Clinical and Experimental Health Sciences

Prevalence and Unawareness of Depression Among Older Adults: A Community-Based Study

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Received: November 23, 2025 **Accepted:** 11 June, 2026

ABSTRACT

Objective: Depression remains a significant public health issue, with evidence from Türkiye indicating a rising prevalence. This study aimed to highlight awareness of depression by comparing the prevalence of depressive symptoms and clinical diagnosis rates in older adults in Türkiye and determining the risk factors associated with depression.

Methods: A prospective study was conducted between September 2022 and January 2023, including 301 patients aged ≥60 years who presented to outpatient clinics. Data were collected through face-to-face interviews. Depression was assessed using the 30-item Geriatric Depression Scale; scores ≥11 indicated depression.

Results: The prevalence of depression was 54.5%, with possible depression (15.3%) and definite depression (39.2%). Of the 164 patients classified as depressed, only 44 had a clinical diagnosis in the last year. Antidepressant treatment was initiated in 23 patients and continued in 9 patients. Only one patient who was currently receiving treatment was not classified with depression. Multivariate logistic regression indicated that older adults with below-middle school education (OR= 2.85, 95% CI: 1.72–4.72), living alone (OR = 2.01, 95% CI: 1.17–3.44), diabetes (OR = 2.30, 95% CI: 1.11–4.75), or polypharmacy (OR = 2.47, 95% CI: 1.15–5.27) were at higher risk of depression.

Conclusion: The prevalence of depression is high among older adults in Türkiye, yet only a small proportion have received a clinical diagnosis. These findings underscore the need for heightened awareness among healthcare professionals and support the implementation of routine depression screening using validated scales at outpatient clinics for the recognition and management of depression.

Keywords: Depression, prevalence, polypharmacy, older adults

1. INTRODUCTION

Depression is one of the most common mental disorders in older adults that causes a negative impact on quality of life (1, 2). Older adults with depression often experience sleep disturbances, impaired daily functioning and social isolation (3). With the rapid growth of the population aged 60 years and older, it is anticipated that older adults will constitute an increasingly large proportion of society. The global geriatric population is projected to double from 2019 to 2050, with an estimated 2.1 billion individuals (4). As the geriatric population grows, the prevalence of depressive disorders is rising significantly (1).

According to the World Health Organization, mental disorders affect 15% of adults aged 60 years and over; depression, which affects 7% of this population, is among the most common mental disorders (5, 6). In Türkiye, earlier surveys reported a 17.2% prevalence of mental disorders, with major depression accounting for 4%, among older adults, whereas the 2013 Chronic Diseases and Risk Factors Survey reported a 9.0% prevalence of depression (7, 8). A localized study conducted in 2021 reported a 50.9% prevalence of depression among the geriatric population (9).

Numerous studies have reported risk factors for depressive disorders in geriatric populations such as female gender, low educational status, chronic illness, loneliness, alcoholism and smoking (4, 6-12). Following the COVID-19 pandemic, the infection itself has also been recognized as a potential risk factor for depression (13). In addition, certain medications

How to cite this article: Bakır Ekinci P, Özçoban İ, Adalı C, Avcı H, Çeliker A. Prevalence and Unawareness of Depression Among Older Adults: A Community-Based Study. Clin Exp Health Sci 2026; 16: 421-428. https://doi.org/10.33808/clinexphealthsci.1827999

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used for chronic diseases have been implicated in the development of depression. Drug classes such as beta blockers, calcium channel blockers, benzodiazepines, corticosteroids, angiotensin-converting enzyme inhibitors and angiotensin receptor blockers have been identified as contributing to depression through various mechanisms (14).

Depression-related cognitive impairment is often misinterpreted as dementia, and late-life depression is frequently regarded as a natural part of the aging process (15, 16). Furthermore, the perceived stigma surrounding mental illness may lead older adults to conceal depressive symptoms, making it difficult to recognize their condition. Despite its clinical importance, depression remains frequently underrecognized and undertreated in this population (17). In population-based studies, the prevalence of depressive symptoms among older adults has been reported as 8% and 12%, while formal diagnosis rates were substantially lower (0.8 and 3%, respectively) (18, 19). Untreated depression primarily manifests in older adults through cognitive changes and somatic complaints rather than overt emotional symptoms. Cohort studies have shown that untreated depression is associated with lower quality of life (QoL scores: 43.85 vs. 53.97) (20), increased fall risk (OR=1.49; 95% CI:1.35–1.63) (21), cognitive impairment (OR=1.22; 95% CI:1.01–1.48) (16), and higher risks of suicide death (22) (HR=1.92) and all-cause mortality (23) (HR=1.34). Incorporating geriatric depression scales into clinical practice is essential for accurate diagnosis and effective treatment. The Geriatric Depression Scale (GDS) is one of the most commonly used instruments for the identification of depression in older adults (24). The GDS is available in various versions, including 30-item (GDS-30), 15-item (GDS-15) and shorter forms (GDS-5 and GDS-4) (25). This research aims to highlight the prevalence of depressive symptoms among older adults in Türkiye who remain undiagnosed and to raise awareness of untreated depression in this population. In addition, this study aims to identify risk factors associated with depression in older patients, to facilitate more careful monitoring of those at risk in clinical practice, and to evaluate the frequency of antidepressant use among older adults.

2. METHODS

This research was conducted prospectively at a tertiary care university hospital between September 2022 and January 2023. The study site, Lokman Hekim University Ankara Hospital, is an academic teaching hospital with 29 outpatient clinics. The study was carried out in accordance with the Helsinki Declaration and the study protocol was reviewed and approved by the Local Ethics Committee (2022/155). Informed consent was obtained from all participants.

2.1. Participants

Inclusion criteria were patients aged 60 years (26) and older who presented to outpatient clinics with any complaints. Patients who could not speak Turkish, had hearing difficulties or had mental problems other than depressive disorders (such as dementia) were excluded. Demographic parameters, sociodemographic variables and the Geriatric Depression Scale were collected through electronic patient records and a semi-structured face-to-face interview with patients/physicians. The interviews lasted 30–45 minutes and were conducted in a private setting within the outpatient clinic. Each patient underwent a single face-to-face interview with the same pharmacist. Alongside the questionnaire, the pharmacist took detailed notes during the interview to record demographic information, which was subsequently used for data analysis. Demographic data were verified against electronic medical records. Comorbidity was defined as the presence of at least one chronic medical condition, including hypertension, diabetes, heart failure, and other chronic diseases, as diagnosed by a physician. In our study, statins, calcium channel blockers, ACE inhibitors, beta-blockers, proton pump inhibitors, NSAIDs, and corticosteroids were considered medications potentially associated with depressive symptoms (14), and polypharmacy was defined as the regular use of at least three medications (27).

2.2. Assessment of depression

The Turkish version of the 30-item Yesavage Geriatric Depression Scale, originally developed by Yesavage et al. in 1983 and validated for reliability and validity in Turkish by Ertan in 1996, was used to assess depression in this study (24, 28). The overall survey score ranges from 0 to 30 points. Scores were categorized as follows: 0-10 points “no depression”, 11-13 points “possible depression”, 14 and above points “definite depression”. In this study, the cut-off point was set at 11 and individuals with scores above this threshold were considered to have a high likelihood of depression. Participants were divided into two groups: “depression present (≥ 11 points)” and “depression absent (< 11 points)”. Patients with possible or definite depression were included in the “depression present” group. Routine geriatric depression screening was not performed in the outpatient clinics because the hospital does not have a geriatric outpatient service. Depression screening was conducted within the scope of this study.

2.3. Post-hoc power analysis

A post-hoc power analysis was conducted for the predictor with the smallest observed effect size (smoking; OR=1.725). The prevalence of depression was 49.5% (93/188) among non-smokers and 62.8% (71/113) among smokers. With α=0.05 and a total sample size of 301, the achieved power was 64.5% (power=0.645), calculated using the powerLogisticBin function (29), indicating a moderate level of statistical power to detect the smallest observed association.

2.4. Statistical analysis

Statistical analyses were conducted using the SPSS for Windows Version 23.0 statistical package (Chicago, IL) by an academic biostatistician. Shapiro-Wilk’s test was performed to assess

the data normality. Levene's test evaluated the homogeneity of variances. Descriptive statistics were presented as median (interquartile range) and frequencies (percentages). Group differences were assessed using the Mann-Whitney U test for continuous variables and either Pearson's chi-square (χ^2) or Fisher's exact test analysis were used for categorical variables. Univariate analysis and multiple binary logistic regression analysis were performed to identify the risk factors of a 0.20 change in state of depression. Significant variables at p<.20 in univariate analysis were included in multiple logistic models and forward elimination was applied with likelihood ratio statistics to identify the independent risk factors. Odds ratios were calculated with 95% confidence intervals. The model calibration, specifically the goodness-of-fit, was evaluated using the Hosmer–Lemeshow test, and p>0.05 indicated a robust model that could not be rejected. The effect sizes of r= z/ $\sqrt{n}$ were calculated for the Mann-Whitney U test. Phi correlation coefficient (ϕ) was calculated as the effect size for the Pearson chi-square test. A p-value of less than 5% was considered statistically significant. The variables which have p<.20 in univariate analysis, such as gender, age, education year, living arrangement, education level, smoking, comorbidity, diabetes, heart failure, depression inducing drugs, metformin and polypharmacy (≥ 3 medications), were included in the logistic regression analysis. Multiple logistic forward regression model: gender, age, education year, living arrangement, smoking, presence of comorbidities, diabetes, heart failure, depression inducing drugs, metformin were adjusted.

3. RESULTS

3.1. Sociodemographic characteristics of the participants

A total of 301 older adults were included in the study and all completed the survey. The median age of the participants was 70 years and more than half were female. The majority were living alone (68.8%) and had below middle school education (58.1%) (Table 1). A total of 250 participants had comorbid diseases. Regarding medical diagnoses, 23.9%, 16.6% and 12.0% of the participants had hypertension, diabetes and heart failure, respectively. The majority of patients (84.4%) were using fewer than 3 medications.

Seventy-one participants had a history of antidepressant use, and 33.2% reported a family history of mental illnesses. However, only 3% (n=9) of the total population was currently receiving antidepressant treatment. Additionally, antidepressant treatment was initiated in 23 participants diagnosed with depression in the last year. At the time of evaluation, only 9 participants were still receiving antidepressant therapy, whereas 14 participants discontinued antidepressant treatment on their own (Figure 1). All patients who were currently using antidepressants reported regular adherence to medication.

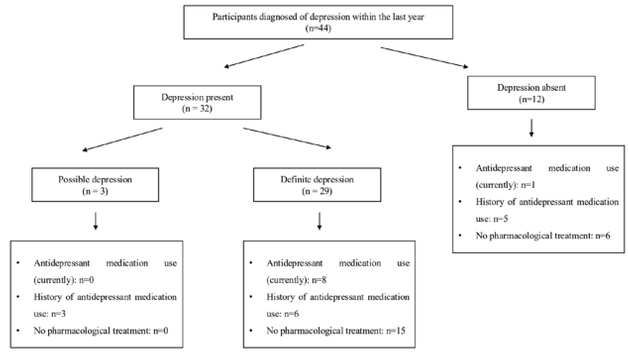


Figure 1. *Antidepressant treatment status among participants diagnosed with depression within the last year*

3.2. Prevalence of depression and associated variables

The prevalence of depression was 54.5% (164/301). Of the participants, 45.5% (n= 137) had "no depression", 15.3% (n= 46) had "possible depression", and 39.20% (n= 118) had "definite depression" (Figure 2). Of the 164 patients with depressive symptoms, 132 (80.5%) were not diagnosed with depression in the last year. It was also observed that 88.9% (n= 8) of patients receiving antidepressant treatment remained depressed (Table 1). Only one patient who was currently receiving antidepressant treatment was not classified as depressed.

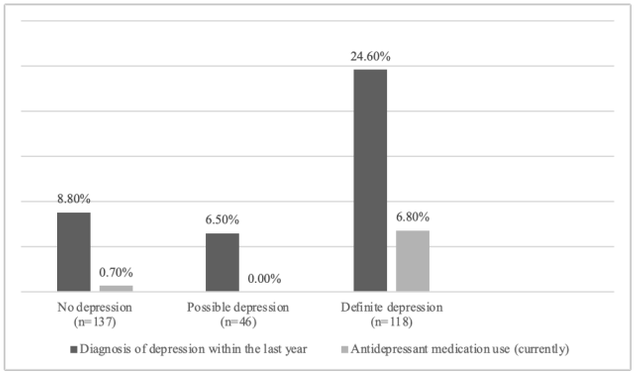


Figure 2. *Prevelance of depression*

Age, living arrangement, education level and years of education were significantly associated with depression. Depression was more common among participants living alone, below-middle school education and those with comorbidities, particularly diabetes (p<.05). The prevalence of depression was similar between patients with and without a history of COVID-19 (p>.05) (Table 2).

Depression was more common in participants using 3 or more medications (p<.01). One hundred twenty-eight patients were using medications known to potentially induce depression. However, no significant relationship was found between depression and depression inducing drugs (p>.05). Additionally, four older adults were taking montelukast, which carries an FDA black box warning for depression; only one of them was classified as depressed according to the scale (Table 3).

3.3. Factors associated with depression according to logistic regression

Multivariate logistic regression analysis indicated that older individuals with below middle school education (OR: 2.849), living alone (OR: 2.006 times), having diabetes (OR: 2.296 times), or polypharmacy (≥ 3 medications) (OR= 2.467 times) had a significantly higher likelihood of experiencing depression. The Hosmer-Lemeshow test indicated good model calibration (χ^2=3.274.0;p=.859) (Table 4).

Table 1. *Association between participants' sociodemographic characteristics and depression*

	Total (n=301)	Depression		p-value	Effect size
		Present (n=137)	Absent (n=164)		
Demographic					
Age, median (IQR)	70 (65-76)	69 (63-75)	70 (66-77)	**.015**[a]	.140
Sex, n (%)					
Male	143 (47.5%)	84 (58.7%)	59 (41.3%)	.158[b]	.081
Female	158 (52.5%)	80 (50.6%)	78 (49.4%)		
Living arrangement, n (%)					
Living with family	94 (31.2%)	32 (34.0%)	62 (66.0%)	**.007**[b]	.155
Living alone	207 (68.8%)	105 (50.7%)	102 (49.3%)		
Education level, n (%)					
Below middle school	175 (58.1 %)	97 (55.4%)	78 (44.6%)	**<.001**[b]	.235
High school and above	126 (41.9%)	40 (31.7%)	86 (68.3%)		
Year of education, median (IQR)	11 (8-11)	8 (8-11)	11 (8-11)	**<.001**[a]	.255
Lifestyle factors					
Smoking, n (%)	113 (37.5%)	69 (61.1%)	44 (38.9%)	.076[b]	.102
Alcohol, n (%)	28 (9.3%)	12 (42.9%)	16 (57.1%)	.272[b]	.075
Mental status and antidepressant treatment					
Family history of mental illness, n (%)	100 (33.2%)	57 (57.0%)	43 (43.0%)	.537[b]	.036
History of antidepressant medication use, n (%)	71 (25.6%)	43 (60.6%)	28 (39.4%)	.239[b]	.068
Yes	230 (76.4%)	121 (52.6%)	109 (47.4%)		
No					
Diagnosis of depression within the last year, n(%)					
Yes	44 (14.6%)	32 (72.7%)	12 (27.3%)	.014[c]	.152
No	257 (85.4%)	132 (51.4%)	125 (48.6%)		
Antidepressant medication use (currently), n (%)					
Yes	9 (3.0%)	8 (88.9%)	1 (11.1%)	.043[d]	.121
No	292 (97.0%)	156 (53.4%)	136 (46.6%)		

Data are presented as median (interquartile range). Categorical variables reported as frequency (percent).
Differences between groups were analysed using: a Mann-Whitney U test, bPearson chi-squared test, cYates continuity correction chi-square test, dFisher's exact test.

Table 2. *Health status and comorbidities associated with depression*

	Total (n=301)	Depression		p-value	Effect size
		Yes (n=164)	No (n=137)		
Number of comorbidities, median (IQR)	1 (1 – 2)	1 (1-2)	1 (1-2)	**.004**[a]	.166
Presence of comorbidities	250 (83.1%)	145 (58.0%)	105 (42.0%)	**.011**[b]	.156
History of COVID-19 disease	83 (27.6%)	41 (49.4%)	42 (50.6%)	.274[b]	.063
Hypertension	72 (23.9%)	36 (50.0%)	36 (50.0%)	.381[b]	.051
Diabetes	50 (16.6%)	37 (74.0%)	13 (26.0%)	**.004**[b]	.175
Heart Failure	36 (12.0%)	25 (69.4%)	11 (30.6%)	.081[b]	.111
Lung diseases	31 (10.3%)	18 (58.1%)	13 (41.9%)	.816[b]	.024
Hypothyroid	24 (8.0%)	15 (62.5%)	9 (37.5%)	.543[b]	.047
Arthritis	29 (9.6%)	14 (48.3%)	15 (51.7%)	.610[b]	.041
Coronary Artery Disease	28 (9.3%)	14 (50.0%)	14 (50.0%)	.381[b]	.029

Data are presented as median (interquartile range). Categorical variables are reported as frequency (percent).
Differences between groups were analysed using: a Mann-Whitney U test, bPearson chi-squared test, cFisher's exact test.
Lung diseases included asthma, chronic obstructive pulmonary disease, and interstitial lung disease.

Table 3. *Medication use and its association with depression*

	Total (n=301)	Depression		p-value	Effect size
		Yes (n=164)	No (n=137)		
Polypharmacy ≥ 3 medications < 3 medications	 47 (15.6%) 254 (84.4%)	 35 (74.5%) 129 (50.8%)	 12 (25.5%) 125 (49.2%)	 **.005**[b]	.173
Use of depression-inducing medications	128 (42.5%)	76 (59.4%	52 (40.6%	.143[b]	.084
Angiotensin-Converting Enzyme Inhibitors / Angiotencin Receptor Blockers	59 (19.6%	29 (49.2%)	30 (50.8%)	.359[b]	.053
Biguanides	28 (9.3%)	19 (67.9%)	9 (32.1%)	.196[b]	.086
Calcium Channel Blockers	15 (5.0%)	9 (60.0%)	6 (40.0%)	.862[b]	.025
Statins	15 (5.0%)	9 (60.0%)	6 (40.0%)	.862[b]	.025

Data are presented as median (interquartile range). Categorical variables are reported as frequency (percent).
Differences between groups were analysed using: bPearson chi-squared test

Table 4. *Multiple logistic regression analysis of depression and associated factors in older adults*

Predictors	*β*	S.E	Wald	p-value	Odds ratio (exp(β))	95% CI
Constant	-0.913	0.223	16.820	<.001	0.401	
Living arrangement (Living alone/ living with family*)	0.696	0.275	6.396	.011	2.006	1.170-3.442
Education level (Below high school / High school and above*)	1.047	0.257	16.557	<.001	2.849	1.721-4.718
Smoking (yes/no*)	0.545	0.260	4.394	.036	1.725	1.036-2.873
Polypharmacy (≥3 medications) (yes / no*)	0.903	0.388	5.428	.020	2.467	1.154-5.272
Diabetes (yes / no*)	0.831	0.371	5.015	.025	2.296	1.109-4.751

Hosmer-Lemeshow test result model (X^2=3.274.0;p=.859)

*Multiple logistic forward regression model: sex, age, year of education, living arrangement, presence of comorbidities, presence of depression inducing drugs, number of depression-inducing drugs, number of comorbidities, diabetes, and metformin were adjusted. *It was taken as the reference category. Abbreviations: S.E. Standard Error; CI: Confidence interval. Significant at value $p \leq 0.05$*

4. DISCUSSION

The prevalence of geriatric depression in this cohort was 54.5%, highlighting a substantially higher burden than previously reported in national studies. Notably, most patients (80.5%) were unaware of their depressive symptoms, and antidepressant use was remarkably low, indicating a significant treatment gap. Living alone, lower education, diabetes, and polypharmacy emerged as significant risk factors for depression in older adults. These findings suggest that social support and higher educational attainment may protect against depression in this population and underscore the importance of a cautious approach to managing depression risk in the context of comorbidities and polypharmacy.

The prevalence observed in this study aligns with other local hospital-based studies in Türkiye, which reported rates of 51.8% and 50.91%, respectively (9, 30). Conversely, studies conducted in urban settings reported a lower prevalence rate (18.5%) (11). According to the Turkish Ministry of Health's Chronic Diseases and Risk Factors Survey, the prevalence of depression was 9.0% (7). Earlier localized studies (2000 and 2002) have reported prevalence rates of 16% and 21.8%, respectively (31, 32). Socioeconomic and demographic differences may contribute to the variability of prevalence rates, indicating that depression among older adults in Türkiye has fluctuated substantially over time, ranging from 9.0% to 51.8% between 2000 and 2021 (5, 9, 11, 30-32) (Figure 3).

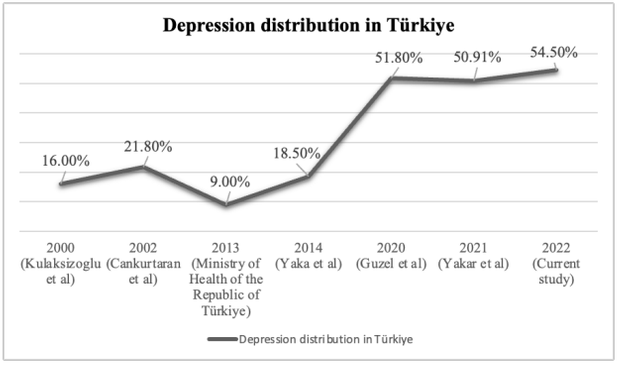


Figure 3. *Distribution of depression in Türkiye over time*

Compared to international studies, depression in older adults in Türkiye appears to be higher. Community-based studies during the years 1955-2005 in Europe reported prevalence rates of 0.4-35% among older adults, 4.2% in Asia and 8.4% in America (33). The EURODEP study (2004), including nine European centers, reported prevalence among older adults ranging from 8.8% in Iceland to 23.6% in Munich, with an overall European prevalence of 12.3% (12). Similar patterns were observed in other countries: 10.61% among Uyghur older adults in China (2014) (1), 44.4% in Egypt (2018) (34), 28.5% in Ethiopia (35), 36.9% in Bangladesh (2019) (36), 42.5% in Indonesia (2018) (37), 23.7% in Thailand (2019) (38). These variations highlight the influence of socioeconomic conditions, cultural attitudes, healthcare access, and diagnostic methods.

Our findings are consistent with previous population-based studies demonstrating substantial unawareness of depression among older adults. In one study, depressive symptoms were identified in 2,450 participants; however, only 245 had a recorded diagnosis, corresponding to an undetected depression rate of 90.0% (18). Similarly, in another epidemiological study, depressive symptoms were detected in 839 participants, yet only 223 reported having received a diagnosis of depression, indicating an undiagnosed rate of 73.4% (19). These findings underscore the persistent gap between the presence of depressive symptoms and their clinical recognition in older adults.

In contrast to several global studies, gender was not a significant risk factor in this cohort. While some studies have suggested that depression rates are higher in women (1, 10, 12, 39, 40), national findings are inconsistent. In Türkiye, Yaka et al. (11) reported higher prevalence in women compared with men (24.6% vs. 9.6%, respectively, p<.001), whereas Yakar et al. (9) found no significant gender differences, similar to our findings (women: 57.81%, men: 46.53%, p= .158). The reasons underlying gender differences in depression remain unclear.

Numerous studies have suggested that living with family and higher levels of education may be protective against depression among older adults (11, 30, 36, 39). Loneliness and lower education may exacerbate depressive symptoms by limiting social interaction and health literacy access.

Chronic illnesses were associated with a higher risk of depression, consistent with previous studies, including research in Ethiopia (AOR= 3.47, 95% CI: 1.5-7.7) (35) and in Türkiye (higher mean GDS scores in participants with chronic diseases: 12.66 ± 7.3 vs. 14.40 ± 7.8, p<.01) (30). In our study, diabetes was independently associated with increased odds of depression. Notably, the impact of diabetes on mental health has been highlighted in a German study (OR= 1.3, 95% CI: 1.04–1.73) (39) and Zheng et al (41) reported a significantly higher prevalence of diabetes among older adults with depression than in those without (11.28% vs. 6.52%, respectively, p<.001). Other studies found that cerebrovascular disease (p<.01) and chronic obstructive pulmonary disease (p<.01) were risk factors for depression (11). Chronic illnesses may increase the risk of depression by reducing physical function and causing emotional distress, with the diabetes–depression relationship still under investigation, potentially related to glycemic and lipid metabolism.

Polypharmacy also emerged as a significant risk factor. Older adults taking multiple medications were more likely to develop depression (OR= 2.467, 95% CI: 1.154-5.272), potentially due to multiple comorbidities and cumulative side effects of concomitant medications. A meta-analysis further indicated that polypharmacy increased the risk of depression by 55% (OR= 1.55, 95% CI: 1.01-2.36) (42), underscoring the importance of careful medication management in this vulnerable population.

In this study, most participants were unaware of their depressive symptoms. Despite the high prevalence of depression in this cohort, antidepressant use was notably low (3% of the total population and 4.9% of the depression group), consistent with previous findings in Türkiye (9%) (31). Lack of awareness may negatively affect quality of life, particularly when medical intervention is required (43). A study conducted in China similarly emphasized that many *older adults* were unaware of their depressive state (1). Additionally, adherence to antidepressants remains a global challenge, thereby negatively affecting treatment success and increasing the risk of relapse (44). In this study, antidepressant treatment was initiated in 23 older adults, of whom 14 discontinued treatment on their own. These findings align with previously reported non-adherence rates, ranging from 10-30% and 60% in the literature (45, 46).

This study has several limitations. Its cross-sectional design and single-center setting limit the generalizability of the findings and reduce the ability to infer causal relationships between the identified risk factors and depression. The study did not differentiate between older adults living in rural and urban areas, which may vary significantly, particularly in terms of socioeconomic differences. Polypharmacy is commonly defined as the use of five or more medications in most studies; however, in the present study, it was defined as the regular use of at least three medications due to the very low prevalence of participants using five or more drugs. Additionally, the Geriatric Depression Scale relies on self-reporting, which may introduce response bias. Some participants may have underreported depressive symptoms due to stigma. Future longitudinal research is required to determine the direction of these relationships.

5. CONCLUSION

Depressive symptoms are highly prevalent among older adults in Türkiye, yet most remain undiagnosed and untreated. This gap between depressive symptoms and formal diagnosis underscores the need for routine depression screening. Addressing modifiable risk factors, including living alone, education, smoking, polypharmacy, could substantially reduce depression prevalence and its adverse outcomes

in this population. Targeted strategies are essential for the prevention and management of depression in older adults.

Funding: *The authors received no financial support for the research.*
Conflicts of interest: *The authors declare that they have no conflict of interest.*
Ethics Committee Approval: *This study was approved by Ethics Committee of Lokman Hekim University, Noninvasive Clinic Ethics Committee (Approval date:2022; Number:155)*
Peer-review: *Externally peer-reviewed.*
Author Contributions:
Research idea: PBE
Design of the study: PBE, IO, CA
Acquisition of data for the study: PBE, IO
Analysis of data for the study: PBE, HA
Interpretation of data for the study: PBE, HA, CA
Drafting the manuscript: PBE, IO, CA, HA, AC
Revising it critically for important intellectual content: PBE, AC
Final approval of the version to be published: PBE, AC

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