Ann Med Res

Current issue list available at AnnMedRes

Annals of Medical Research

journal page: www.annalsmedres.org

# Depression in older adults: May be the mass under the tip of the iceberg?

Ercument Ozturk[a,*], Sencer Ganidagli[a], Zeynel Abidin Ozturk[a]

[a] *Gaziantep University, Faculty of Medicine, Department of Internal Medicine, Division of Geriatric Medicine, Gaziantep, Türkiye*

ARTICLE INFO

**Keywords:**
Depression
Anxiety
Geriatric assessment
Malnutrition
Activities of daily living

Received: Apr 11, 2023
Accepted: Jun 20, 2023
Available Online: 25.07.2023

DOI:
10.5455/annalsmedres.2023.04.091

## Abstract

**Aim:** Our aim was to investigate the relationship between common geriatric syndromes and depression.

**Materials and Methods:** 515 patients over 65 years old admitted to a university hospital participated in this cross-sectional study. The Beck Anxiety Inventory (BAI), the European Quality of Life (EQ-5D), and the Pittsburgh Sleep Quality Index (PSQI) were administered to the participants in addition to the Comprehensive Geriatric Assessment. The Geriatric Depression Scale (GDS) was used to assess depressive symptoms in persons 65 years and older.

**Results:** The mean age of the participants was 72.2±6.3 years, and 133 (24.8%) of them scored high on the GDS for depression. The non-depressed group had lower rates of sarcopenia, fewer medications, lower BAI and PSQI scores, and higher EQ-5D and Instrumental Activities of Daily Living (IADL) scores. Correlation analysis showed that the GDS score was moderately positively associated with the number of medications ($r = 0.351$, $p = <0.001$), the BAI score ($r = 0.638$, $p = <0.001$), and moderately negatively associated with the IADL score ($r = -0.355$, $p = <0.001$) and the Mini Nutritional Assessment (MNA) score ($r = -0.316$, $p = <0.001$). After multivariate logistic regression analysis, IADL, MNA, and BAI scores were independently associated with depression ($p = 0.026$, OR = 0.72, $p = 0.026$, OR = 0.94, and $p = <0.001$, OR = 1.11, respectively).

**Conclusion:** Interventions aimed at alleviating depressive symptoms may be an effective strategy for preventing the adverse consequences of depression that lead to deterioration in quality of life. Therefore, focusing on factors that are independently associated with depression, such as dependency in activities of daily living, anxiety symptoms, and poor nutritional status, may be a useful method in the management of older patients with depression.



## Introduction

Depression is a common and important health problem among older adults. Late-life depression, which is influenced by gender, socioeconomic status, physical activity, and diet, is associated with serious consequences that increase the risk of morbidity and mortality [1,2]. Geriatric depression is strongly associated with negative outcomes related to the presence of medical comorbidities, cognitive decline, functional worsening, high rates of suicide risk, and all-cause mortality [3]. In addition, older people with depression have higher relapse rates, poorer treatment outcomes, and inadequate functional recovery [4]. Depression in older individuals is a highly under-recognized syndrome (40%–60% of cases) [5], and depressive symptoms among community-dwelling older adults have a substantial ratio ranging from ~8 to 16% [6]. One of the most common anxiety disorders, generalized anxiety disorder (GAD), affects an estimated 7.3% of older adults [7] and is linked to disability, increased healthcare costs, reduced quality of life, and probably higher rates of mortality [8]. Moreover, despite the negative impact of anxiety on overall health, GAD remains an underdiagnosed and undertreated condition in older people [9]. Anxiety is also a risk factor for depression in the older population and co-occurs with depression in about 31% of older adults with depression [10]. The experience of stress and unpleasant events in later life is associated with adverse physical and mental health outcomes. Depression and anxiety are associated with increased morbidity, impaired physical, cognitive, and social functioning, and poorer psychosocial health [11].

The higher prevalence of disability and chronic disease in the geriatric population compared to other age groups also leads to a reduction in quality of life, a multidimensional

*Corresponding author:
*Email address:* ercument37@yahoo.com (Ercument Ozturk)

concept of health that is a key to optimal aging. A variety of health-related conditions, such as physical illness, malnutrition, and polypharmacy, that affect quality of life and disability are triggers for depression [12,13]. Polypharmacy is associated with depression and is also a reliable predictor of depression [14]. Furthermore, depression increases the risk of poor nutritional status in older adults, and malnourished patients had higher depression scores [15].

Assessment of multiple dimensions, including physical, cognitive, affective, social, financial, environmental, and spiritual components that influence an older adult's health is required to provide comprehensive health care. A comprehensive geriatric assessment (CGA) is needed to define an older person's medical, psychosocial, and functional limitations in order to establish a sustainable healthy life throughout the aging process. Functional limitations of the elderly older persons are closely related to their depressive symptoms [16]. Many studies have shown that older adults with depressive symptoms or depression are at increased risk for cognitive decline, mild cognitive impairment, and dementia [17]. On the other hand, depressive symptoms are common in older people with dementia, with a prevalence of about 30% [18]. Many studies have reported an association between depressive symptoms or major depression and cognitive dysfunction in older adults [19,20].

Although it can occur at any age, sarcopenia is more prevalent in older adults. It is also linked to depressive symptoms in this population, independent of age, sex, cognitive ability, or other potential confounders [21].

In this study, we have researched the relationship between depression and various CGA characteristics, which are measures of health and quality of life in older people.

## Materials and Methods

This cross-sectional study was conducted with a total of 515 patients who applied to the geriatric outpatient clinic of a university hospital between November 2020 and November 2021. The study involved participants who were 65 years of age or older, who did not meet any exclusion criteria, and who gave their consent to participate. The exclusion criteria were aphasia, cognitive conditions that significantly impaired cooperation, the presence of cancer, severe inflammatory conditions, neuromuscular diseases, immobility, and additional comorbid conditions (severe osteoarthritis, peripheral arterial disease, neuropathy, visual and hearing impairment, and other conditions that limited assessment of muscle function, balance, and gait). We obtained their medical history, including any comorbidities and polypharmacy. Polypharmacy was defined as the concurrent daily use of five or more different chronic medications [22]. The sample size was calculated using the Epi Info software and the minimum sample size was 288 participants at the level of $\alpha = 0.05$ with 95% power.

This study was approved by the local ethics committee (Gaziantep University Clinical Research Ethics Committee, date: 11.05.2022 decision no: 2022/155) and was conducted in accordance with the principles of the Declaration of Helsinki.

Screening and assessment of fall risk, sarcopenia, activities of daily living, instrumental activities of daily living, nutritional status, depressive symptoms, and mental status are part of a comprehensive geriatric assessment. All participants were screened and underwent a geriatric assessment tests as part of this process.

The GDS, a 30-item questionnaire designed for older people, was used to assess depressive symptoms. Although some questions are reverse coded, the scale codes as follows positive responses 0 and negative responses 1. With a score of 0-10, depression is not present; 11-13, it may be present; and 14-plus, it is present [23].

The frequency of anxiety symptoms is quantified by the Beck Anxiety Inventory (BAI). The 21-item measure uses a four-point Likert scale (0 = none, 3 = intense). The study used the validated form of the BAI for the Turkish population [24].

Participants' balance and mobility were assessed using the Tinetti Balance and Gait Assessment Tool (TBGA). A score of 24 on the Tinetti Balance-Gait Evaluation Scale indicates a low risk of falling, a score of 19-23 indicates a moderate risk of falling, and a score of 19 indicates a high risk of falling.

*Tinetti Balance (TB):* The patient is instructed to sit in an armless chair before standing. He or she had to maintain balance while standing while being gently pushed, either in a neutral position or with eyes closed. Then, without losing balance, he or she tried to turn around completely. In addition, the patient was observed while sitting. The maximum score is sixteen.

*Tinetti Gait (TG):* The individual was instructed to walk on a straight path at a fast but safe pace using the TG. Ground contact and symmetrical, even steps were observed. The participant was allowed to use assistive devices. In the assessment of sarcopenia, the highest possible score is 12.

The European Working Group on Sarcopenia in Older People (EWGSOP2) criteria of reduced muscle mass and strength were used to diagnose sarcopenia. Using a Jamar hydraulic hand dynamometer to test muscle strength (handgrip strength) and a bioelectric impedance analyzer to determine muscle mass (Tanita SA165, A-0950U3), the handgrip strength (HGS) thresholds for Turkish population were used. (22 kg for women and 32 kg for men). To measure muscle mass, skeletal muscle mass index (SMMI) corrected for body mass index (BMI) was calculated; values lower than 0.823 for women and 1.049 for men were considered to indicate low muscle mass. Low walking speed was defined as less than 0.8 m/s, while severe sarcopenia was defined as both low walking speed and sarcopenia.

The Katz Index of Activities of Daily Living (ADL) measures a person's physical dependence on tasks such as washing, dressing, toileting, transferring, maintaining continence, and eating. Higher scores, which range from 0 to 6, indicate greater independence.

Instrumental Activities of Daily Living (IADL), a scale developed by Lawton and Brody that assesses independence in tasks such as shopping, housework, laundry, food preparation, using the telephone, driving a vehicle, taking

medications, and managing money. Higher scores indicate greater independence. Scores range from 0 to 8.

A validated Turkish version of the Mini-Nutritional Assessment (MNA) questionnaire (25) was used to fully measure nutritional status. Malnutrition was defined as an MNA score of 17, risk of malnutrition as an MNA score of 17-23.5, and normal nutritional status as an MNA score of 24.

The MMSE is a 30-point questionnaire that measures cognitive impairment. It examines functions including orientation (10 pts), registration (3 pts), attention and calculation (5 pts), recall (3 pts), and language/visuospatial construction (9 pts). Its reliability and validity have been confirmed in Turkey, and the cut-off point for diagnosing mild dementia in the Turkish population was found to be 23/24 (25).

The European Quality of Life-5 Dimensions (EQ-5D) questionnaire was used to assess quality of life. The questionnaire asks people to self-assess their health status in five dimensions: mobility, self-care, regular activities, pain or discomfort, and anxiety or depression. The index score is then calculated. Negative scores indicate dependency, bed rest, and unconsciousness, while a score of 1 indicates excellent health and 0 indicates death.

The PSQI, which measures subjective sleep quality over the past month, was used to assess sleep quality. It has 19 self-rated questions and five partner-rated questions. Subjective sleep quality, latency, duration, efficiency, disturbances, use of sleep medications, and daytime dysfunction are the seven factors used to score the 19 items. A total PSQI score ranging from 0 to 21 was created by combining these component scores, with lower numbers indicating poorer sleep quality. PSQI scores greater than 5 were considered abnormal. The culturally appropriate Turkish form was used in the study [26].

The Kolmogorov-Smirnov test was used to determine whether the distributions of continuous variables were normal. The independent samples t-test was used to compare two independent groups with normally distributed data, the Mann-Whitney U-test to compare two independent groups with non-normal distribution, and the Kruskall-Wallis test to compare three independent groups with non-normal distribution. Relationships between categorical and numerical variables were examined using Chi-square analysis and Spearman's rank correlation coefficient, respectively. Potential confounders of depression were examined, variance inflation factor (VIF) was calculated. Variables with a VIF $>$ 5 were considered to have a multicollinearity problem and were excluded from the model. Variables without multi-collinearity problems were included in the multivariate logistic regression analysis. Data were analyzed using IBM SPSS Statistics (Version 22) predictive analytic software. A p-value less than 0.05 were accepted as statistically significant.

## Results

The mean age of the participants was 72.2 +/- 6.3 years, and 58.6% were female. According to the GDS, 133 participants (25.7%) were classified as depressed. The non-depressed group had lower rates of female participation, sarcopenia, medication use, and disease than the depressed and potentially depressed groups. In addition, the non-depressed group had better IADL and EQ-5D scores, lower BAI and PSQI scores, better MMSE and TBGA scores, and lower BAI and PSQI scores than the depressed group (Table 1).

According to the results of the correlation analysis, the GDS score had moderately positive correlations with the number of medications (r = 0.351, p = <0.001), the BAI score (r = 0.638, p = <0.001) and PSQI score (r = 0.426, p = <0.001) and moderately negative correlations with IADL (r = -0.355, p = <0.001), EQ-5D (r = -0.601, p = <0.001) and MNA (r = 0.316) (Table 2, Table 3).

Potential confounders of depression (age, sex, diabetes mellitus, PSQI, IADL, BAI, MMSE, MNA, sarcopenia, hypertension) were examined, variance inflation factor (VIF) was calculated, and number of comorbidities, number of medications, and ADL score were excluded due to collinearity problem. According to multivariate logistic regression analysis, IADL and MNA scores were found to be independent variables for decreased association with depression and BAI score for increased association with depression. (p = 0.026, OR = 0.72, p = 0.026, OR = 0.94, and p = <0.001, OR = 1.11, respectively) (Table 4).

## Discussion

In our study, we found that poor nutritional status, high levels of anxiety, and a decline in instrumental activities of daily living were all factors independently associated with depression. We know that anxiety is a risk factor for older people with depression and is highly prevalent in this population [7]. Anxiety disorders are much more common in older persons with depression than in younger people [10]. Depression and anxiety in aging are significant risk factors for morbidity and have a detrimental effect on both physical and psychological well-being [11]. Studies of hospitalized and community-dwelling older adults have found that depression increases the likelihood of poor nutritional status and that malnourished patients have higher depression scores [15,27]. Depression has been shown to play a significant role in predicting malnutrition in older adults [28]. In the current study, the number of patients with malnutrition was higher in the depressed group, and it was also found to be independently associated with depression, in line with a study investigating the relationship between sarcopenia components and depression in geriatric outpatients [29]. Numerous studies have previously demonstrated the strong link between depression and malnutrition [15,30]. Treatments and interventions for depression may reduce the risk of malnutrition, although the relationship between depression and malnutrition is complicated and there is a bidirectional relationship between the two conditions [31]. Functional decline is significantly associated with depressive symptoms, and functional independence is a very strong predictor of quality of life [32]. In older adults, functional disability in IADLs, sarcopenia, and depression have been shown to be related [33]. Physical problems, including a decline in aerobic capacity, muscle strength, motor response, and overall functional capacity, may be consequences of depression-related social and physical limitations. The results of this study

**Table 1.** Participants' socio-demographic characteristics and comprehensive geriatric assessment results (n=515).

| Variables | Non-depressed (0-10 pts) (n=324) | Possible depressed (11-13 pts) (n=58) | Depressed (≥14 pts) (n=133) | p | Total (n=515) |
|---|---|---|---|---|---|
| Gender | | | | | |
| • Female | 164(50.6%)* | 44(75.9%) | 94(70.7%) | <0.001* | 302(58.6%) |
| • Male | 160(49.4%)* | 14(24.1%) | 39(29.3%) | | 213(41.4%) |
| Age † | 72.0±5.8 | 72.1±6.4 | 72.8±7.4 | 0.443 | 72.2±6.3 |
| Number of comorbidities # | 2(0-8)* | 3(1-7) | 3(1-7) | <0.001* | 2(0-8) |
| Number of medications # | 4(0-20)* | 5(0-18) | 5(0-15) | <0.001* | 4(0-20) |
| Comorbidities | | | | | |
| • Hypertension | 178(54.9%) | 36(62.1%) | 83(62.4%) | 0.263 | 297(57.7%) |
| • Diabetes mellitus | 139(42.9%)* | 31(53.4%) | 73(54.9%)* | 0.039* | 243(47.2%) |
| • Coronary artery disease | 85(26.2%) | 21(36.2%) | 39(29.3%) | 0.281 | 145(28.2%) |
| • Neurodegenerative diseases | 26(8.0%)* | 11(19.0%) | 36(27.1%) | <0.001* | 73(14.2%) |
| • Asthma/COPD | 34(10.5%) | 8(13.8%) | 21(15.8%) | 0.271 | 63(12.2%) |
| Polypharmacy | 137(42.3%)* | 30(51.7%) | 75(56.4%)* | 0.017* | 242(47.0%) |
| ADL † | 4.1±1.6 | 4.1±1.8 | 3.8±1.8 | 0.282 | 4.00±1.7 |
| IADL† | 6.2±1.7* | 5.2±2.5 | 4.6±2.6 | <0.001* | 5.7±2.2 |
| BAI # | 6(0-25)* | 13(0-42) | 15(0-48) | <0.001* | 9(0-48) |
| MMSE † | 24.6±4.9* | 23.2±4.8 | 22.2±6.2* | <0.001* | 23.8±5.4 |
| MNA † | 23.4±5.0* | 21.0±5.4 | 20.4±5.4 | <0.001* | 22.4±5.3 |
| EQ-5D # | 0.78(-0.07-1.00)* | 0.31(-0.16-0.91) | 0.33(-0.53-1.00) | <0.001* | 0.52(-0.53-1.00) |
| PSQI # | 4(0-16)* | 8(2-15) | 7(0-17) | <0.001* | 6(0-17) |
| Sarcopenia | 90(27.7%)* | 29(50.0%) | 65(48.8%) | <0.001* | 174(35.7%) |
| TBGA # | 25(9-35)* | 24(6-35) | 22(1-35)* | 0.011* | 25(1-35) |

*p<0.05; †Data are presented as Mean±SD. # Data are presented as median (min-max). COPD, Chronic obstructive pulmonary disease; ADL, Katz Index of Activities of daily living; IADL, Lawton & Brody index of Instrumental Activities of Daily Living; BAI, Beck Anxiety Inventory; MMSE, Mini Mental State Examination; MNA, The Mini Nutritional Assessment Tool; EQ-5D; European Quality of Life-5 Dimensions; PSQI, Pittsburgh Sleep Quality Index; TBGA, Tinetti Balance and Gait Assessment Tool.

**Table 2.** Correlation analysis results between the variables.

| | | GDS | Age | Number of comorbidities | Number of medications | ADL | IADL | EQ5D |
|---|---|---|---|---|---|---|---|---|
| GDS | r | 1.000 | 0.064 | 0.351 | 0.221 | -0.034 | -0.355 | -0.601 |
| | p | | 0.148 | **<0.001*** | **<0.001*** | 0.435 | **<0.001*** | **<0.001*** |

r: Spearman rank correlation coefficient; *Significant at 0.05 level; ** Significant at 0.01 level. GDS, The Geriatric Depression Scale; ADL, Katz Index of Activities of daily living; IADL, Lawton & Brody index of Instrumental Activities of Daily Living; EQ-5D; European Quality of Life-5 Dimensions.

**Table 3.** Correlation analysis results between the variables.

| | | GDS | BAI | MMSE | MNA | PSQI | TBGA |
|---|---|---|---|---|---|---|---|
| GDS | r | 1.000 | 0.638 | -0.286 | -0.316 | 0.426 | -0.091 |
| | p | | **<0.001*** | **<0.001*** | **<0.001*** | **<0.001*** | 0.095 |

r: Spearman rank correlation coefficient; *Significant at 0.05 level; ** Significant at 0.01 level. GDS, The Geriatric Depression Scale; BAI, Beck Anxiety Inventory; MMSE, Mini Mental State Examination; MNA, The Mini Nutritional Assessment Tool; PSQI, Pittsburgh Sleep Quality Index; TBGA, Tinetti Balance and Gait Assessment Tool.

showed that sarcopenia was significantly more common in the depressed group, which is consistent with the findings of numerous studies in the literature. Depression may result from sarcopenia for a variety of reasons, including increased risk of falls, independence, difficulty with self-care, malnutrition, and physical inactivity. Similarly, sarcopenia can result from depressive symptoms such as fatigue, loss of appetite, apathy, and low motivation. As a result, older adults who are more physically active have a protective lifestyle against sarcopenia and depression [34].

The main reason for polypharmacy is the presence of multiple comorbidities. Consistent with this, we found a moderately positive association in the study between the number of medications and the presence of various comorbidities. In addition, there was a small but significant associa-

**Table 4.** Multivariate logistic regression analysis results of the independent variables for depression.

| Variable | Depression | |
|---|---|---|
| | OR [95% CI] | p value |
| Age | 1.00[0.94-1.05] | 0.900 |
| Gender (Female vs male) | 0.83[0.39-1.74] | 0.622 |
| DM | 1.25[0.60-2.60] | 0.557 |
| HT | 0.81[0.38-1.72] | 0.583 |
| IADL | 0.72[0.54-0.96] | 0.026* |
| BAI | 1.11[1.06-1.17] | **<0.001*** |
| MMSE | 0.99[0.92-1.06] | 0.685 |
| MNA | 0.94[0.88-0.99] | 0.026* |
| Sarcopenia | 1.02[0.47-2.23] | 0.953 |
| PSQI | 1.09[0.99-1.21] | 0.070 |

*p < 0.05 according to multivariate binary logistic regression analysis. CI, confidence interval; OR, odds ratio. DM, diabetes mellitus; HT, hypertension ; IADL, Lawton & Brody index of Instrumental Activities of Daily Living; BAI, Beck Anxiety Inventory; MMSE, Mini Mental State Examination; MNA, The Mini Nutritional Assessment Tool; PSQI, Pittsburgh Sleep Quality Index.

tion between the number of medications and GDS, which is consistent with the findings of previous studies examining the association between polypharmacy and depression [13]. In addition, depression may be a better independent predictor of polypharmacy than other comorbidities [14]. In older adults, polypharmacy increases the risk of developing geriatric syndromes as well as morbidity and mortality. It is associated with frailty, an increase in falls, higher rehospitalization rates, longer hospital stays, and greater financial burden [35].

In older population, poor sleep quality may be a critical warning indicator of mental and physical illness. Because of the high prevalence of sleep problems and their detrimental effects on health and quality of life, it is important to assess sleep quality in older people who are depressed. Poor sleep quality is a significant risk factor for both new-onset and recurrent depression, as well as being a symptom of depression [36]. Sleep problem is a geriatric syndrome that is also independently associated with depression [37]. In the current study, we found that the proportion of patients with poor sleep quality was significantly higher in the depressed group and that there was a somewhat positive association between the PSQI and GDS as well as between the PSQI and BAI. Depression and anxiety are inversely correlated with sleep quality: depression is correlated with satisfaction with sleep quality, whereas anxiety is correlated with efficiency with sleep quality [38]. Cognitive decline and late-life depression often coexist, suggesting a significant link between them [39]. The causal relationship remains unclear. Depression may accelerate cognitive decline and shorten the time between the pathological neurodegenerative stage and the clinical onset of Alzheimer's dementia [40]. Our research showed that the MMSE scores of the depressed group were much lower. According to a previous study, this finding may indicate that depressive symptoms are common in the early stages of dementia [41].

Our study has several limitations. First, the number of participants is relatively small. Second, we did not examine how socioeconomic and environmental factors may influence depression symptoms. In addition, because the study is cross-sectional, we cannot determine a cause-and-effect relationship. Despite these limitations, the study has several strengths. First, a thorough geriatric assessment was performed, taking into account any other conditions that might affect the results. Second, in addition to CGA, quality of life, sleep, and anxiety were assessed. This provided a multidimensional assessment of the health of the older people who participated in the study.

## Conclusion

Depression, gender, nutritional status, functional status, cognition, and the presence of chronic disease all affect a person's QoL. Each of the general conclusions of our study about depression is a sign of a decline in QoL. To avoid the negative effects of depression that could worsen QoL, interventions focused on reducing its symptoms may be a useful strategy. In addition, focusing on factors independently associated with depression, such as dependence on activities of daily living, anxiety symptoms, and poor nutritional status, may be helpful in achieving this goal.

*Authorship contribution statement*

E.Ö. : Conceptualization, Formal analysis, Methodology, Writing-original draft, Writing-review & editing

S.G. : Investigation, Methodology, Writing-review & Editing

Z.A.Ö.: Investigation, Methodology, Writing-review & editing

*Ethical approval*

Ethical approval was obtained for this study from Gaziantep University Clinical Research Ethics Committee (date: 11.05.2022 decision no: 2022/155).

*Funding*

There are no funding sources to declare.

*Conflict of interest*

On behalf of all authors, the corresponding author states that there is no conflict of interest.

## References

1. Alexopoulos GS. Depression in the elderly. Lancet (London, England). 2005 Jun;365(9475):1961–70.
2. Han K-M, Chang J, Yoon H-K, Ko Y-H, Ham B-J, Kim Y-K, et al. Relationships between hand-grip strength, socioeconomic status, and depressive symptoms in community-dwelling older adults. J Affect Disord. 2019 Jun;252:263–70.
3. Valiengo L da CL, Stella F, Forlenza OV. Mood disorders in the elderly: prevalence, functional impact, and management challenges. Neuropsychiatr Dis Treat. 2016;12:2105–14.
4. Tedeschini E, Levkovitz Y, Iovieno N, Ameral VE, Nelson JC, Papakostas GI. Efficacy of antidepressants for late-life depression: a meta-analysis and meta-regression of placebo-controlled randomized trials. J Clin Psychiatry. 2011 Dec;72(12):1660–8.
5. Alamo C, López-Muñoz F, García-García P, García-Ramos S. Risk-benefit analysis of antidepressant drug treatment in the elderly. Psychogeriatrics. 2014 Dec;14(4):261–8.

6. Blazer DG. Depression in late life: review and commentary. J Gerontol A Biol Sci Med Sci. 2003 Mar;58(3):249–65.
7. Flint AJ. Generalised anxiety disorder in elderly patients: epidemiology, diagnosis and treatment options. Drugs Aging. 2005;22(2):101–14.
8. Porensky EK, Dew MA, Karp JF, Skidmore E, Rollman BL, Shear MK, et al. The Burden of Late-Life Generalized Anxiety Disorder: Effects on Disability, Health-Related Quality of Life, and Healthcare Utilization. Am J Geriatr Psychiatry [Internet]. 2009;17(6):473–82. Available from: https://www.sciencedirect.com/science/article/pii/S1064748112607568.
9. Cully JA, Graham DP, Stanley MA, Ferguson CJ, Sharafkhaneh A, Souchek J, et al. Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. Psychosomatics. 2006;47(4):312–9.
10. Gum AM, Cheavens JS. Psychiatric comorbidity and depression in older adults. Curr Psychiatry Rep. 2008 Feb;10(1):23–9.
11. Sowislo JF, Orth U. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. Psychol Bull. 2013 Jan;139(1):213–40.
12. Jiménez-Redondo S, Beltrán de Miguel B, Gavidia Banegas J, Guzmán Mercedes L, Gómez-Pavón J, Cuadrado Vives C. Influence of nutritional status on health-related quality of life of non-institutionalized older people. J Nutr Health Aging. 2014 Apr;18(4):359–64.
13. Eyigor S, Kutsal YG, Toraman F, Durmus B, Gokkaya KO, Aydeniz A, et al. Polypharmacy, Physical and Nutritional Status, and Depression in the Elderly: Do Polypharmacy Deserve Some Credits in These Problems? Exp Aging Res. 2021;47(1):79–91.
14. Yuruyen M, Yavuzer H, Demirdag F, Kara Z, Cengiz M, Yavuzer S, et al. Is depression a predictive factor for polypharmacy in elderly? Klin Psikofarmakol Bülteni-Bulletin Clin Psychopharmacol. 2016;26(4):374–81.
15. Cabrera MAS, Mesas AE, Garcia ARL, de Andrade SM. Malnutrition and depression among community-dwelling elderly people. J Am Med Dir Assoc. 2007 Nov;8(9):582–4.
16. Ahmad NA, Abd Razak MA, Kassim MS, Sahril N, Ahmad FH, Harith AA, et al. Association between functional limitations and depression among community-dwelling older adults in Malaysia. Geriatr Gerontol Int. 2020 Dec;20 Suppl 2:21–5.
17. Wilson RS, Barnes LL, Mendes de Leon CF, Aggarwal NT, Schneider JS, Bach J, et al. Depressive symptoms, cognitive decline, and risk of AD in older persons. Neurology. 2002 Aug;59(3):364–70.
18. 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 Sep;288(12):1475–83.
19. 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 Mar;63(3):273–9.
20. Verdelho A, Madureira S, Moleiro C, Ferro JM, O'Brien JT, Poggesi A, et al. Depressive symptoms predict cognitive decline and dementia in older people independently of cerebral white matter changes: the LADIS study. J Neurol Neurosurg Psychiatry. 2013 Nov;84(11):1250–4.
21. Wang H, Hai S, Liu Y, Cao L, Liu Y, Liu P, et al. Association between depressive symptoms and sarcopenia in older Chinese community-dwelling individuals. Clin Interv Aging. 2018;13:1605–11.
22. Ong G-J, Page A, Caughey G, Johns S, Reeve E, Shakib S. Clinician agreement and influence of medication-related characteristics on assessment of polypharmacy. Pharmacol Res Perspect. 2017 Jun;5(3):e00321.
23. Ertan T, Eker E. Reliability, validity, and factor structure of the geriatric depression scale in Turkish elderly: are there different factor structures for different cultures? Int psychogeriatrics. 2000 Jun;12(2):163–72.
24. Ulusoy M, Sahin NH, Erkmen H. Turkish version of the Beck Anxiety Inventory: psychometric properties. J Cogn Psychother. 1998;12(2):163.
25. Güngen C, Ertan T, Eker E, Yaşar R, Engin F. [Reliability and validity of the standardized Mini Mental State Examination in the diagnosis of mild dementia in Turkish population]. Turk Psikiyatri Derg. 2002;13(4):273–81.
26. Agargun MY, Kara H, Anlar O. The validity and reliability of the Pittsburgh Sleep Quality Index. Turk Psikiyatr Derg. 1996;7(2):107–15.
27. German L, Feldblum I, Bilenko N, Castel H, Harman-Boehm I, Shahar DR. Depressive symptoms and risk for malnutrition among hospitalized elderly people. J Nutr Health Aging. 2008 May;12(5):313–8.
28. Feldblum I, German L, Castel H, Harman-Boehm I, Bilenko N, Eisinger M, et al. Characteristics of undernourished older medical patients and the identification of predictors for undernutrition status. Nutr J. 2007 Nov;6:37.
29. Delibaş DH, Eşkut N, İlhan B, Erdoğan E, Top Kartı D, Yılmaz Küsbeci Ö, et al. Clarifying the relationship between sarcopenia and depression in geriatric outpatients. aging male Off J Int Soc Study Aging Male. 2021 Dec;24(1):29–36.
30. Park Y-H, Suh EE. [The risk of malnutrition, depression, and the perceived health status of older adults]. Taehan Kanho Hakhoe Chi. 2007 Oct;37(6):941–8.
31. O'Keeffe M, Kelly M, O'Herlihy E, O'Toole PW, Kearney PM, Timmons S, et al. Potentially modifiable determinants of malnutrition in older adults: A systematic review. Clin Nutr. 2019 Dec;38(6):2477–98.
32. Chen Y, Hicks A, While AE. Depression and related factors in older people in China: a systematic review. Rev Clin Gerontol. 2012;22(1):52–67.
33. Kilavuz A, Meseri R, Savas S, Simsek H, Sahin S, Bicakli DH, et al. Association of sarcopenia with depressive symptoms and functional status among ambulatory community-dwelling elderly. Arch Gerontol Geriatr. 2018;76:196–201.
34. Kim S-Y, Park J-H, Lee MY, Oh K-S, Shin D-W, Shin Y-C. Physical activity and the prevention of depression: A cohort study. Gen Hosp Psychiatry. 2019;60:90–7.
35. Wastesson JW, Morin L, Tan ECK, Johnell K. An update on the clinical consequences of polypharmacy in older adults: a narrative review. Expert Opin Drug Saf. 2018 Dec;17(12):1185–96.
36. Franzen PL, Buysse DJ. Sleep disturbances and depression: risk relationships for subsequent depression and therapeutic implications. Dialogues Clin Neurosci. 2008;10(4):473–81.
37. İlhan B, Bakkaloğlu OK. Yaşlılıkta Depresyon: Sık ve Diğer Geriatrik Sendromlarla İlişkili. İzmir Eğitim ve Araştırma Hastan Tıp Derg. 2019;23(3):208–14.
38. Mayers AG, Grabau EAS, Campbell C, Baldwin DS. Subjective sleep, depression and anxiety: inter-relationships in a non-clinical sample. Hum Psychopharmacol. 2009 Aug;24(6):495–501.
39. Zubenko GS, Zubenko WN, McPherson S, Spoor E, Marin DB, Farlow MR, et al. A collaborative study of the emergence and clinical features of the major depressive syndrome of Alzheimer's disease. Am J Psychiatry. 2003 May;160(5):857–66.
40. Butters MA, Young JB, Lopez O, Aizenstein HJ, Mulsant BH, Reynolds CF 3rd, et al. Pathways linking late-life depression to persistent cognitive impairment and dementia. Dialogues Clin Neurosci. 2008;10(3):345–57.
41. Dillon C, Serrano CM, Castro D, Leguizamón PP, Heisecke SL, Taragano FE. Behavioral symptoms related to cognitive impairment. Neuropsychiatr Dis Treat. 2013;9:1443–55.