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Original Research Article

EPIDEMIOLOGICAL STUDY FOR DEPRESSION AMONG THE ELDERLY POPULATION: PREVALENCE, ASSOCIATED FACTORS, AND CONCORDANCE BETWEEN GDS-15 AND HAM-D SCALES

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ABSTRACT

Background: Depression is a major public health concern among the elderly population worldwide, yet it remains underdiagnosed and undertreated in developing countries like India. With the rapidly ageing Indian population, understanding the epidemiology and risk factors of geriatric depression is crucial for planning targeted interventions. **Aims and Objectives:** To study the prevalence of depression among the elderly population, determine the causative factors, and analyze the association of various sociodemographic, clinical, and laboratory parameters with depressive symptoms. **Materials and Methods:** A cross-sectional study was conducted among 120 elderly patients (≥60 years) attending the outpatient department. Depression was assessed using the 15-item Geriatric Depression Scale (GDS-15) and the Hamilton Depression Rating Scale (HAM-D). Sociodemographic, clinical, geriatric, and laboratory parameters were recorded. Chi-square test, Mann-Whitney U test, and Pearson correlation were used for statistical analysis. **Results:** The overall prevalence of depression was 63.3% (GDS-15 ≥5). Depression was significantly associated with advancing age ($p<0.001$), female sex ($p<0.001$), widowed marital status ($p=0.006$), and lower educational attainment ($p<0.001$). History of falls ($p<0.001$), hearing impairment ($p=0.002$), and visual impairment ($p=0.003$) were significantly associated with depression. Depressed patients had significantly lower haemoglobin (10.76 vs 12.77 g/dL, $p<0.001$) and serum albumin (3.26 vs 3.77 g/dL, $p<0.001$). A strong positive correlation was observed between GDS-15 and HAM-D scores ($r=0.857$, $p<0.001$). **Conclusion:** Depression is highly prevalent among the elderly and is associated with multiple sociodemographic and clinical risk factors. Routine screening with GDS-15 in primary care settings, coupled with nutritional assessment and sensory impairment correction, may improve early detection and management of geriatric depression.

INTRODUCTION

The global population is ageing at an unprecedented rate. According to the World Health Organization (WHO), by 2030, one in six people worldwide will be aged 60 years or over, and the number of persons aged 60 years and above is projected to nearly double from 1.1 billion in 2023 to 2.1 billion by 2050.[1] India is experiencing a particularly significant demographic transition, with the elderly population (aged ≥60 years) estimated at approximately 138 million in 2021, comprising over 10% of the total population, and projected to exceed 319 million by 2050.[2,3] This demographic shift presents enormous challenges for healthcare systems, particularly in the domain of mental health.

Depression is the most common mental health disorder among the elderly and is a leading cause of disability worldwide.[4] The WHO estimates that approximately 14.1% of adults aged 70 and over live with a mental disorder, with depression and anxiety being the most prevalent conditions.[1] In India, the burden of geriatric depression is considerably higher. A recent systematic review and meta-analysis of 23 community-based cross-sectional studies across 13 Indian states reported a combined prevalence of depression among the elderly of 47% (95% CI: 0.39–0.55), using the Geriatric Depression Scale (GDS) as

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a screening tool.[5] Individual studies from different regions of India have reported prevalence rates ranging from 32% to 68.2%, highlighting the magnitude of this public health challenge.[6,7]

Despite its high prevalence, depression in the elderly is frequently underdiagnosed and undertreated, particularly in low- and middle-income countries. This may be attributed to the overlap of depressive symptoms with normal ageing processes, comorbid physical illnesses, and the prevailing stigma surrounding mental health.[8] Several sociodemographic factors have been identified as risk factors for geriatric depression, including advancing age, female sex, widowhood, low educational attainment, rural residence, and economic dependence.[7,9,10] Additionally, geriatric conditions such as sensory impairments, falls, immobility, and chronic medical diseases have been associated with increased depression risk.[11,12,13]

The 15-item Geriatric Depression Scale (GDS-15), developed by Yesavage and Sheikh in 1986, is one of the most widely used screening instruments for depression in older adults due to its brevity and simple yes/no response format.[14] The Hamilton Depression Rating Scale (HAM-D), originally developed by Max Hamilton in 1960, is a clinician-administered instrument that provides a more detailed assessment of depression severity through 17–21 items.[15,16] While both instruments are widely used, studies examining their concordance specifically in the Indian elderly population remain limited.

Furthermore, there is growing recognition of the role of nutritional status, particularly anaemia and hypoalbuminaemia, in the pathogenesis of geriatric depression. Low haemoglobin and serum albumin levels have been linked to increased depressive symptoms through mechanisms involving fatigue, reduced cerebral oxygenation, and inflammatory pathways.[17,18] Understanding these associations is essential for developing comprehensive management strategies for geriatric depression.

The present study was undertaken with the objectives of determining the prevalence of depression among the elderly population, identifying the sociodemographic and clinical factors associated with depression, and assessing the concordance between GDS-15 and HAM-D depression assessment scales.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based cross-sectional observational study conducted at the outpatient department of a tertiary care teaching hospital in North India.

Study Population and Sample Size

A total of 120 consecutive elderly patients aged 60 years and above attending the outpatient department were enrolled in the study. Patients with severe cognitive impairment precluding reliable interview, acute medical emergencies, or those unwilling to participate were excluded.

Data Collection

A pre-designed, pre-tested proforma was used to record data on sociodemographic characteristics including age, sex, religion, caste, occupation, educational status, marital status, and place of living (rural/urban/semi-urban). Detailed history was obtained including geriatric enquiry for history of falls, immobility, dizziness/blackout, hearing impairment, visual impairment, and dementia. General physical examination was performed to assess vital signs (pulse rate, blood pressure in supine and sitting positions, respiratory rate, temperature), anthropometric measurements (height, weight, BMI), and general examination findings (pallor, icterus, cyanosis, clubbing, pedal oedema, lymphadenopathy, JVP, and hydration status).

Assessment of Depression

Depression was assessed using two validated instruments: (1) The 15-item Geriatric Depression Scale (GDS-15): A self-rated screening tool consisting of 15 yes/no items assessing feelings over the past week. Scores were categorized as: Normal (0–4), Mild depression (5–8), Moderate depression (9–11), and Severe depression (12–15) [14]. (2) The Hamilton Depression Rating Scale (HAM-D): A clinician-administered 21-item scale assessing various domains of depression including depressed mood, guilt, suicide, insomnia, work and activities, psychomotor retardation, agitation, anxiety, somatic symptoms, and insight. Scores were categorized as: Normal (0–7), Mild (8–13), Mild to Moderate (14–17), Moderate (18–24), and Severe (≥25).[15,16] Depression was defined as a GDS-15 score ≥5 for the primary analysis.

Laboratory Investigations

Routine laboratory investigations were performed including complete blood count (haemoglobin, total leucocyte count, differential leucocyte count, MCV, platelet count), renal function tests (blood urea, serum creatinine), serum electrolytes (sodium, potassium, chloride), liver function tests (SGOT, SGPT, total bilirubin, direct bilirubin, total protein, serum albumin, alkaline phosphatase), random blood sugar, and urine examination for albumin and sugar.

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using statistical software. Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as mean ± standard deviation. The Chi-square test was used to assess the association between categorical variables and depression status. The Mann-Whitney U test was used to compare continuous variables between depressed and non-depressed groups, as the data did not follow a normal distribution. Pearson correlation coefficient was used to assess the correlation between GDS-15 and HAM-D total scores. A p-value of <0.05 was considered statistically significant.

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RESULTS

A total of 120 elderly patients were enrolled in the study. The mean age was 72.53 ± 7.00 years (range: 60–87 years). Males constituted 49.2% (n=59) and females 50.8% (n=61) of the study population. The overall prevalence of depression, defined as GDS-15 score ≥5, was 63.3% (n=76). Among the depressed patients, 33.3% (n=40) had mild depression, 20.0% (n=24) had moderate depression, and 10.0% (n=12) had severe depression as per GDS-15 categorization.

Association of Sociodemographic Variables with Depression (Table 1)

Table 1 presents the association of sociodemographic variables with depression status. Age was significantly associated with depression (χ^2=34.54, p<0.001), with the prevalence increasing progressively from 19.0% in the 60–65 age group to 100% in those above 80 years. Female sex was significantly associated with depression (χ^2=16.95, p<0.001), with 82.0% of females being depressed compared to 44.1% of males. Marital status showed a significant association (χ^2=12.52, p=0.006), with the highest prevalence among widowed (75.6%) and divorced (100%) individuals. Educational status was highly significantly associated with depression (χ^2=36.11, p<0.001), with prevalence decreasing from 92.0% among illiterates to 25.0% among graduates. Place of living showed a borderline association (p=0.050), with rural elderly having the highest prevalence (72.7%).

Table 1: Association of Sociodemographic Variables with Depression Status (Chi-Square Test)

Variable	Category	Total (N=120)	Depressed n(%)	Not Depressed n(%)	χ^2	p-value
Age Group	60–65	21	4 (19.0%)	17 (81.0%)	34.54	<0.001
	66–70	30	18 (60.0%)	12 (40.0%)		
	71–75	28	16 (57.1%)	12 (42.9%)		
	76–80	20	17 (85.0%)	3 (15.0%)		
	>80	21	21 (100.0%)	0 (0.0%)		
Sex	Male	59	26 (44.1%)	33 (55.9%)	16.95	<0.001
	Female	61	50 (82.0%)	11 (18.0%)		
Marital Status	Married	56	27 (48.2%)	29 (51.8%)	12.52	0.006
	Widowed	45	34 (75.6%)	11 (24.4%)		
	Divorced	7	7 (100.0%)	0 (0.0%)		
	Unmarried	12	8 (66.7%)	4 (33.3%)		
Education	Illiterate	25	23 (92.0%)	2 (8.0%)	36.11	<0.001
	Primary	28	23 (82.1%)	5 (17.9%)		
	Middle	21	15 (71.4%)	6 (28.6%)		
	High School	17	8 (47.1%)	9 (52.9%)		
	Intermediate	9	1 (11.1%)	8 (88.9%)		
	Graduate	12	3 (25.0%)	9 (75.0%)		
	Post-Graduate	8	3 (37.5%)	5 (62.5%)		
Place of Living	Rural	55	40 (72.7%)	15 (27.3%)	5.99	0.050
	Urban	34	16 (47.1%)	18 (52.9%)		
	Semi-urban	31	20 (64.5%)	11 (35.5%)		

Association of Geriatric Conditions with Depression (Table 2)

Table 2 shows the association of geriatric conditions with depression. History of falls was highly significantly associated with depression (χ^2=14.76, p<0.001); 89.5% of elderly with a fall history were depressed compared to 51.2% without. Hearing impairment (χ^2=9.16, p=0.002) and visual impairment (χ^2=9.05, p=0.003) also showed significant associations. Among hearing-impaired elderly, 84.2% were depressed, while among visually impaired, 82.9% were depressed. Immobility, dizziness/blackout, and dementia did not show statistically significant associations with depression (p>0.05).

Table 2: Association of Geriatric Conditions with Depression Status (Chi-Square Test)

Variable	Category	Total (N=120)	Depressed n(%)	Not Depressed n(%)	χ^2	p-value
History of Fall	Yes	38	34 (89.5%)	4 (10.5%)	14.76	<0.001
	No	82	42 (51.2%)	40 (48.8%)		
Immobility	Yes	29	19 (65.5%)	10 (34.5%)	0.00	0.953
	No	91	57 (62.6%)	34 (37.4%)		
Dizziness/Blackout	Yes	35	24 (68.6%)	11 (31.4%)	0.31	0.578
	No	85	52 (61.2%)	33 (38.8%)		
Hearing Impairment	Yes	38	32 (84.2%)	6 (15.8%)	9.16	0.002
	No	82	44 (53.7%)	38 (46.3%)		

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Visual Impairment	Yes	41	34 (82.9%)	7 (17.1%)	9.05	0.003
	No	79	42 (53.2%)	37 (46.8%)		
Dementia	Yes	17	10 (58.8%)	7 (41.2%)	0.02	0.885
	No	103	66 (64.1%)	37 (35.9%)		

Comparison of Clinical and Laboratory Parameters (Table 3)

Table 3 compares the clinical and laboratory parameters between depressed and non-depressed groups. Age was significantly higher in the depressed group (75.29 ± 6.52 vs 67.77 ± 5.01 years, p<0.001). Haemoglobin levels were significantly lower in the depressed group (10.76 ± 1.82 vs 12.77 ± 1.60 g/dL, p<0.001). Serum albumin was also significantly lower in the depressed group (3.26 ± 0.38 vs 3.77 ± 0.42 g/dL, p<0.001). Serum potassium (p=0.057) and SGOT (p=0.081) showed near-significant trends. BMI, TLC, blood urea, serum creatinine, serum electrolytes, liver function tests, random blood sugar, blood pressure, and pulse rate did not differ significantly between the two groups.

Table 3: Comparison of Clinical and Laboratory Parameters between Depressed and Non-Depressed Groups (Mann-Whitney U Test)

Parameter	Depressed (n=76) Mean ± SD	Not Depressed (n=44) Mean ± SD	U-statistic	p-value
Age (years)	75.29 ± 6.52	67.77 ± 5.01	2696.0	<0.001
BMI (kg/m²)	22.04 ± 5.15	23.16 ± 4.74	1479.5	0.296
Haemoglobin (g/dL)	10.76 ± 1.82	12.77 ± 1.60	679.5	<0.001
TLC (cells/µL)	8022 ± 2208	7936 ± 2144	1715.5	0.815
Blood Urea (mg/dL)	36.58 ± 11.02	36.27 ± 13.01	1707.0	0.851
Serum Creatinine (mg/dL)	1.12 ± 0.40	1.22 ± 0.43	1431.5	0.191
Sodium (mEq/L)	138.28 ± 5.19	138.64 ± 5.02	1612.5	0.747
Potassium (mEq/L)	4.29 ± 0.69	4.53 ± 0.61	1323.0	0.057
SGOT (U/L)	43.95 ± 19.13	49.89 ± 16.46	1351.0	0.081
SGPT (U/L)	41.05 ± 17.88	40.84 ± 20.03	1688.5	0.931
Total Protein (g/dL)	6.54 ± 0.68	6.51 ± 0.71	1740.5	0.711
Albumin (g/dL)	3.26 ± 0.38	3.77 ± 0.42	600.5	<0.001
RBS (mg/dL)	164.89 ± 49.38	170.07 ± 54.91	1547.5	0.499
Systolic BP (mmHg)	145.25 ± 20.55	147.61 ± 17.87	1567.0	0.569
Pulse Rate (bpm)	80.88 ± 11.42	79.70 ± 11.48	1763.0	0.622

Concordance between GDS-15 and HAM-D (Table 4)

Table 4 presents the cross-tabulation of depression severity as classified by GDS-15 and HAM-D. A strong positive correlation was observed between the total scores of GDS-15 and HAM-D (Pearson r=0.857, p<0.001). The cross-tabulation demonstrated excellent concordance: all 28 patients classified as "Normal" by HAM-D were also classified as "Normal" by GDS-15, and all 8 HAM-D "Severe" cases fell within the GDS-15 "Moderate" or "Severe" categories. The Chi-square test for the cross-tabulation was highly significant (χ^2=151.13, df=12, p<0.001).

Table 4: Cross-tabulation of Depression Severity by GDS-15 and HAM-D Categories

GDS-15 Category	HAM-D Normal	HAM-D Mild	HAM-D Mild–Mod	HAM-D Moderate	HAM-D Severe	Total
Normal	28	16	0	0	0	44
Mild Depression	0	22	12	6	0	40
Moderate Depression	0	0	3	12	9	24
Severe Depression	0	0	0	4	8	12
Total	**28**	**38**	**15**	**22**	**17**	**120**

Pearson Correlation (r) = 0.857, p < 0.001; Chi-square (χ^2) = 151.13, df = 12, p < 0.001

DISCUSSION

The present study reveals a high prevalence of depression (63.3%) among the elderly population, consistent with the findings of several Indian and international studies. Pilania et al. (2013) described elderly depression as an emerging public health challenge in India.[8] A meta-analysis by Pilania et al. (2024) reported a combined prevalence of 47% (95% CI: 0.39–0.55) across 23 Indian community-based studies using GDS.[5] The higher prevalence in our study may be attributed to the hospital-based setting, where patients are likely to have more comorbid conditions and functional impairments. Debnath et al.

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(2023) reported a prevalence of 68.2% among elderly in Delhi,[7] while a global meta-analysis by Abdela et al. (2021) reported a pooled prevalence of 31.74%,[19] suggesting considerable geographic variation.

The significant association of advancing age with depression observed in our study (p<0.001), with 100% prevalence in those aged >80 years, corroborates the findings of Goswami et al. (2017), who reported significantly higher odds of depression in those aged ≥70 years.[9] The WHO has also recognized advancing age as a key risk factor, noting that multiple co-existing medical and psychological problems in the oldest-old contribute to vulnerability.[1] The progressive loss of functional independence, social networks, and physical health with advancing age may explain this association.

Female sex was a significant risk factor for depression in our study, with 82.0% of females being depressed compared to 44.1% of males (p<0.001). This finding is consistent with the LASI data analysis by Muhammad et al. (2023), which demonstrated that older women had significantly higher odds of depression, with marital status contributing to 36.7% of the gender gap.[10] Srivastava et al. (2023) also reported a higher incidence of depression among elderly females (5.1%) compared to males (3.6%) at the population level.[20] The higher vulnerability of women may be related to widowhood, economic dependence, limited social networks, and hormonal factors.

Widowed marital status was significantly associated with depression in the present study (75.6% prevalence, p=0.006). Srivastava et al. (2021) used data from the nationally representative LASI study (n=30,639) and found that widowed older adults were 34% more likely to be depressed (AOR: 1.34, 95% CI: 1.2–1.49), and those who were widowed and living alone were 56% more likely to suffer from depression (AOR: 1.56, 95% CI: 1.28–1.91).[21] The loss of a spouse represents a catastrophic event in old age, with profound repercussions on emotional, economic, and physical well-being.

The highly significant association between lower educational attainment and depression (p<0.001), with 92.0% prevalence among illiterates, is supported by multiple Indian studies. Nayak et al. (2017) reported that illiteracy was significantly associated with depression (OR=4.6, p<0.05) among elderly attending primary health care.[22] The study from Odisha by Swain et al. (2021) similarly found illiteracy, low education, and widowhood to be significantly associated with depression.[23] Education may confer protective effects through better coping strategies, health literacy, social engagement, and economic security.

Among geriatric conditions, history of falls showed the strongest association with depression in our study (89.5% prevalence in fallers, p<0.001). This is consistent with the findings of Kvelde et al. (2015), who described a significant bidirectional relationship between depression and falls in older adults, mediated through cognitive, sensory, and motor pathways.[24] Feng et al. (2023) confirmed that falls were significantly associated with depressive symptoms in a large Chinese cohort, and a systematic review by Chambergo-Michilot et al. (2024) concluded that depression was a significant risk factor for falls (OR: 1.6–2.49).[25,26] The fear of falling, loss of confidence, and restricted mobility following falls may precipitate or worsen depressive symptoms.

Hearing impairment (84.2% depression prevalence, p=0.002) and visual impairment (82.9%, p=0.003) were both significantly associated with depression. Liu et al. (2022) demonstrated in a 7-year prospective cohort study of 9,492 Chinese adults that participants with vision impairment (HR: 1.14), hearing impairment (HR: 1.24), and combined sensory impairment (HR: 1.25) had significantly higher hazard ratios for incident depressive symptoms.[11] Renaud and Bédard (2013) reported moderate to strong correlations between depression and quality of life in elderly with visual impairment (r=0.22–0.68).[13] Sensory impairments restrict social participation, communication, and independence, thereby contributing to social isolation and depression.

The significantly lower haemoglobin levels in the depressed group (10.76 vs 12.77 g/dL, p<0.001) are supported by Ahmed Tamer et al. (2023), who found that untreated anaemia was associated with a 2.6-fold increased odds of depression in community-dwelling older adults.[17] Anaemia causes fatigue, weakness, poor muscle oxygenation, and reduced physical activity, which may contribute to depressive symptoms. The significantly lower serum albumin in the depressed group (3.26 vs 3.77 g/dL, p<0.001) is consistent with the population-based study by Al-Marwani et al. (2023), who demonstrated a significant inverse association between serum albumin and depression.[18] Hypoalbuminaemia serves as a marker of malnutrition and chronic inflammation, both of which are implicated in the pathogenesis of depression.

The strong positive correlation between GDS-15 and HAM-D scores (r=0.857, p<0.001) observed in our study confirms excellent concordance between the two depression assessment tools. Yesavage and Sheikh (1986) originally demonstrated that the GDS-15 had comparable accuracy to longer scales including the HAM-D.[14] The GDS-15 with its simple yes/no format is particularly well-suited for elderly populations due to its brevity and ease of administration, and our findings support its reliability as a screening instrument in this population.[27,28]

This concordance has important clinical implications, as the GDS-15 can be used for rapid screening in busy primary care settings, reserving the more detailed HAM-D assessment for clinical confirmation.

Limitations

This study has certain limitations. The cross-sectional design precludes establishing causal relationships between the identified risk factors and depression.

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The hospital-based setting may limit the generalizability of findings to the community. The sample size of 120, while adequate for preliminary analysis, may not have sufficient power to detect smaller effect sizes in subgroup analyses. Additionally, cognitive impairment in some elderly participants may have influenced the reliability of self-reported GDS-15 responses.

CONCLUSION

Depression is highly prevalent among the elderly population (63.3%), with significant associations with advancing age, female sex, widowed marital status, lower educational attainment, history of falls, hearing impairment, visual impairment, lower haemoglobin, and lower serum albumin levels. The GDS-15 and HAM-D showed excellent concordance (r=0.857), supporting the use of GDS-15 as a reliable screening tool in clinical practice. These findings underscore the need for routine depression screening in elderly patients attending healthcare facilities, with particular attention to high-risk groups including the oldest-old, women, widowed individuals, and those with sensory impairments and nutritional deficiencies. A multidisciplinary approach involving mental health screening, nutritional assessment, sensory impairment correction, and social support strengthening is recommended for comprehensive management of geriatric depression.

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