

Original Articles

Prevalence and determinants of depression among elderly persons in a rural community from northern India

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ABSTRACT

Background. Globally, more than 350 million people of all ages suffer from depression. Elderly persons are more vulnerable to depression. We conducted this study to estimate the prevalence of depression, and to study the association of depression with sociodemographic and clinical variables among elderly persons in a rural community.

Methods. We conducted a community-based cross-sectional study among 395 randomly selected elderly persons aged 60 years and above in a rural area of Ballabgarh, Haryana, India. The participants were screened by using the Geriatric Depression Scale, and diagnosis was confirmed by the Mini International Neuropsychiatric Interview. Multivariate analysis was done for independent predictors of depression.

Results. The prevalence of depression was 11.4% (95% CI 8.6%–14.9%). Living in a nuclear family (adjusted odds ratio [AOR] 8.98, 95% CI 3.40–23.71), lack of physical activity (AOR 4.95, 95% CI 2.00–12.27), whole-time involvement in household work (AOR 4.47, 95% CI 1.18–16.93), presence of two or more chronic diseases (AOR 4.45, 95% CI 1.60–12.35), having no role in family decision-making (AOR 2.77, 95% CI 1.19–6.42), sleep problems in past one year (AOR 2.97, 95% CI 1.32–6.69) and bilateral hearing impairment (AOR 4.00, 95% CI 1.80–8.88) were factors associated with depression in elderly persons.

Conclusions. Depression is common among elderly persons in rural areas. Individuals providing healthcare to elderly persons need to be trained to identify depression and take appropriate action; elderly persons with chronic diseases and hearing impairment deserve special attention.

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INTRODUCTION

Life expectancy has increased dramatically over the past century, and the world will soon have more elderly people than children.¹ The proportion of the world's population over 60 years will double from about 11% in the year 2000 to 22% by 2050. The absolute number of people aged 60 years and above is expected to increase from 605 million to 2 billion over the same period.² By 2050, 80% of the world's elderly people will be living in low- and middle-income countries.²

Globally, more than 350 million people of all ages suffer from depression.³ It is projected that depression will be ranked second in the global burden of disease in terms of DALYs (disability-adjusted life years) by 2020, and ranked first by 2030.⁴ Elderly persons are particularly prone to psychological issues; depression is the commonest psychiatric disorder reported in the elderly. The prevalence of depression among elderly persons has been estimated in 2011 to be 10.2% globally, and 21.9% in India.⁵ Thus, India has a substantial share of elderly persons with depression. Studies have used various scales and instruments to assess the presence of depression.⁵ Early identification and management of depression improves the quality of life. Estimating burden of depression among elderly persons is necessary for planning public health interventions.

We assessed the prevalence of depression, and studied the association of depression with sociodemographic and clinical variables among elderly persons in a rural community of Ballabgarh, District Faridabad, Haryana.

METHODS

We conducted this cross-sectional, community-based study at the Comprehensive Rural Health Services Project (CRHSP), Ballabgarh, District Faridabad, Haryana, India. The CRHSP, Ballabgarh is run by the All India Institute of Medical Sciences (AIIMS), New Delhi in collaboration with the state government of Haryana. The field practice area has a population of approximately 90 000 spread over 28 villages.

An elderly person was defined as a person aged 60 years and above. All elderly persons residing in this area for at least the past 6 months were included in the study. Exclusion criteria were impaired cognition (assessed by the Hindi Mini-Mental State Examination) and/or unable to interact (e.g. unable to speak, documented acute psychosis, unable to understand the question, severe hearing loss). Assuming the prevalence of depression as

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21.9%,⁵ relative precision of 20%, and an α value of 0.05, the required sample size was 356. Considering the prevalence of cognitive impairment as 5%, response rate of 85%, death and migration rate of 10%, the final sample size was 490 persons aged 60 years and above. The Health Management Information System (HMIS) of CRHSP, Ballabgarh has information on all persons residing in the area. From the HMIS, a list of all elderly persons residing in the field practice area was prepared. This served as the sampling frame. A sample of 490 elderly persons was selected by simple random sampling from this sampling frame.

A structured interview schedule was developed on the basis of a review of the literature and opinion of experts in this field. It was pre-tested and finalized. The interview schedule was used to collect information on sociodemographic and clinical variables from the participants. The Mini-Mental State Examination (MMSE) is an effective screening tool for cognitive impairment among elderly, community-dwelling, hospitalized and institutionalized adults.⁶ A Hindi version of MMSE (HMSE) was developed and validated by Pandav *et al.* at Ballabgarh.⁷ In consultation with experts, a cut-off score of <25 was taken as impaired cognition. However, for blind participants, the cut-off was lowered to <21, since some tasks of the questionnaire could not be completed by them due to blindness.

The Geriatric Depression Scale (GDS), developed and validated by Yesavage *et al.*, is widely used for screening of depression among elderly persons.⁸ Its limitation in terms of identification of depression in persons with dementia was sought to overcome by excluding persons with cognitive impairment.⁹ The Geriatric Depression Scale-Hindi (GDS-H) was developed and validated by Ganguli *et al.* at Ballabgarh.¹⁰ The maximum possible score of GDS-H is 30. A score of ≤ 10 is classified as normal, 11–13 is borderline and ≤ 14 is depression. In this study, GDS-H was used as a screening tool, with a cut-off score of ≥ 11 as abnormal.

The Mini International Neuropsychiatric Interview (MINI) (diagnosis according to DSM-IV criteria) was used as a confirmatory tool. This methodology ensured a high level of sensitivity as well as specificity for diagnosis of depression. The MINI is a short, structured interview scale developed and validated by Sheehan *et al.* for the diagnosis of various psychiatry disorders including depression.¹¹ The MINI has also been used as a gold standard for validation of various depression-related scales.^{12–14} A faculty member of the Department of Psychiatry at AIIMS trained a single investigator who administered the HMSE, GDS-H and MINI.

House-to-house visits were made to all the 490 identified elderly persons. In case an elderly person was not found at home despite three visits, she or he was categorized as a non-respondent. The visits were 2–4 weeks apart. All the elderly persons available during the visit were informed about the purpose of the visit. They were provided with an information sheet in Hindi. All participants gave written informed consent. Thereafter, the concerned participant was assessed for eligibility by the HMSE. If cognitive impairment was present, the elderly person was excluded from the study. If there was no cognitive impairment, the interview schedule and GDS-H were administered. All those who had a GDS-H score ≥ 11 were further administered the MINI. Participants who were assessed by the MINI as having a major depressive episode (current/recurrent) were classified as having depression. Among the participants who were classified as normal based on the GDS-H score, 10% were selected by systematic random sampling, and administered the MINI to confirm the absence of depression.

Vision was recorded at a distance of 6 metres for each eye

separately with the help of the Snellen's chart. Participants with presenting vision $< 6/60$ in the better eye were considered as blind. Bilateral hearing impairment was assessed by the tuning fork test. A tuning fork of 512 Hz was used. Weber and Rinne tests were performed. Chronic disease was defined as current disease that had persisted for at least the preceding 6 months. The ascertainment of chronic disease was based on availability of prescriptions or medicines for the stated condition, except for joint pain. Clinical examination was done for joint pain, in the absence of prescription and medication. Sleep problem was considered as present if any participant had a self-reported sleep problem (induction/maintenance) most of the time in the preceding one year.

Data were entered in Epiinfo 7. Analysis was done in SPSS 16.0. The results were reported as proportions with 95% confidence interval (95% CI) for prevalence of depression. Mean (SD) was reported for continuous variables. Univariate and multivariate analyses were done to examine the association of variables with depression. Strength of association was measured as odds ratios. A value of $p < 0.05$ was considered statistically significant. Logistic regression was done for selected sociodemographic and clinical variables. Unadjusted odds ratio and p value were reported in univariate analyses. Multivariate analysis was done for independent predictors of depression. The variables for which p was < 0.25 on univariate analysis were included in the multiple logistic regression. Forward step-wise logistic regression was undertaken with the probability of entry and removal as 0.05 and 0.10, respectively.

Approval was obtained from the Ethics Committee of AIIMS. Participants identified as having depression and other disorders were referred to the psychiatry or other appropriate outpatients department at CRHSP, Ballabgarh.

RESULTS

Of the 490 identified elderly persons, 29 were dead, 16 had migrated and 19 were ineligible, and hence excluded from the study. Of the 19 excluded, 3 were unable to interact due to severe hearing loss, 3 had documented psychosis, 1 was unable to understand the questions, 1 was unable to speak, and 11 were excluded on the basis of the HMSE score. Of the remaining 426 eligible elderly persons, 13 could not be contacted, 14 refused to participate, and 4 did not complete the GDS-H form. Thus, a total of 395 participants were finally interviewed. The participation rate was 92.7%—almost equal for men (92%) and women (93.3%).

There were 172 (43.5%) men and 223 (56.5%) women (Table I). The mean (SD) age of the participants was 69.2 (7.0) years. Two hundred and forty-two (61.3%) participants were currently married. No participant was divorced or separated. Most participants were illiterate (71.1%). The majority of participants (60.5%) were currently not working. Half of the participants (53.4%) were living with their spouse and children. Nearly two-thirds (62%) of participants were involved in family decision-making most of the time. Most (88.3%) participants were availing pension, mainly in the form of old age pension (68.6%).

A total of 192 (48.6%) participants indulged in substance use (alcohol/smoking/tobacco product on at least 3 days/week). Substance use was more common among men (110; 64%) than women (82; 36.8%). Smoking (cigarette, *bidi*, *hukka*) was common.

Seventy-three (18.5%) participants had sleep problems in the past one year (Table II) and 41% had various chronic diseases.

Of the 395 participants, 80 (20.2%) were not engaged in any physical activity, and 186 (47.1%) reported only walking (Table III). On the basis of the GDS-H of the 395 participants, 287 were classified as normal, 32 as borderline and the remaining 76 as

TABLE I. Distribution of participants by sociodemographic variables

Variable	Men n=172 (%)	Women n=223 (%)	Total n=395 (%)
<i>Age (in years)</i>			
60–64	54 (31.4)	62 (27.8)	116 (29.4)
65–69	48 (27.9)	67 (30)	115 (29.1)
70–74	30 (17.4)	55 (24.7)	85 (21.5)
>75	40 (23.3)	39 (17.5)	79 (20)
<i>Marital status</i>			
Married	144 (83.7)	98 (43.9)	242 (61.3)
Widow/widower	28 (16.3)	125 (56)	153 (38.7)
<i>Education</i>			
Illiterate	72 (41.9)	209 (93.7)	281 (71.1)
Primary (up to class V)	17 (9.9)	9 (4.0)	26 (6.6)
Class VI to VIII	32 (18.6)	5 (2.3)	37 (9.4)
Above class VIII	51 (29.6)	Nil	51 (12.9)
<i>Current occupation</i>			
Home-maker	5 (2.9)	81 (36.3)	86 (21.8)
Farmer	28 (16.3)	10 (4.5)	38 (9.6)
Not doing anything at present	113 (65.7)	126 (56.5)	239 (60.5)
Others	26 (15.1)	6 (2.7)	32 (8.1)
<i>Type of family</i>			
Nuclear	18 (10.5)	20 (9.0)	38 (9.6)
Extended	154 (89.5)	203 (91)	357 (90.4)
<i>Number of family members</i>			
1–6	75 (43.6)	121 (54.3)	196 (49.6)
>7	97 (56.4)	102 (45.7)	199 (50.4)
<i>Living status</i>			
Living alone	1 (0.6)	3 (1.4)	4 (1)
Living with spouse only	11 (6.4)	14 (6.3)	25 (6.3)
Living with children only	29 (16.9)	124 (55.6)	153 (38.7)
Living with spouse and children	131 (76.1)	80 (35.9)	211 (53.4)
Living with other family members	Nil	2 (0.9)	2 (0.5)
<i>Type of pension</i>			
No pension	23 (13.4)	23 (10.3)	46 (11.7)
Old age pension	111 (64.5)	160 (59)	271 (68.6)
Government job pension after retirement	31 (18.0)	6 (2.7)	37 (9.3)
Widow pension	Nil	19 (8.5)	19 (4.8)
Husband pension	Nil	14 (6.3)	14 (3.5)
Other	7 (4.1)	1 (0.5)	8 (2.1)
<i>Self-income (in ₹ per month)</i>			
0 (no income)	4 (2.3)	20 (9.0)	24 (6.0)
Up to 550	97 (56.4)	124 (55.6)	221 (56)
>550	71 (41.3)	79 (35.4)	150 (38)
<i>Involved in family decision-making</i>			
Yes, mostly	125 (72.7)	129 (57.9)	254 (64.3)
Yes, sometimes	14 (8.1)	40 (17.9)	54 (13.7)
Never	33 (19.2)	54 (24.2)	87 (22)
<i>Number of confidants</i>			
None	62 (36)	89 (39.9)	151 (38.2)
1	34 (19.8)	56 (25.1)	90 (22.8)
2	47 (27.3)	35 (15.7)	82 (20.8)
3	29 (16.9)	43 (19.3)	72 (18.2)
<i>Number of economically dependent persons on participant</i>			
None	118 (68.6)	217 (97.3)	335 (84.2)
≥1	54 (31.4)	6 (2.7)	60 (15.2)

having depression. On the basis of the MINI of the 108 participants, 41 had a current major depressive episode, and 4 had recurrent major depressive episodes. The prevalence of depression was 11.4% (95% CI 8.6%–14.9%). All 29 participants who were

classified as normal by the GDS-H and administered MINI were found to have no depressive episode.

Logistic regression analysis showed that the sociodemographic factors, which were independently associated with depression,

TABLE II. Distribution of participants by clinical variables

Variable	Men n=172 (%)	Women n=223 (%)	Total n=395 (%)
<i>Sleep problems in past one year</i>			
Absent	154 (89.5)	168 (75.3)	322 (81.5)
Present	18 (10.5)	55 (24.7)	73 (18.5)
<i>Hearing status</i>			
Normal	137 (79.7)	182 (81.6)	319 (80.8)
Bilateral hearing impairment	35 (20.3)	41 (18.4)	76 (19.2)
<i>Presenting vision</i>			
Sighted	149 (86.6)	194 (87.0)	343 (86.8)
Blind (better eye vision <6/60)	23 (13.4)	29 (13.0)	52 (13.2)
<i>Chronic disease*</i>			
No chronic disease	109 (63.4)	124 (55.6)	233 (59.0)
Joint pain	21 (12.2)	53 (23.8)	74 (18.7)
COPD/asthma	28 (16.3)	21 (9.4)	49 (12.4)
Hypertension	9 (5.2)	28 (12.6)	37 (9.37)
Diabetes	6 (3.5)	12 (5.4)	18 (4.5)
Myocardial infarction	6 (3.5)	2 (0.9)	8 (2.0)
Stroke	3 (1.7)	Nil	3 (0.8)
Malignancy	1 (0.6)	2 (0.9)	3 (0.8)
Hypothyroidism	1 (0.6)	2 (0.9)	3 (0.8)
Others	2 (1.2)	3 (1.3)	5 (1.3)

* Multiple answers possible COPD chronic obstructive pulmonary disease

TABLE III. Distribution of participants by physical activity

Physical activity	Men n=172 (%)	Women n=223 (%)	Total n=395 (%)
None	31 (18.0)	49 (22.0)	80 (20.2)
Walking only	89 (51.7)	97 (43.5)	186 (47.1)
Household work only	4 (2.3)	31 (13.9)	35 (8.9)
Farm work only	16 (9.3)	7 (3.1)	23 (5.8)
Combination of physical activity	30 (17.5)	39 (17.5)	69 (17.5)
Others (cycled regularly)	2 (1.2)	Nil	2 (0.5)

were nuclear family (adjusted odds ratio [AOR] 8.98, 95% CI 3.40–23.71), and no involvement in family decision-making (AOR 2.77, 95% CI 1.19–6.42; Table IV).

Sleep problems during the past one year (AOR 2.97, 95% CI 1.32–6.69), presence of two or more chronic diseases (AOR 4.45, 95% CI 1.60–12.35) and bilateral hearing impairment (AOR 4.00, 95% CI 1.80–8.88) were independent predictors of depression (Table V).

Elderly persons who were not engaged in any physical activity (AOR 4.95, 95% CI 2.00–12.27), or those who reported exclusive involvement in household work (AOR 4.47, 95% CI 1.18–16.93) were associated with depression on multivariate analysis (Table VI).

The number of family members (OR 1.99, 95% CI 1.04–3.79), number of confidants (OR 5.65, 95% CI 1.29–24.82), living status (OR 7.69, 95% CI 3.00–19.70) and presence of any chronic disease (OR 2.47, 95% CI 1.16–5.27) were factors associated with depression on univariate analyses. However, these factors were not significant statistically after adjustment for age, sex, education, occupation and other factors in multivariate analysis of forward step-wise logistic regression.

Age, sex, marital status, education, occupation, pension status, self-income and number of people economically dependent on the participant, stressful event within the past one year, tobacco use,

and presenting vision were not associated with depression in elderly persons.

DISCUSSION

The reported prevalence of depression among elderly persons varies from 6% to 50% in community-based studies from rural areas outside India,^{15,16} and from 12.7% to 53.7% in community-based studies in India.^{17–21} The prevalence of depression in our study was 11.4% (95% CI 8.6%–14.9%), which is similar to that estimated by Barua (10.3%) in a meta-analysis on the prevalence of depression in the elderly.⁵ Among community-based Indian studies, the result of our study, i.e. 11.4% prevalence of depression (95% CI 8.6%–14.9%) was similar to the 12.7% prevalence (95% CI 10.64%–14.76%) estimated by Rajkumar *et al.* from a rural area of Kaniyambadi block, Vellore.¹⁷

Of the five rural Indian community-based studies, three reported a high prevalence of depression among elderly persons. All these studies used the shorter version of the Geriatric Depression Scale-15 (GDS-15) for diagnosis of depression, which has a high sensitivity but low specificity. Therefore, there is a possibility of overestimating the true prevalence due to high false-positive results.²² A cross-sectional community-based study conducted by Maulik *et al.* among 82 persons aged over 60 years in a rural area of Hooghly district of West Bengal estimated the prevalence of depression as 53.7%.²¹ This high prevalence may be explained by a small sample size and the tool (Bengali version of the GDS-15) used to identify depression. Reddy *et al.* estimated the prevalence of depression as 47% from the rural area of Valadi of Tamil Nadu.²⁰ Deshpande *et al.* conducted a community-based study among elderly persons in six villages in Maval Taluka of Pune, Maharashtra and estimated the prevalence as 41.1%.¹⁹ The high prevalence of depression among elderly persons in the above studies could be due to the use of GDS-15, a screening tool, while we used a diagnostic interview to confirm the diagnosis. On the basis of GDS-30 (screening tool) in our study, the prevalence of depression was 19.2% (95% CI 15.7%–23.4%), which was similar to the estimated prevalence for Indian studies (21.9%)⁵ in the meta-analysis done by Barua *et al.* as well as the prevalence found in the study conducted by Barua and Kar in rural areas of Udipi district of Karnataka (21.7%).¹⁸

It was found that nuclear family (AOR 8.98, 95% CI 3.40–23.71) had a strong association with depression. Similar findings were reported by Seby *et al.*²³ from Pune, Maharashtra (p=0.02) and Taqui *et al.*²⁴ from Karachi, Pakistan (AOR 4.3, 95% CI 2.4–7.6). Loprinzi concluded that light and moderate-to-vigorous physical activity (OR 0.78, 95% CI 0.64–0.94) was associated with a lower rate of depression among elderly American adults.²⁵ The findings of our study are in agreement with the results of Loprinzi. Lack of physical activity (AOR 4.95, 95% CI 2.00–12.27) was associated with a higher risk of depression compared to persons who were involved in walking (morning/evening/any other time). The presence of chronic medical illness has been found to increase the risk of depression in studies reported by Jain and Aras from Mumbai,²⁶ Jariwala *et al.* from Surat,²⁷ Gupta *et al.* from Chandigarh,²⁸ and Liu *et al.* from China.²⁹ It was found that the presence of two or more chronic diseases was associated with a higher risk of depression (AOR 4.45, 95% CI 1.60–12.35). Sleep problems in the past one year (AOR 2.97, 95% CI 1.32–6.69) were associated with depression in elderly persons. This finding is consistent with those of Paudel *et al.* from the USA (AOR 5.43, 95% CI 3.87–7.63).³⁰ Hearing impairment (AOR 4.00, 95% CI 1.80–8.88), exclusive involvement in household

TABLE IV. Association of depression with sociodemographic variables

Variable	Number of participants (n=395)	Depression present (%) (n=45)	Unadjusted odds ratio (95% CI)	p value
<i>Age (in years)</i>				
60–64	116	12 (10.3)	Reference	–
65–69	115	10 (8.7)	0.83 (0.34–1.99)	0.67
70–74	85	11 (12.9)	1.29 (0.54–3.07)	0.57
>75	79	12 (15.2)	1.55 (0.66–3.66)	0.32
<i>Sex</i>				
Men	172	14 (8.1)	Reference	–
Women	223	31 (13.9)	1.82 (0.94–3.54)	0.07
<i>Marital status</i>				
Married	242	29 (12.0)	Reference	–
Widow/widower	153	16 (10.5)	0.86 (0.45–1.6)	0.64
<i>Education</i>				
Illiterate	281	40 (14.2)	Reference	–
Up to class VIII	63	3 (4.8)	0.30 (0.90–1.00)	0.05
Above class VIII	51	2 (3.9)	0.25 (0.06–1.05)	0.06
<i>Occupation</i>				
Home-maker	86	10 (11.6)	Reference	–
Farmer	38	2 (5.3)	0.42 (0.09–2.03)	0.28
Not doing anything at present	239	30 (12.6)	1.09 (0.51–2.33)	0.82
Others	32	3 (9.4)	0.79 (0.20–3.06)	0.73
<i>Type of family</i>				
Extended	357	30 (8.4)	Reference	–
Nuclear*	38	15 (39.5)	7.11 (3.36–15.05)	<0.001
<i>Number of family members</i>				
>7	199	16 (8.0)	Reference	–
1–6	196	29 (14.8)	1.99 (1.04–3.79)	0.03
<i>Living status</i>				
Living with spouse and children	213	17 (8.0)	Reference	–
Living with spouse only	25	10 (40.0)	7.69 (3.00–19.70)	<0.001
Living with children only	153	17 (11.1)	1.44 (0.71–2.92)	0.31
Living alone	4	1 (25.0)	3.84 (0.38–38.98)	0.26
<i>Type of pension</i>				
Nil	46	7 (15.2)	Reference	–
Availing	349	38 (10.9)	0.68 (0.29–1.63)	0.39
<i>Self-income (₹)</i>				
>550	150	13 (8.7)	Reference	–
≤550	221	28 (12.7)	1.53 (0.76–3.06)	0.23
0 (no income)	24	4 (16.7)	2.11 (0.63–7.10)	0.23
<i>Involved in family decision-making</i>				
Yes, mostly	254	19 (7.5)	Reference	–
Yes, sometimes	54	6 (11.1)	1.55 (0.59–4.07)	0.38
Never†	87	20 (23.0)	3.69 (1.86–7.32)	<0.001
<i>Number of confidants</i>				
>3	72	2 (2.8)	Reference	–
2	82	6 (7.3)	2.76 (0.54–14.14)	0.22
1	90	16 (17.8)	7.57 (1.68–34.12)	0.008
None	151	21 (13.9)	5.65 (1.29–24.82)	0.02
<i>Number of economically dependent people on participant</i>				
None	335	42 (12.5)	Reference	–
>1	60	3 (5.0)	0.37 (0.11–1.26)	0.10

Adjusted odds ratio: * 8.98 (3.40–23.71), p<0.001; † 2.77 (1.19–6.42), p=0.02

work (AOR 4.47, 95% CI 1.18–16.93) and no involvement in family decision-making (AOR 2.77, 95% CI 1.19–6.42) were found to be associated with a higher risk of depression in this study.

The prevalence of depression increased with increasing age; however, this was statistically not significant. The prevalence of

depression was more among women (13.9%) as compared to men (8.1%). Of the 395 participants, only 4 who were living alone. Therefore, it is not possible to comment on the association between living alone and depression. Though the prevalence of depression decreased with increase in educational level, it was not statistically significant.

TABLE V. Association of depression with clinical variables

Variable	Number of participants <i>n</i> =395	Depression present <i>n</i> =45 (%)	Unadjusted odds ratio (95% CI)	p value	Adjusted odds ratio (95% CI)	p value
<i>Sleep problems in last one year</i>						
Absent	322	27 (8.4)	Reference		Reference	–
Present	73	18 (24.7)	3.58 (1.84–6.93)	<0.001	2.97 (1.32–6.69)	0.009
<i>Hearing status</i>						
Normal	319	25 (7.8)	Reference		Reference	–
Bilateral hearing impairment	76	20 (26.3)	3.52 (1.95–6.36)	<0.001	4.00 (1.80–8.88)	0.001
<i>Presenting vision</i>						
Sighted	343	36 (10.5)	Reference			
Blind (better eye vision <6/60)	52	9 (17.3)	1.79 (0.80–3.96)	0.15	–	–
<i>Chronic disease</i>						
None	235	15 (6.4)	Reference		Reference	–
Present (any one)	104	15 (14.4)	2.47 (1.16–5.27)	0.019	1.84 (0.71–4.74)	0.20
Present (two or more)	56	15 (26.8)	5.37 (2.43–11.81)	<0.001	4.45 (1.60–12.35)	0.004

TABLE VI. Association of depression with physical activity

Physical activity	Number of participants <i>n</i> =395	Depression present <i>n</i> =45 (%)	Unadjusted odds ratio (95% CI)	p value	Adjusted odds ratio (95% CI)	p value
Walking only	186	12 (6.5)	Reference	–	Reference	–
Household work only	35	6 (17.1)	3.00 (1.04–8.62)	0.04	4.47 (1.18–16.93)	0.03
Farm-work only	23	1 (4.3)	0.66 (0.08–5.32)	0.70	1.87 (0.20–17.98)	0.59
Combination of physical activity*	71	5 (7.1)	1.10 (0.37–3.24)	0.87	1.21 (0.33–4.47)	0.77
No physical activity	80	21 (26.2)	5.16 (2.39–11.13)	<0.001	4.95 (2.00–12.27)	0.001

* Two persons who were involved in other forms of physical activity (cycling) have been included in the combination of physical activity for analysis

The strengths of our study were that it was community-based, and the sample size was adequate. The coverage rate was high (92.7%). Screening of patients by GDS-H (cut-off score ≥ 11) and confirmation of diagnosis by the MINI provided a high sensitivity and specificity for diagnosis of depression.

Our study had some limitations. Dementia is a risk factor for depression. However, patients with cognitive impairment were excluded by the HMSE. Hence, there is likely to be some under-estimation of the prevalence of depression. This being a cross-sectional study, we could not establish temporality. This particularly refers to sleep problems, physical activity and involvement in family decision-making. Also, these findings are generalizable only to rural areas.

Conclusions

The prevalence of depression in elderly persons residing in a rural community of district Faridabad, Haryana, was 11.4%. Living in a nuclear family, lack of physical activity, exclusive involvement in household work, presence of two or more chronic diseases, having no role in family decision-making, sleep problems in the past year and bilateral hearing impairment were factors associated with depression in elderly persons. The number of chronic diseases and hearing impairment are likely to be independent risk factors for depression; other factors may have a bidirectional relationship, which can be best elucidated through longitudinal studies. Elderly people with sleep problems require evaluation to rule out depression. Physical activity, such as walking is recommended for elderly persons. Elderly persons who are involved whole-time only in household work should be encouraged to take part in other forms of physical activity as well. Patients suffering from multiple chronic diseases (two or more) deserve special attention; there is a need to screen them for depression.

Depression among elderly persons in the rural area needs to be an integral component of public health interventions in the community. Early diagnosis and appropriate management of this group of people will not only alleviate their suffering, but shall also go a long way in improving their contribution to society. Public healthcare providers and primary healthcare physicians need to be trained to identify depression and take suitable action. Social care providers, from both the formal and informal sectors, need to be included in the healthcare team for this purpose. Training of a mental health team is included under the District Mental Health Programme of the National Mental Health Programme of the Government of India.³¹ Community-based programmes are required to identify elderly persons who are likely to have depression, and institute effective measures for prevention and control.

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