Rate and correlates of depression among elderly people attending primary health care centres in Al-Dakhiliyah governorate, Oman

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معدل الاكتئاب والعوامل المصاحبة له بين المسنين الذين يراجعون مراكز الرعاية الصحية الأولية في محافظة الداخلية، عُمان

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الخلاصة: تهدف هذه الدراسة إلى التعرف على معدلات الاكتئاب والعوامل المصاحبة له لدى المسنين في المجتمع استناداً إلى البيانات المستمدّة من تقييم صحي شامل أجري في محافظة الداخلية في سلطنة عُمان في الفترة 2008-2010. وتغطي تلك البيانات السمات الديموغرافية، والأحوال الطبية والتغذوية، والقدرات الوظيفية، والاكتئاب، والخرف. واتضح أن معدل حدوث الاكتئاب 16.9٪ وهو أعلى لدى النساء (19.3) مما هو لدى الرجال (14.3٪) وأنه مما يرجّح حدوث الاكتئاب: وجود عوامل اختطار اجتماعية مستقلة (معدل الأرجحية 3.44)، والخرف (معدل الأرجحية 3.17)، واختلال أنشطة الحياة اليومية (معدل الأرجحية 2.19)، ومشكلات في المفاصل (معدل الأرجحية 1.52)، وتقييد في الحركة (معدل الأرجحية 1.43). وإذا ما استبعد الباحثون الخرف من النموذج فإن الاكتئاب يمكن توقعه أيضاً من خلال ضعف الإدراك للصحة (معدل الأرجحية 2.09)، وخلل الأنشطة الأساسية للحياة اليومية (معدل الأرجحية 1.47)، والأعمار المتقدمة التي تزيد على 70 عاماً وتقل عن 80 عاماً (معدل الأرجحية 1.63)، والأعمار التي تبلغ أو تزيد على ثمانين عاماً (معدل الأرجحية 1.75)، واستنتج الباحثون من الدراسة أن الاكتئاب شائع بين المسنين، رغم أنه ليس من الشكاوى الرئيسية لديهم.

ABSTRACT This study determined the rates and correlates of depression among community-dwelling elderly people, based on data from the comprehensive health assessment conducted in Al-Dakhiliyah governorate in Oman in 2008–2010. Data covered sociodemographic characteristics, medical and nutrition status, functional abilities, depression and dementia. The rate of depression was 16.9%, higher among women than men (19.3% versus 14.3%). Depression was independently predicted by the presence of social risk (OR = 3.44), dementia (OR = 3.17), impairment in activities of daily living (OR = 2.19), joint problems (OR = 1.52) and mobility restriction (OR = 1.43). If dementia was excluded from the model, depression was additionally predicted by poor perception of health (OR = 2.09), impairment in instrumental activities of daily living (OR = 1.47) and older ages of 70–< 80 years (OR = 1.63) and ≥ 80 years (OR = 1.75). Although not presenting as a complaint, depression in not uncommon among elderly people.

Pourcentage et corrélats de la dépression chez des personnes âgées consultant dans des centres de soins de santé primaires dans la région d'Al-Dakhiliyah (Oman)

RÉSUMÉ La présente étude visait à déterminer les pourcentages et les corrélats de la dépression chez des personnes âgées vivant dans la communauté, à partir des données extraites de l'évaluation de santé globale menée dans la région d'Al-Dakhliyah (Oman) de 2008 à 2010. Les données recueillies couvraient les caractéristiques sociodémographiques, l'état de santé et nutritionnel, les capacités fonctionnelles, la dépression et la démence. Le taux de dépression était de 16,9 % ; il était plus élevé chez les femmes (19,3 %) que chez les hommes (14,3 %). Le risque social (OR = 3,44), la démence (OR = 3,17), des difficultés à accomplir les activités de la vie quotidienne (OR = 2,19), des douleurs articulaires (OR = 1,52) et une restriction de la mobilité (OR = 1,43) étaient les facteurs prédictifs indépendants de la dépression. Si la démence était exclue du modèle, la dépression pouvait aussi être prévisible à partir d'indicateurs tels qu'une mauvaise perception de sa santé (OR=2,09), les difficultés à accomplir les activités importantes de la vie quotidienne (OR = 1,47) ainsi que les tranches d'âge plus avancées – 70 à moins de 80 ans (OR = 1,63) et 80 ans et plus (OR = 1,75). La dépression n'était pas rare chez les personnes âgées, même si elle ne motivait pas une consultation.

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Introduction

Depression is a major contributor to the global burden of disease throughout the lifespan. In 2008 it was the first cause of years lived with disability (YLDs) and the third cause of disability-adjusted life years (DALYs), accounting for 4.3% of DALYs worldwide, and it is projected to rank first by the year 2030, resulting in an estimated 6.2% of DALYs [1]. In Oman in 2010, depression was the first cause of YLDs and the third cause of DALYs [2].

The deterioration in health status that is associated with ageing increases the risk of depression. A systematic review by Barua et al. in 2012 revealed that chronic disorders, impairment of special senses and limitation of functional abilities significantly increased the risk of depression among elderly people [3]. Depression among the elderly is often undetected because it is manifested by executive dysfunction [4] and is viewed as part of the ageing process [5], resulting in further deterioration of health status [6], low quality of life [7] and greater use of health services [6].

The World Health Organization (WHO) recommended the integration of mental health services into primary care settings. Such integration has proved to be successful in narrowing the treatment gap when primary health-care centres are supported by secondary and tertiary levels of specialized care [8] such as in the case of Oman. The exact cause of depression remains unknown and its prevention is only feasible at the secondary level [9]. Screening of elderly people for depression will enable primary care physicians to recognize cases early in the course of the disease and initiate appropriate interventions, with the aim of alleviating suffering and improving outcomes.

The comprehensive health assessment of the elderly population in Al-Dakhiliyah governorate of Oman, initiated by the Ministry of Health between 2008 and 2010, included screening for mental status and depression. The extent of depression among the elderly in Oman has not been studied. This review and analysis of the data from the comprehensive health assessment will shed light on the extent of depression among community-dwelling elderly people and determine its relation with their sociodemographic characteristics and health status and functional abilities.

Methods

Study design

The study was a retrospective review of records of the comprehensive health assessment of the population aged 60 years and older in Al-Dakhiliyah governorate, Oman, initiated by the Ministry of Health between 2008 and 2010. The study was approved by the ethics review committee of Sultan Qaboos University and the Directorate General of Health Affairs, Al-Dakhiliyah governorate.

Study setting

In 2010, the number of Omani nationals in Al-Dakhiliyah governorate was 285 658, representing 13.7% of the total Omani population, and the estimated number of individuals aged 60 years and above was 10 855 [10]. Al-Dakhiliyah governorate is divided into 8 *wilayat* (the smallest administrative unit). The comprehensive health assessment of elderly population has been implemented in the 5 *wilayat* with the highest populations (total of 252 823 individuals). Out of the 17 primary health-care centres in these *wilayat*, 4 were excluded because of organizational obstacles to implementation. Therefore a total of 1666 elderly people attending 13 primary health-care facilities in 5 *wilayat* between 2008 and 2010 were subjected to the comprehensive health assessment.

Assessment tools

The assessment was done using a set of instruments translated into Arabic and validated and compiled by the Ministry of Health in a field manual for use by primary-care physicians and nurses [11].

- The Arabic version of the Geriatric Depression Scale (15 questions) was used to screen for depression. A score of ≥ 5 indicated the presence of depression, which was further classified into mild (score 5–10) and severe (score ≥ 11) depression [11–13].
- The Arabic version of the Mini-Mental State was used to screen for dementia. The scores range was 0–22. A score of ≤ 14 indicated the presence of dementia and was classified into mild (score 10–14) and severe (score 0–9) dementia [11,14].
- The Instrumental Activities of Daily Living (IADL) and Activities of Daily Living (ADL) scales were used to measure functional abilities. The ADL assessed the ability to perform basic activities using Barthel index scoring, yielding a score range 0–100 [11,15]. The IADL assessed the ability to live independently, yielding a score range 0–8 [11,16]. Dependent elderly were those who scored < 100 on ADL and < 8 on IADL.
- The time and Tinetti tests were used to determine the extent of mobility and balance and gait. On the time test, a time of ≤ 10 seconds indicated the absence of mobility handicap. The Tinetti test (16 questions) included the balance test (9 questions) and gait test (7 questions). The score range was 0–28; a score ≤ 24 indicated a risk of falls [11,17,18].
- The 16-item Mini-Nutrition Assessment was used to assess nutrition status [11,19]. It had a screening component (6 questions) to address a recent (over the past 3 months) decline in nutrition status (scoring ≤ 11) and a core component (10 questions) applicable to participants with unsatisfactory nutrition status on the screening component, yielding a score range 0–16. The score on the Mini-Nutrition Assessment was the

sum of scores on the 2 components and used to indicate sound nutrition status (score > 23.5), at risk of malnutrition (score 17–23.5) and existing malnutrition (score < 17).

- Screening for incontinence was done by enquiring about urge symptoms, urge incontinence, stress incontinence and stool incontinence. The score range was 0–7 [11]. A score > 0 indicated incontinence that required investigation.
- The health profile included the person's medical history of chronic medical conditions based on previous medical evaluations and diagnosis. Polypharmacy was assessed as the use of > 5 medications, including herbal medicines.
- The sociodemographic characteristics of the person included age, sex, marital status, education and socioeconomic status. The latter was a composite of social contact, social activities, living situation and economic level variables [11], yielding a maximum score of 25. A score < 17 indicated social risk, requiring evaluation by a social worker.

Data analysis

The data were analysed using *SPSS*, version 20, and expressed as numbers and percentages. The odds ratio (OR) and the corresponding 95% confidence interval (CI) were computed. The case–control approach analysis was adopted to identify the determinants of depression using univariate and multivariate logistic regression analyses. The significance of the results was judged at the 5% level.

Results

Prevalence of depression

Only 4.8% of the elderly people reported a previous psychiatric diagnosis including depression. The screening for depression revealed that 16.9% of the respondents had depression but most of them (90.0%) were experiencing mild depression. The rates of depression and severe depression were higher among women (19.3% and 11.5% respectively) than men (14.3% and 7.8% respectively). None of the women had received a formal education and they constituted a substantial proportion of the widows (85.1%) and the divorced (58.5%) as well as those living in unfavourable socioeconomic conditions (60.6%).

Sociodemographic variables and risk of depression

Depression was significantly more likely among women (OR = 1.44; 95% CI: 1.11–1.86), those who had lost a spouse by divorce (OR = 1.81; 95% CI: 1.06–3.07) or death (OR = 1.35; 95% CI: 1.01–1.80) and those having unfavourable socioeconomic conditions (OR = 4.56; 95% CI: 3.37, 6.19). Respondents in the age group of 70–< 80 years were 2.14 times (95% CI: 1.60–2.86) more likely to be depressed and the risk increased to 3.34 times (95% CI: 2.33–5.06) among those in the age group ≥ 80 years relative to those in the youngest age group. No excess risk of depression was observed in relation to education attainment (Table 1).

Health status and risk of depression

Table 2 portrays the risk of depression among elderly people in relation to their health status. More than half (56.7%) of the depressed elderly people were suffering from dementia compared with 19.0% of those who were not depressed. Depressed respondents were more likely to have dementia (OR = 5.58; 95% CI: 4.21–7.40), unsatisfactory nutritional status (OR = 2.67; 95% CI: 1.82–3.93) and joint problems (OR = 1.85; 95% CI: 1.42–2.41). Depression was 2.47 times higher among elderly people who were probably incontinent (95% CI: 1.29–4.72) and 3.24 times higher among those who were actually incontinent (95% CI: 2.00–5.23). More than half of elderly people (59.1%) were suffering from chronic diseases including diabetes, hypertension, heart diseases and bronchial asthma, and 16.0% were on polypharmacy. No excess risk of depression was linked to these variables.

Depressed elderly people were 1.94 times more likely to report being physically inactive in the week preceding the assessment (95% CI: 1.48–2.55) and 6.34 times more likely to rate their health as poor (95% CI: 4.10–9.81) compared with those who were not depressed (Table 2). Depressed respondents were more likely to have corneal opacity (OR = 1.50; 95% CI: 1.12–2.01), twice as likely to have hearing defects (OR = 2.31; 95% CI: 1.55–3.44) and 5 times more likely to have abnormal audiometry results (OR = 5.41; 95% CI: 2.13–13.75) than non-depressed respondents (Table 3). Depressed elderly were 3 times more likely to have mobility limitations (OR = 3.04; 95% CI: 2.31–4.00) and to be at risk of falls (OR = 3.12; 95% CI: 2.11–4.61). They were 2.29 times more likely to be dependent in IADL (95% CI: 1.72–3.04) and 3.63 times more likely to be dependent in ADL (95% CI: 2.77–4.77) (Table 4).

Independent predictors of depression

Two models were constructed to identify the independent predictors of depression considering variables significant in the univariate analysis, except for audiometric evaluation and nutrition assessment as these would have resulted in a considerable reduction in the number of cases eligible for analysis because of missing data. For the same reason, "mobility" and "balance and gait" were combined into one variable categorized as: mobility and/or balance and gait affected; or neither mobility nor balance and gait affected. Dementia was included in the first model (Table 5) and excluded in the second model

Table 1 Depression in relation to sociodemographic characteristics of the sample of elderly people in Al-Dakhliyah governorate, Oman

Sociodemographic characteristics	Not depressed		Depressed		Total		OR	95% CI
	No.	%[a]	No.	%[a]	No.	%[a]		
Age (years)								
60–	969	70.0	137	48.7	1106	66.4	1.00	–
70–	317	22.9	96	34.2	413	24.8	2.14	1.60–2.86
≥ 80	99	7.1	48	17.1	147	8.8	3.43	2.33–5.06
Sex								
Men	691	49.9	115	40.9	806	48.4	1.00	–
Women	694	50.1	166	59.1	860	51.6	1.44	1.11–1.86
Marital status								
Married	902	67.3	161	59.0	1063	65.9	1.00	–
Divorced	62	4.6	20	7.3	82	5.1	1.81	1.06–3.07
Single	15	1.1	5	1.8	20	1.2	1.87	0.67–5.21
Widow/widower	362	27.0	87	31.9	449	27.8	1.35	1.01–1.80
Education attainment								
Illiterate and read and write	1315	99.2	271	98.9	1586	99.2	1.00	–
Any formal education	10	0.8	3	1.1	13	0.8	1.46	0.40–5.33
Socioeconomic status								
No social risk	1237	90.0	186	66.4	1423	86.0	1.00	–
Presence of social risk	137	10.0	94	33.6	231	14.0	4.56	3.37–6.19

[a]*Data were missing in some categories; denominators for the percentages were the total number for the category.*
OR = odds ratio; CI = confidence interval.

(Table 6) as it was related to age and impairment of functional ability.

The first model, in which 1200 individuals were included, revealed that depression among elderly people was independently predicted by the presence of dementia, unfavourable socioeconomic conditions, impaired ADL, presence of joint problems and impairment of mobility and/or gait and balance (Table 5). The model correctly classified 85.8% of elderly people. The model correctly predicted 98.4% of non-depressed elderly people but the prediction of depressed elderly was low (15.4%).

The exclusion of dementia in the second model, which involved 1250 individuals, revealed that depression was additionally predicted by older age, impaired IADL and poor perception of health status (Table 6). The model correctly classified 84.6% of elderly people. The model predicted correctly 98.1% of non-depressed elderly; however, the prediction of depressed elderly was low (10.4%).

Discussion

Depression is the commonest mental health problem among the elderly [5,8] and its extent varies considerably across studies, depending on the population surveyed as well as the methods used to assess and report depression. A WHO report in 2001 indicated that up to 37% of elderly people cared for at primary health-care facilities were suffering from depression [5]. A lower rate of depression (16.9%) was revealed among the elderly people in our study, although 90.0% of them had mild depression. Such a low rate of depression could be attributed to the nurturing Omani culture and the few existing economic constraints. It is not surprising to find that depression is often neither reported by the elderly nor recognized by their caregivers or the treating physician, as depression-related symptoms are often masked by the presentation of physical illnesses [20].

In this study depression was predicted by how elderly people perceived and rated their health status, rather than the actual presence of diseases requiring lifelong treatment, a finding that is supported by previous studies [6,21–25]. Findings of a meta-analysis of cross-sectional and prospective studies provided evidence that poor perception of health is a risk rather than a consequence of depression [26]. The observed higher risk of depression in association with chronic medical problems and polypharmacy was not statistically significant, which is disagrees with several other reports [3,21,24,26–30]. These reports encompassed a wide range of incapacitating medical conditions while "chronic diseases" in the current study

Table 2 Depression in relation to general health status of elderly people in Al-Dakhliyah governorate, Oman

General health status	Not depressed		Depressed		Total		OR	95% CI
	No.	%[a]	No.	%[a]	No.	%[a]		
Chronic diseases								
No	571	41.7	103	36.9	674	40.9	1.00	–
Yes	799	58.3	176	63.1	975	59.1	1.22	0.94–1.59
Dementia								
No	1053	81.0	113	43.3	1166	74.7	1.00	–
Yes	247	19.0	148	56.7	395	25.3	5.58	4.21–7.40
Incontinence								
Absent	1269	94.1	232	84.4	1501	92.4	1.00	–
Probably	31	2.3	14	5.1	45	2.8	2.47	1.29–4.72
Present	49	3.6	29	10.5	78	4.8	3.24	2.00–5.23
Joints								
No problem	850	64.7	132	49.8	982	62.2	1.00	–
Problem present	463	35.3	133	50.2	596	37.8	1.85	1.42–2.41
Use of mobility aid								
No	873	64.8	173	64.3	1046	64.7	1.00	–
Yes	475	35.2	96	35.7	571	35.3	1.02	0.78–1.34
Nutrition status								
Satisfactory	271	64.7	61	40.7	332	58.3	1.00	–
Unsatisfactory	148	35.3	89	59.3	237	41.7	2.67	1.82–3.92
Polypharmacy								
Not present	1143	85.7	221	81.5	1364	85.0	1.00	–
Present	190	14.3	50	18.5	240	15.0	1.36	0.97–1.92
Perception of health								
Good/very good	502	37.4	54	19.9	556	34.4	1.00	–
As peers of same age	729	54.2	151	55.5	880	54.5	1.93	1.38–2.68
Poor	85	6.3	58	21.3	143	8.8	6.34	4.10–9.81
Uncertain	28	2.1	9	3.3	37	2.3	2.99	1.34–6.66
Physical activity last week								
Yes	919	70.4	142	55.0	1061	67.8	1.00	–
No	387	29.6	116	45.0	503	32.2	1.94	1.48–2.55

[a]*Data were missing in some categories; denominators for the percentages were the total number for the category.*
OR = odds ratio; CI = confidence interval.

was limited to a few manageable health problems, predominantly hypertension, diabetes and hypercholesterolaemia. In this respect, more importance should be given to the type of the illness and its impact on the elderly. Sources of constant frustration for elderly people that had significant effects on depression in this study included: stroke (with its disabling outcomes); musculoskeletal disorders (leading to impaired mobility, balance and gait); joint problems (which are a source of discomfort, pain and limitation of movement); incontinence (resulting in frequent soiling of clothes and confining elderly people to their home); and impairments of vision and hearing (which create a sense of isolation).

Prospective studies have pointed to the lack of association between late life depression and the development of dementia [29,31]. Studies using the case–control approach reported a higher rate of depression among the elderly suffering from dementia [32,33] and a higher rate of dementia among those suffering from depression [34]. Brommelhoff et al., who additionally used the co-twin approach to eliminate the confounding effects of environmental and genetic factors, confirmed the higher rate of dementia among depressed elderly people [34]. The current findings, however, showed that dementia and depression were related, although the direction of association could not be ascertained due to the nature of the study. Jorm's meta-analysis provided evidence

Table 3 Depression in relation to ocular and auditory findings among elderly people in Al-Dakhliyah governorate, Oman

Ocular & auditory findings	Not depressed		Depressed		Total		OR	95% CI
	No.	%[a]	No.	%[a]	No.	%[a]		
Cataract								
No	759	60.3	146	57.9	905	59.9	1.00	–
Yes	500	39.7	106	42.1	606	40.1	1.10	0.84–1.45
Corneal opacity								
No	1012	77.0	180	69.0	1192	75.6	1.00	–
Yes	303	23.0	81	31.0	384	24.4	1.50	1.12–2.01
Hearing screening								
Normal	1204	92.5	210	84.3	1414	91.2	1.00	–
Abnormal	97	7.5	39	15.7	136	8.8	2.31	1.55–3.44
Audiometry								
Normal (≥ 50 Hz)	104	80.6	10	43.5	114	75.0	1.00	–
Abnormal (< 50 Hz)	25	19.4	13	56.5	38	25.0	5.41	2.13–13.75

[a]Data were missing in some categories; denominators for the percentages were the total number for the category.
OR = odds ratio; CI = confidence interval.

of the association of depression with dementia in both case–control and prospective studies, and the quantified risk was almost 2-fold [35]. Three possible reasons were given for the association of depression and dementia: being an early prodrome of dementia [34,35]; advancing the clinical manifestations of dementia diseases [35]; and damage to the hippocampal area of the brain via a glucocorticoid cascade [35].

Though functional ability is retained until relatively older age, its decline is fastest compared with the physical and mental components of health and the steepest decline is for gait speed followed by IADL and ADL [36]. There is a general disagreement about the extent and direction of association between depression and limitations of functional ability. In agreement with the current findings, several other studies revealed a higher risk of depression in association with impairment in ADL [3,21–24,27,28,37] and IADL [28,37], while other studies did not find an excess risk [25,30]. The independent contribution of impairment in IADL in predicting depression in the elderly respondents in this study was eliminated when dementia was considered in the model, perhaps because the areas of IADL are affected by cognitive

Table 4 Depression in relation to state of mobility, gait and dependency on activities of daily living (ADL) and instrumental activities of daily living (IADL) among elderly people in Al-Dakhliyah governorate, Oman

Mobility, gait and dependency	Not depressed		Depressed		Total		OR	95% CI
	No.	%[a]	No.	%[a]	No.	%[a]		
Mobility timed test								
Unaffected	876	65.4	100	38.3	976	61.0	1.00	–
Affected	464	34.6	161	61.7	625	39.0	3.04	2.31–4.00
Balance and gait								
Normal	323	51.6	40	25.5	363	46.4	1.00	–
At risk of falls	303	48.4	117	74.5	420	53.6	3.12	2.11–4.61
IADL								
Independent	642	46.9	76	27.8	718	43.7	1.00	–
Dependent	728	53.1	197	72.2	925	56.3	2.29	1.72–3.04
ADL								
Independent	1113	80.9	148	53.8	1261	76.4	1.00	–
Dependent (probable/ actual)	263	19.1	127	46.2	390	23.6	3.63	2.77–4.77

[a]Data were missing in some categories; denominators for the percentages were the total number for the category.
OR = odds ratio; CI = confidence interval.

Table 5 Independent predictors of depression among elderly people in Al-Dakhliyah governorate, Oman

Independent predictors	Adjusted OR	95% CI	*P*-value
Socioeconomic status			
No social risk	1.00	–	
Presence of social risk	3.45	2.29–5.18	< 0.001
Dementia			
No dementia	1.00	–	
Demented	3.18	2.22–4.54	< 0.001
ADL			
Independent	1.00	–	
Dependent (probable/actual)	2.19	1.48–3.24	< 0.001
Joints			
No problems	1.00	–	
Problems present	1.52	1.06–2.17	0.024
Mobility, gait & balance			
Unaffected	1.00	–	
Affected	1.43	0.97–2.11	0.069

Nagelkerke R^2 = 0.221.
ADL = activities of daily living; OR = odds ratio; CI = confidence interval.

Table 6 Independent predictors of depression among elderly people in Al-Dakhliyah governorate, Oman

Independent predictors	Adjusted OR	95% CI	*P*-value
Age (years)			
60–	1.00	–	
70–	1.63	1.12–2.36	0.011
≥ 80	1.75	1.02–2.98	0.041
Socioeconomic status			
No social risk	1.00	–	
Presence of social risk	3.45	2.33–5.12	< 0.001
ADL			
Independent	1.00	–	
Dependent (probable/actual)	2.08	1.40–3.10	< 0.001
IADL			
Independent	1.00	–	
Dependent	1.47	0.99–2.18	0.054
Perception of health			
Good/very good	1.00	–	
As peers of same age	1.36	0.91–2.04	0.131
Poor	2.09	1.16–3.76	0.014
Uncertain	0.65	0.17–2.51	0.535
Joints			
No problems	1.00	–	
Problems present	1.41	0.99–2.02	0.056
Mobility, gait & balance			
Unaffected	1.00	–	
Affected	1.48	1.01–2.16	0.044

Nagelkerke R^2 = 0.195.
ADL = activities of daily living; IADL = instrumental activities of daily living; OR = odds ratio; CI = confidence interval.

abilities, as suggested by Huang et al. [38]. It seems that Gayman et al. have ended the debate regarding the direction of association by demonstrating that functional limitation at baseline significantly affected depressive scores over a 3-year period, with no evidence of a reverse direction [37]. This association was explained on the basis of an intervening level of pain [37], loss of self-actualization [27] and the general lack of mastery or sense of control [27].

Several studies demonstrated the higher susceptibility of elderly women [9,22,24,25,27,29,33] and the older elderly [24,25,27,29,30] to depression, while a few studies showed the non-significant effects of sex [23,30] and age [21,23] when other risk factors were considered. Murata et al. concluded that depression was not the consequence of old age *per se* but rather the deterioration of health or other factors that may have adverse effects on health [21]. This is probably the reason for our finding that the age of the elderly person did not predict depression in the presence of dementia. The female predominance in depression is age-related, depicting a curvilinear relation, with the largest difference between the sexes in adult life and the lowest in old age [5,9]. The vulnerability of elderly women in this study did not persist after controlling for the confounding effect of other risk factors. The vulnerability of these women is probably related to their low socioeconomic status, indicated by illiteracy, and the loss of a spouse, with its subsequent negative impact on their status.

This study underscored the role of an unfavourable socioeconomic situation—measured objectively as a composite of economic level, living situation, social contact and social activities—in predicting depression among elderly people. Depression, associated with low income [21,24,25,27,33], poor housing [24], limited social interaction [22,24,25,33] and lack of social support [7], is often due to the inability of the elderly person to cope with the increasing

demands of life. An unfavourable socioeconomic situation is also the source of many other vulnerability factors for depression such as improper nutrition, physical illness, adverse life events and dissatisfaction with life.

The study had some limitations inherent in a review of records, such as missing information, and was limited to elderly people attending primary health-care centres. Community-based surveys of the elderly may yield a higher rate of depression, as those with severe and incapacitating health problems are less likely to attend primary health-care facilities. Failure to identify depression among the elderly is a common problem facing primary-care physicians, particularly in developing countries where the depressed are more likely to present with somatic complaints. Addressing the identified risk factors for depression among the elderly will eventually prevent its occurrence and enhance recovery. Future research should focus on the outcome of the identification and treatment of depression among the elderly on health status, functional abilities and quality of life. Screening the elderly population for depression, followed by appropriate management, could break the vicious cycle in the elderly whereby depression and the deterioration of health status/functional capacities reinforce each other. Such an approach is likely to be cost–effective in view of the high rate of utilization of primary-care facilities and the acute shortage of psychiatrists.

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