGE score of ≥ 2 .

Nicotine dependence was assessed using the Fagerström Test for Nicotine Dependence, with high dependence defined as per standard scoring criteria.

Macrovascular and microvascular complications included documented complications related to diabetes mellitus and or hypertension.

Out-of-pocket expenditure refers to the proportion of total household income spent on non-communicable disease care.

Table 3. Prevalence of depression and anxiety by disease group among study participants (n = 303)

Disease group	Total in group, n	Depression n (%)	Anxiety n (%)	Both depression and anxiety n (%)
Diabetes mellitus only	106	39 (36.8)	40 (37.7)	27 (25.5)
Hypertension only	45	20 (44.4)	29 (64.4)	15 (33.3)
Diabetes mellitus and hypertension	152	65 (42.7)	66 (43.4)	37 (24.3)
Total	303	124 (40.9)	135 (44.6)	71 (23.4)

Depression assessed using PHQ-9 and anxiety assessed using GAD-7.

Cut-off score ≥ 10 used to define clinically significant symptoms.

Table 4. Multivariable logistic regression analysis showing predictors of depression and anxiety among study participants (n = 303)

Predictor variable	Depression AOR (95% CI)	p value	Anxiety AOR (95% CI)	p value
Female sex	2.3 (1.2–4.3)	0.01	1.6 (0.9–2.9)	0.08
Low Standard of Living Index	1.2 (1.0–1.9)	0.03	1.2 (1.0–2.3)	0.04
Fried or oily food ≥ 5 times per week	1.6 (1.2–2.5)	0.01	—	—
Alcohol dependence (CAGE ≥ 2)	1.8 (1.1–3.6)	0.02	2.1 (1.3–3.5)	0.01
Diabetes mellitus and hypertension	1.7 (1.3–2.8)	0.01	—	—
Hypertension only	—	—	5.4 (2.2–13.5)	0.001
Peripheral neuropathy	0.4 (0.3–0.9)	0.02	—	—
Uncontrolled blood pressure	1.4 (1.1–2.2)	0.03	1.5 (1.2–2.3)	0.02

AOR adjusted odds ratio, CI confidence interval

Variables entered into the model were selected based on clinical relevance and statistical significance in univariable analysis.

A two-tailed p value <0.05 was considered statistically significant.

Supplementary Files

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- [SupplementaryFile1.docx](#)