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Original Article

Psychosocial Predictors of Cognitive Impairment in the Elderly: A Cross-Sectional Study

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Abstract

Objective: Cognitive impairment is a major public health problem among elderly population. The aim of this study was to assess some psychosocial predictors of cognitive impairment (age, education, living alone, smoking, depression and social support) in the Iranian elderly population.
Method: A total of 1612 elderly (over 60 years) were enrolled in this cross-sectional study. Cognitive function was assessed using Mini Mental State Examination (MMSE). In addition, data from psychological tests and demographic characteristics were analyzed.
Results: Older age, low education level, living alone, smoking, depressive symptoms, and lower social support were associated with an increased risk of cognitive impairment. Ages 70 to 74 (OR = 3.47; 95% CI, 2.13-5.65), 75 to79 (OR = 3.05; 95% CI, 2.11-4.41) and 80 to 85 (OR = 5.81; 95% CI, 2.99-11.22) and depression symptoms (OR = 1.64; 95% CI, 1.27-2.13) were significant positive predictors, whereas social support with scores ranging from 26 to 30 (OR =0. 32; 95% CI, 0.16-0.62) and 31 to 33 (OR =0.29; 95% CI, 0.14-0.61) and more than 5 years of education (OR = 0.19; 95% CI, 0.14-0.27) were the negative predictors of cognitive impairment.
Conclusion: The findings suggest older age and depression as positive predictive factors and higher education level and social support as negative predictive factors of cognitive impairment in the elderly population.

Key words: *Cognitive Impairment, Depressive Symptoms, Older People, Predictors, Social Support*

Dementia is the common cause of cognitive impairment in the elderly population. Dementia reflects disruption in one or more cognition domains (memory, language, orientation, judgment, conducting interpersonal relationship, performing actions, and problem solving) and is frequently complicated by behavioural symptoms (1). Dementia is a common illness, which is known as the most important cause of disability and mortality in older adults (2). According to World Health Organization (WHO) reports, the prevalence of dementia ranges from 2.1% to 8.1% in the older population aged 60 years and over (3).

Alzheimer's disease, vascular dementia, dementia with Lewy bodies, and frontotemporal dementia are the most common types of dementia (4). Some studies have introduced several risk factors for dementia (5-8). Beerenset et al. suggested that depressive symptoms and agitation are related to lower quality of life in the elderly with dementia (5). In addition, Wei et al. showed that stroke, lack of fruits and vegetables in daily diet, early parental death, household financial management, cardiovascular disease, and hypertension were significantly associated with dementia in highly educated elderly people in Tianjin (6).

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Another study found that 75% of patients suffering from dementia have experienced some neuropsychiatric symptoms in the past month (apathy 36%, depression 32%, agitation 30%) and that 80% of patients experienced at least one symptom at the onset of cognitive decline (7).

Depression is one of the most prevalent symptoms in dementia. It is not well-known whether depression could lead to cognitive impairment (10). Some meta-analysis studies found that individuals with a history of depression were more predisposed to Alzheimer's dementia during ageing (11, 12). Additionally, some investigations suggest that depression is a psychological reaction to cognitive decline (13, 14).

Social support has a strong influence on older individuals' health (15). Social support is a general concept commonly divided into instrumental and emotional support. Social support refers to the number of social relationships of individuals and its quality (16). Several lines of evidence emphasize that higher cognitive function in older adults was associated with increased social support (17). Taken together, identifying factors of successful cognitive aging influences prevention strategies to ensure optimal health and prevent or delay cognitive impairment in the elderly. Although previous literature investigated the risk factors of cognitive impairment, few studies have focused on the psychological risk factors (10-14). In this cross-sectional study, we assessed some psychosocial predictive factors of dementia (age, education, living alone, smoking, depression, social support) in the Iranian elderly.

Materials and Methods

Study Population and Design

This cross-sectional study was a part of the Amirkola Health and Ageing Project (AHAP) (18). AHAP cohort study is mainly concerned with geriatric medical problems, such as falling, bone fragility and fractures, cognitive impairment and dementia, poor mobility, and functional dependence. Those aged 60 years and over were invited to participate in this study through posters distributed throughout the city and were assessed by a broad range of biochemical and hormonal tests measured at baseline and follow-up. All participants signed a written informed consent. AHAP cohort study was approved by the Medical Ethics Committee of Babol University of Medical Sciences. A detailed discussion of the AHAP sample was described previously (18).

Health care practitioners were trained in a workshop to use the questionnaire and assess the old population in the public health clinics of city of Amirkola. Inclusion criteria were as follow: age 60 and over and completing all the 3 questionnaires of Mini Mental State Examination (MMSE), Duke Social Support Index (DSSI), and Geriatric Depression Scale (GDS). Elderly people who were not able to answer questions due to severe psychiatric disorders, such as bipolar mood disorder, depressive disorder or psychosis, were excluded.

Assessment of Cognition

Mini Mental State Examination (MMSE)

MMSE is a brief and objective screening tool for cognitive impairment among the elderly that has proven to be valid and reliable across a variety of clinical, epidemiological, and community survey studies. It is used to evaluate various aspects of cognitive function, including orientation, attention, memory, language, and visual-spatial skills (19). The total score for the MMSE ranges from 0 to 30. The most widely accepted and frequently used cut- off score for the MMSE is 25, with the score 25 or lower indicating the presence of cognitive impairment. Because the MMSE was developed as a screening tool for cognitive impairment, a low score ($\leq$ 24) indicates both the likelihood of cognitive impairment and the need for further evaluation. In this study, we considered MMSE score of 25 to 30 as normal, 20 to 24 as mild cognitive impairment, 10 to 19 as moderate cognitive impairment, and $\leq$ 9 as severe cognitive impairment (20, 21). Also, the scores less than 24 were adjusted based on age and education level using the score adjustment coefficients suggested by Magni et al. (22).

Duke Social Support Index (DSSI)

This instrument consists of 11 questions and 2 subscales: social interaction (4 items) and social satisfaction (7 items). The items were scored using a Likert scale as follow: 1 point for rarely/very dissatisfied, 2 points for sometimes/dissatisfied, and 3 points for most of the times /satisfied. Total social support scores range from 11 to 33. A higher score indicates higher levels of social support. Internal consistency for all the questions was 0.77, and test-retest reliability was 0.70 to 0.81 (23). In addition, we used the validated Persian version of DSSI (24). The Cronbach's alpha of the scale was 0.69 in this study.

Geriatric Depression Scale (GDS)

This instrument is a valid questionnaire (25), with 15 questions, each of which is scored 0 or 1. Ten questions suggest the presence of depression when answered positively, while the rest (question numbers 1, 5, 7, 11, 13) suggest depression when answered negatively. A low score ($\leq$ 24) indicates depressive symptoms, which were divided into mild (5-8), moderate (9-12), and severe (13-15). Test sensitivity and specificity were 92% and 89%, respectively (25-27). In addition, we used the validated Persian GDS to assess depression (28). Cronbach's alpha for this questionnaire was 0.81 in the elderly population of Amirkola city.

Data Analysis

At first, descriptive analysis was conducted to compute the percentages, means, and standard deviations of all variables. T tests were used to identify the significant differences between men and women. Chi- square tests

were used to identify univariate relationships between the psychosocial variables and cognition impairment. At first, each single variable was entered into the univariate logistic regression. Then, condition variables (P<0.20) were entered into the final multivariate model. Backward multivariate logistic regression analysis was performed to assess independent predictors of cognition impairment and odds ratios (OR), and 95% CI were estimated. This model was then adjusted for all baseline characteristics that were significant at p <0.05 in the bivariate analysis. All analyses were conducted using SPSS software Version 18.

Results

A total of 1616 older people participated in this study (72.3% response rate), and 4 patients were excluded due to incompletion the evaluation for cognitive impairment. Therefore, 1612 participants were entered in this study. Among them, 881 (54.7%) were male and 731 (45.3%) were female. Table 1 demonstrates the demographic characteristics of the participants.

In this study, the mean social support score was 27.48 ± 2.98. According to GDS scores, 700 (43.4%) individuals had symptoms of depression (mild 63%, moderate 25.2%, and severe 11.8%). Based on MMSE scores, 509 (31.5%) individuals had cognitive impairment. Table 2 demonstrates the mean of psychosocial variables according to gender status. There were significant differences between men and women with regards to cognition status, depression symptom, and social support. The mean of cognitive impairment and depressive symptom in women were significantly higher than in men. The mean of total social support and 2 subscales (social interaction and social satisfaction) in women were significantly lower than in men. Table 3 demonstrates the univariate relationship between cognition status and psychosocial factors. There was a significant relationship between age and cognitive impairment (P < 0.001). Univariate analysis revealed that cognitive impairment was significantly more prevalent in women than in men (P < 0.001). In univariate analysis, elder people with cognitive impairment had significantly more symptoms of depression than those without cognitive impairment (P < 0.001). Elder people who lived alone had more frequency of cognitive impairment than those who did not live alone (P < 0.001). Also, older adult smokers had more frequency of cognitive impairment compared to non-smokers (P < 0.001). Those with high perceived social support had lower cognitive impairment than those with low perceived social support (P < 0.001).

Table 4 presents the results of univariate logistic regression. According to multivariate logistic regressions, depressive symptoms had a significant positive association with cognitive impairment and were considered as important risk factors in those aged 80 to 85, 70 to 74, and 75 to 79. Social support with scores ranging from 26 to 30 and 31 to 33 were negative predictors of cognitive impairment. Also, education more than 5 years was a negative predictor of cognitive impairment (Table 5).

Table 1. Frequency and Apercentile of Demographic Characteristics in the Elderly (N=1612)

Variables	N	%
Age		
60-64	571	35.4
65-70	335	20.8
≥71	706	43.8
Education Level		
<9 Years	1476	91.5
≥9 years	136	8.5
Marital Status		
Married	1374	85.2
Single	238	14.8
Living Arrangement		
Alone	107	6.6
With others	1495	93.4
Gender		
Male	881	54.7
Female	731	45.3

*Single population includes divorced, unmarried and widowed individuals

Table 2. Comparison of Means of Psychosocial Factors between Men and Women of Elderly

Variables	Men Mean (SD)	women Mean (SD)	P-value
Cognition status (MMSE score)	26.2 (3.2)	23.9 (4.3)	0.001
Depression symptom (GDS score)	3.4 (2.9)	5.9 (3.5)	0.001
Social support (DSS)	10.4 (1.3)	9.9 (1.5)	0.001
Social interaction	17.7 (2.5)	16.7 (2.8)	0.001
Social satisfaction	28.1 (3.0)	26.6 (3.4)	0.001
Total score			

Ranges: Mini Mental State Examination (MMSE), 0-30; Geriatric Depression Scale (GDS), 0-15; Duke Social Support Index (DSSI), social interaction (1-12) and social satisfaction total score, 11-33.

Table 3. Univariate Relationship of the Cognitive Impairment with Psychosocial Variables in the Elderly

Cognitive impairment variables	Yes		No		p-value
	N	%	N	%	
Gender					
Men	179	35.2	701	63.6	0.000
women	330	64.8	402	54.9	
Age					
60-64	120	21.0	452	79.0	
65-69	86	25.7	249	74.3	
70-74	87	30.7	196	69.3	
75-79	124	48.8	130	51.2	0.000
80-84	58	50.9	56	49.1	
85-99	33	63.0	20	37.0	
Education					
≤5 years	450	88.4	591	53.6	0.000
>5 years	59	11.6	512	46.4	
Living Alone					
Yes	109	21.4	128	11.6	0.000
No	400	78.6	975	88.4	
Smoking					
Yes	451	88.6	860	78	0.000
No	58	11.4	243	22	
Social support					
11-20	45	83.7	16	26.3	
21-25	169	49.4	173	50.6	
26-30	236	27.9	610	72.1	0.000
31-33	59	16.3	304	83.7	
Depression					
Yes	300	59.1	399	36.2	0.000
No	208	40.9	703	63.8	

Table 4. Predictors of Cognition Impairment in Univariate logistic Regression in the Elderly

Variables	OR	Confidence interval (CI) 95%	P-value
Gender (Women/Men)	3.25	2.49-4.25	0.000
Age			
60-64	1.00		
65-69	1.30	0.95-1.79	0.104
70-74	1.67	1.21-2.31	0.002
75-79	3.59	2.61-4.94	0.000
80-84	3.90	2.57-5.93	0.000
85≥	6.40	3.56-11.53	0.000
Education(>5 years/≤5 years)	0.15	0.11-0.20	0.000
Depression(Yes/No)	2.54	2.05-3.15	0.000
Social support (Duke scores)			
20≤	1.00		
21-25	0.35	0.19-0.64	0.001
26-30	0.14	0.08-0.25	0.000
31-33	0.07	0.04-0.13	0.000

Table 5. Predictors of Cognition Impairment in Multivariate Logistic Regression in the Elderly

Variables	OR	Confidence interval (CI) 95%	P-value
Gender (Women/Men)	3.25	2.49-4.25	0.000
Age			
60-64	1.18	0.82-1.69	0.352
65-69	1.30	0.91-1.88	0.148
70-74	3.05	2.11-4.41	0.000
75-79	3.47	2.13-5.65	0.000
80-84	5.81	2.99-11.22	0.000
Education(>5 years/≤5 years)	0.19	0.14-0.27	0.000
Depression (Yes/No)	1.64	1.27-2.13	0.000
Social support (Duke scores)			
21-25	0.56	0.28-1.11	0.098
26-30	0.32	0.16-0.62	0.001
31-33	0.29	0.14-0.61	0.001

Discussion

In the present study, some psychosocial predictors of cognitive impairment in the elderly were investigated. It was concluded that 509 (31.5%) elders had cognitive impairment. The prevalence of moderate to severe dementia in different population groups is 5% in the population older than 65 years (1). The prevalence of dementia in older Malaysians was reported to be 14.3% (29). In addition, we found that women had higher means of cognitive impairment and depressive symptoms compared to men. Female gender is sometimes identified as a risk factor for dementia and other psychiatric disorders (29, 30). Along with most studies, we found that women had lower social support than men (31), whereas some studies have indicated contrasting results (32, 33).

Our results revealed that age over 70 years had a significant positive association with cognitive impairment. Similar to our study, some reports have indicated that older age is an independent risk factor for dementia (29). During aging, prevalence of dementia increases by 0.6 to 0.8 at the age of 65 to 21% at the age of 90 (1).

Moreover, we found that education more than 5 years was a negative predictor of cognitive impairment. Previous researches also indicated that lower levels of education are associated with higher risk of cognitive impairment in older adults (34). People with higher education may have a greater cognitive reserve that delays the clinical manifestations of dementia.

In our findings, depressive symptom had a significant positive association with cognitive impairment. In accordance with our results, Saczynski et al. revealed that older adults with depression have a significant increased risk of developing dementia compared to healthy ones (35). A study investigated whether a history of depression is associated with the increased risk of dementia. In contrast to our findings, they reported that the onset of depression before dementia was not associated with an increased risk of dementia (37).

How is depression associated with cognitive impairment? Several possible underlying mechanisms have been proposed. First, depressive symptoms merely reflect the presence of underlying brain diseases that lead to cortical atrophy, limbic atrophy, and white matter lesions, which are often seen in both dementia and late onset depression (38). In addition, depression and dementia have common etiological factors, such as inflammation, vascular changes, and vascular risk factors (39, 40). Also, low socioeconomic status, educational level, and other medical comorbidities are common risk factors (41, 42).

The obtained results indicated that social support is a negative predictor of cognitive impairment. There are some hypotheses to explain the negative relationship between cognitive impairment and social support. First, social support as stress-buffering hypothesis states that people with more functional support are protected better against the negative consequences of psychological stress (43). The greater social support is associated with enhanced quality of life (16). Second, social support also increases the ability to deal with stressors via receiving informational and emotional support. If social support improves, it results in fewer physiological and psychological symptoms of the disease (44). Third, social support may also influence people, whether they are engaged in health promoting or health damaging behaviours (45). Depression and cognitive impairment frequently occur. Faramarzi et al. showed that lack of social support is negatively associated with depression in older people (46).

Limitation

This study has some limitations. First, we were not able to verify the relationship between some potential risk factors and development of dementia. Second, the diagnosis of cognitive impairment was not based on the clinical interview by a psychiatrist. Third, this was a cross- sectional study, and explanation of causality in

these studies is difficult. However,strong points of this study were large sample size, being a population based-study, and the use of valid and reliable instruments.

Conclusion

The findings noted that older age and depression are risk factors for cognitive impairment. Higher education level and social support are protective factors of cognitive impairment in elderly population. Further evaluations via prospective studies and eventually an experimental study on the patients are highly recommended.

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Conflict of Interest

Authors had no conflict of interest.

References

1. Benjamin J. Sadock, Virginia A. Sadock, Pedro Ruiz. Kaplan and Sadock's Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychiatry. 11th eds. London: Lippincott Williams & Wilkins; 2015.
2. G. Levy G, Tang M-X, Louis ED, Côté LJ, Alfaro B, Mejia H, SternY, Marder K. The association of incident dementia with mortality in PD. Neurology 2002; 59: 1708-1713.
3. Dementia: a public health priority. World Health Organization and Alzheimer's disease International 2012.
4. Keage HA, Ince PG, Matthews FE, Wharton SB, McKeith IG, Brayne C. Impact of less common and disregarded neurodegenerative pathologies on dementia burden in a population-based cohort. J Alzheimers Dis 2012; 28: 485–493.
5. Beerens HC , Zwakhalen S M.G, Verbeek H, Ruwaard D, Hamers J PH. Factors associate d with quality of life of people with dementia in long-term care facilities: A systematic review. Int J Nurs Stud 2013; 50: 1259–1270.
6. Wei C-J, Cheng Y, Zhang Y, Sun F, Zhang W-S, Zhang MY. Risk factors for dementia in highly educated elderly people in Tianjin,China. Clin Neurol Neurosurg 2014; 122: 4–8.
7. Lyketsos CG, Lopez O, Jones B, Fitzpatrick AL, Breitner J, DeKosky S. Prevalence of neuropsychiatric symptoms in dementia and mild cognitive impairment: results from the cardiovascular health study. JAMA 2002; 288: 1475–1483.
8. Kheirkhah F, Poorkarim K, Hosseini S R, Bijani A, Parsian H, Hamidia A et al. The Association Between Zinc and Cognitive Impairment in Elderly People of Iran. Shiraz E-Med J 2017; 18: e13093.
9. Steinberg M, Shao H, Zandi P, Lyketsos CG, Welsh-Bohmer KA, Norton MC, et al. Point and 5-year period prevalence of neuropsychiatric symptoms in dementia: the Cache County Study. Int J Geriatr Psychiatry 2008; 23: 170–177.
10. Schweitzer I, Tuckwell V, O'Brien J, Ames D. Is late onset depression a prodrometo dementia? Int J Geriatr Psychiatry 2002; 17: 997-1005.
11. Gao Y, HuangC, Zhao K, Ma L, Qiu X, Zhang L, et al. Depression as a risk factor for dementia and mild cognitive impairment: a meta-analysis of longitudinal studies. Int JGeriatr Psychiatry 2013; 28: 441–449.
12. Da Silva J, Gonc¸alves-Pereira M, Xavier M, Mukaetova-Ladinska EB. Affective disorders and risk of developing dementia: systematic review. Br J Psychiatry 2013; 202: 177-186.
13. Li G, Wang LY, Shofer JB, Thompson ML, Peskind ER, McCormick W, et al. Temporal relationship between depression and dementia: findings from a large community-based 15-year follow-up study. Arch Gen Psychiatry 2011; 68: 970-977.
14. Brommelhoff JA, Gatz M, Johansson B, McArdle JJ, Fratiglioni L, Pedersen NL. Depression as a risk factor or prodromal feature for dementia? Findings in a population-based sample of Swedish twins. Psychol Aging 2009; 24: 373–384.
15. Benmarhnia T, Zunzunegui MV. The role of social support on macroeconomic determinants on elderly people health: a hypothesis about a counterexample in Spain. J Epidemiol Community Health 2014; 68: 391-92.
16. Helgeson VS. Social support and quality of life. Qual Life Res 2003; 12: 25-31.
17. Jennifer Yeh S-C J, Liu Y-Y. Influence of social support on cognitive function in the elderly. BMC Health Serv Res 2003; 3: 9.
18. Hosseini SR, Cumming RG, Kheirkhah F, Nooreddini H, Baiani MA, Mikaniki E, et al. Cohort profile: The Amirkola Health and Aging Project (AHAP). Int J Epidemiol 2014; 43: 1393-1400.

19. Folstein MF, Folstein SE, McHugh PR. "Mini-Mental State". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975; 12:189–98.
20. Pezzotti P, Scalmana S, Mastromattei A, Di Lallo D. The accuracy of the MMSE in detecting cognitive impairment when administered by general practitioners: A prospective observational study. BMC Fam Pract 2008; 9: 29.
21. Tombaugh TN, McIntyre NJ. The Mini-Mental State Examination: a comprehensive review. J Am Geriatr Soc 1992; 40: 922-935.
22. Magni E, Binetti G, Bianchetti A, Rozzini R, Trabucchi M: Mini Mental State Examination: a normative study in Italian elderly population. Eur J Neurol 1996; 3: 198-202.
23. Goodger B, Byles J, Higganbotham N. Assessment of short scale to measure social support among older people. Aust N Z J Public Health 1999; 23: 260-265.
24. Bayrami M, AndalibKourayem M, Pouresmali A, Mohammadibakhsh L. The comparison of social support and religiosity in post-traumatic stress disorder patients, their wives and control group. Journal of Kermanshah University of Medical Sciences 2013; 17: 68-75.
25. Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS). Recent evidence and development of a shorter version. ClinGerontol 1986; 37: 819-820.
26. Gori C, Appollonio I, Riva G P, Spiga D, Ferrari A , Trabucchi M, et al. Using a single question to screen for depression in the nursing home. Arch GerontolGeriatrSuppl 1998; 6: 235–240.
27. Cheng S, Chan A CM. A brief version of the Geriatric Depression Scale for the Chinese. Psychol Assess 2004; 16: 182–186.
28. Malakouti SK, Fatollahi P, Mirabzadeh A, Salavati M, Zandi T. Reliability, Validity and factor structure of the GDS-15 in Iranian elderly. Int J Geriatr Psychiatry 2006; 21: 588-593.
29. Hamid TA, Krishnaswamy S, Abdullah SS, Momtaz YA. Socio-demographic risk factors and correlates of dementia in older Malaysians. Dement Geriatr Cogn Disord 2010; 30: 533-539.
30. Faramarzi M, Cheraghi M, Zamani M, et al. Gender specific predictors of depressive symptoms among community elderly. J Res Health Sci 2017; 17: e00377.
31. Barry LC, Kasl SV, Lichtman J, Harlan M, Krumholz HM. Social support and change in health-related quality of life 6 months after coronary artery bypass grafting. J Psychosom Res 2006; 60: 185-193.
32. Melchiorre MG, Chiatti C, Lamura G, Torres-Gonzales F, Stankunas M, Lindert J, et al. Social support, socio-economic status, health and abuse among older people in seven European countries. PLoS One 2013; 8: e54856.
33. Alipour F, Sajadi H, Forozan A, Nabavi H, Khedmati E. [The role of social support in the anxiety and depression of elderly (Persian)]. Iranian Journal of Aging 2009; 4: 53-61.
34. Zhu K, van Hilten JJ, Marinus J. Predictors of dementia in Parkinson 's disease; findings from a 5-year prospective stud y using the SCOPA-COG. Parkinsonism and Related Disorders2014; 20: 980-985.
35. Saczynski JS, Beiser A, Seshadri S, Auerbach S, Wolf PA, Au R. Depressive symptoms and risk of dementia: the Framingham Heart Study. Neurology 2010; 75: 35–41.
36. Meeks TW, Vahia IV, Lavretsky H, Kulkarni G, Jeste DV. A tune in "a minor" can "b major": a review of epidemiology, illness course, and public health implications of subthreshold depression in older adults. J Affect Disord 2011; 129:126–142.
37. Brommelhoff JA, Gatz M, Johansson B, McArdle JJ, Fratiglioni L, Pedersen NL. Depression as a risk factor or prodromal feature for dementia? Findings in a population-based sample of Swedish twins. Psychol Aging 2009; 24: 373–84.
38. Landes AM, Sperry SD, Strauss ME. Prevalence of apathy, dysphoria, and depression in relation to dementia severity in Alzheimer's disease. J Neuropsychiatry Clin Neurosci 2005; 17: 342–349.
39. Barnes DE, Alexopoulos GS, Lopez OL, Williamson JD, Yaffe K. Depressive symptoms, vascular disease, and mild cognitive impairment: findings from the Cardiovascular Health Study. Arch Gen Psychiatry 2006; 63: 273–279.
40. Kohler S, Thomas AJ, Lloyd A, Barber R, Almeida OP, O'Brian JT. White matter hyperintensities, cortisol levels, brain atrophy and continuing cognitive deficits in late-life depression. Br J Psychiatry 2010; 196:143–149.
41. Heun R, Hein S. Risk factors of major depression in the elderly. Eur Psychiatry 2005; 20: 199-204.

42. Yip AG, Brayne C, Matthews FE. Risk factors for incident dementia in England and Wales: the medical research council cognitive function and ageing study. A population-based nested case-control study. Age Ageing 2006; 35: 154–160.
43. Prokop CK, Bradley LA, Burish TG, Anderson KO, Fox JE. The diathesis-stress model. In Health psychology: Clinical methods and research. New York: MacMillan Publishing Company; 1991.
44. Hogan BE, Linden W, Najarian B. Social support interventions. Do they work? Clin Psychol Rev 2002; 22: 383-442.
45. Richardson LG. Psychosocial issues in patients with congestive heart failure. Prog Cardiovasc Nurs 2003; 18: 19-27.
46. Faramarzi M, HosseiniSH, Cumming RJ, Kheirkhah F, Parsaie F, Bijani A. A negative association between social support and depression in the elderly population of Amircola City. British Journal of Medicine & Medical Research. In press.