



## Prevalence of depression in elderly and relations to chronic diseases

### Prevalencija depresije kod starih osoba i povezanost sa hroničnim bolestima

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#### Abstract

**Background/Aim.** Depression is the most prevalent mental disorder which affects approximately 7% of the world's older population. This study aimed at examining the prevalence of depression among older adults and its relations to chronic illnesses. **Methods.** Study was conducted within the National Health Survey of the Serbian population in 2013. The questionnaires used as instruments in this study were created in accordance with the questionnaires of the European Health Interview Survey – Second Wave. The Patient Health Questionnaire-8 (PHQ-8) was used to evaluate the presence of depressive symptoms. The relations between depression symptoms (a dependent variable) and a set of independent variables were examined with univariate and multivariate logistic regression analyses. **Results.** The study showed that there was a 10.0% prevalence of depression within this population with statistically significant differences between the genders – 12.6% of women and 6.5% of men. The multivariate analysis revealed that multimorbidity [odds ratio (OR) = 1.89], chronic pain (OR = 2.35) and self-evaluations of poor health (OR = 8.37) were strongly associated to depression. In terms of individual chronic illnesses, the study showed that strokes double the odds of developing depression (OR = 1.82) while the deformities of lower spine increased this odds by 27%. **Conclusion.** Depression is very frequent in older persons who suffer from chronic diseases and medical conditions. It is crucial to enable adequate screening in primary healthcare institutions in order to diagnose depression in its early stages and start its treatment as soon as possible.

**Key words:**  
depression; chronic disease; comorbidity; aged;  
prevalence; serbia.

#### Apstrakt

**Uvod/Cilj.** Depresija je najčešći mentalni poremećaj koji pogađa oko 7% starije svetske populacije. Cilj ovog istraživanja bio je utvrđivanje prevalencije depresije u starijoj populaciji i njene povezanosti sa hroničnim oboljenjima. **Metode.** Istraživanje je sprovedeno u okviru nacionalne studije “Istraživanje zdravlja stanovništva Srbije” 2013. godine. Kao instrument istraživanja korišćeni su upitnici kreirani u skladu sa upitnicima Evropskog istraživanja zdravlja – drugi talas. Za procenu prisustva simptoma depresije korišćen je *the Patient Health Questionnaire-8* (PHQ-8). Povezanost prisustva depresivnih simptoma (zavisna varijabla) i skupa nezavisnih varijabli ispitana je univarijantnom i multivarijantnom logističkom regresijom. **Rezultati.** Rezultati ukazuju na stopu prevalencije depresije od 10,0% sa statistički značajnim razlikama među polovima – 12,6% kod žena i 6,5% kod muškaraca. Multivarijantna analiza je pokazala da postoje jake veze između depresije i multimorbiditeta [*odds ratio* (OR) = 1.89], hroničnog bola (OR = 2,35) i samo-procena lošeg zdravlja (OR = 8,37). Što se tiče pojedinačnih oboljenja, studija je pokazala da moždani udari dvostruko povećavaju šanse za pojavu depresije (OR = 1,82), dok prisustvo deformiteta donje kičme te šanse povećava za 27%. **Zaključak.** Depresija je veoma česta kod starijih osoba koje pate od hroničnih bolesti i stanja. Ključno je omogućiti adekvatan skrining u ustanovama primarne zdravstvene zaštite kako bi se depresija dijagnostikovala u ranoj fazi i što pre započelo njeno lečenje.

**Ključne reči:**  
depresija; hronična bolest; komorbiditet; stare osobe; prevalenca; srbija.

## Introduction

The world's population has been ageing rapidly<sup>1</sup>. Simultaneously, mental health problems in elderly populations have become an important public health issue<sup>2,3</sup>. According to the World Health Organization (WHO) report, approximately 15% of adults aged 60 and over suffer from some mental disorder<sup>4</sup>. Depression is the most prevalent among them. It affects approximately 7% of the global older population and has severe physical, psychological and social impacts on individuals, their families and entire societies<sup>5</sup>.

Depressive symptoms among the elderly are generally associated with several adverse health outcomes – they decrease functional ability and life quality, worsen the outcomes of other medical illnesses and increase the risks of mortality and suicide<sup>6-10</sup>. Depressive episodes had been present in about 80% of those aged 74 and over who committed suicide<sup>11</sup>. Furthermore, depression substantially increases health care costs due to higher health care needs and improper health behavior<sup>3,6,12</sup>. Depression with older adults requires special attention since it is commonly under-recognised and undertreated<sup>7</sup>. It is inadequately dealt with predominantly because it is generally considered as a natural phenomenon in aging<sup>13,14</sup>. Previous studies have shown that a half of the depression cases commonly remains undiagnosed<sup>2</sup>.

Depression in late life can result from a complex interaction of biological, physical, psychosocial and social factors<sup>3,15</sup>. Studies have shown that chronic diseases are one of the leading factors for developing depression<sup>16,17</sup>. Depression is two times more common in patients with chronic diseases than in general population, whereas risks of suffering from depression increase with the number of chronic diseases a patient has<sup>5</sup>. Even though any chronic medical condition can result in depressive symptoms, there are certain medical diagnoses that are more likely to lead to depression, e.g. coronary heart disease, diabetes, stroke, cancer, rheumatoid arthritis and hypertension<sup>18,19</sup>. It is well known that depression which appears as comorbidity to chronic diseases can affect mortality rates, clinical outcomes, adherence to prescribed therapy and treatments and functional abilities to perform daily tasks<sup>2,14</sup>.

The relations between depression in the elderly population and their chronic diseases, on one hand, and their subjectively evaluated medical conditions, on the other hand, have not been fully explored in Serbia. Therefore, this study aimed at examining the depression prevalence in older adults and its potential links to chronic diseases on a large and representative sample of the Serbian old population.

## Methods

### *Study population and sample*

This epidemiological population-based study was conducted as a part of the 2013 National Health Survey initiated and carried out by the Ministry of Health of the Republic of

Serbia. The survey was conducted from 7th October to 30th December, 2013. The ethics approvals were granted by the Institute of Public Health of Serbia "Dr Milan Jovanovic Batut". The written informed consents were obtained from all the individuals who participated in this study.

The study was conducted in accordance with the methodology and instruments of the European Health Interview Survey – Second Wave (EHIS wave 2). The target population of the National Health Survey were the individuals aged 15 and over who lived in private households. The survey excluded persons who lived in collective households or institutions (e.g. foster homes, social and gerontology institutions, prisons, psychiatric facilities, etc.). In order to obtain a reliable assessment of a large number of factors for the population health at the national level, as well as in four geographic areas (Vojvodina, Belgrade, Šumadija and Western Serbia, Southern and Eastern Serbia) and in different settlement types separately, the National Health Survey used a stratified two-stage sample. The units of the first sampling stage included 670 census enumeration areas defined in the 2011 Population Census. The units of the second sampling stage were randomly selected households. The study included 6,500 randomly selected households (3,909 from urban and 2,591 from other areas). The response rate was 94.1%. Finally, 13,756 respondents (aged 15 and over) successfully completed the survey.

The target population for this particular analysis were the individuals aged 65 and over who lived in private households in Serbia at the time of the data collection. The number of participants who fulfilled this age criterion was 3,540. The final sample of this study thus comprised of 3,540 elderly adults.

### *Instruments*

The questionnaires used as instruments in this study were created in accordance with the questionnaires of the EHIS wave 2 which had been created based on internationally accepted and defined criteria. They are adapted here to the particularities of the Serbian context.

Depression was selected as a dependent variable. It was evaluated with the Patient Health Questionnaire-8 (PHQ-8)<sup>20</sup> that was incorporated in a „face-to-face“ questionnaire for respondents aged 15 and over. The respondents were asked to evaluate how often they had been bothered by any of the given mental problems during the previous two weeks. Their responses were marked as 0 (“not at all”), 1 (“for a few days”), 2 (“more than seven days” and 3 (“almost every day”). After summing up the points for every answer, we obtained the scores ranging from 0 to 24 points. The values within the range 0–4 indicated that there were no symptoms of depression. The values from 5–9 were taken as a proof of mild depression (subsyndrome depression) and the range from 10 to 24 as a high probability of a depressive episode. Depressive episodes (i.e. depression) were further classified as: moderate (10–14 points), moderately severe (15–19 points) and severe (20–24 points).

The evaluations of the medical conditions included: 1) self-evaluations of medical states; 2) the presence of a long-term disease or a medical condition (where a *long-term disease* refers to an illness and a medical condition that had lasted or was expected to last for at least 6 months), and 3) the presence and intensity of bodily pain during the month preceding the time of the data collection and its influence on performing usual activities and tasks.

The study included 17 different chronic diseases or medical conditions reported by the participants in the last 12 months: 1) Asthma (J45), Status asthmaticus(J46); 2) Chronic bronchitis, chronic obstructive pulmonary disease, emphysema (J40-J44), and Chronic lower respiratory diseases excluding asthma but including chronic asthmatic bronchitis (J47); 3) Myocardial infarction (heart attack) or chronic consequences of myocardial infarction [I21 (Acute myocardial infarction – AMI), I22 (Subsequent myocardial infarction), I23 (Certain current complications following AMI), (consequences of former MI included partly also under I25)]; 4) Coronary heart disease or angina pectoris (I20-I25); 5) High blood pressure [I10-I13 and I15 (Hypertensive diseases)]; 6) Stroke [I60-I69 (Cerebrovascular diseases)]; 7) Arthrosis (M15-M19, arthritis excluded); 8) Low back disorder or other chronic back defect [No specific ICD-10 codes can be used but the condition is included under some M40-M54 (Dorsopathies) diagnosis (excluding M45-Ankylosing spondylitis and M50 – Cervical disc disorders)]; 9) Neck disorder or other chronic neck defect [No specific ICD-10 codes can be used but the condition is included under some M40-M54 (Dorsopathies) diagnosis (excluding M45 – Ankylosing spondylitis and M51 – Other intervertebral disc disorders)]; 10) Diabetes [E10-E14 (Diabetes mellitus)]; 11) Depression [F31-F39 (Mood (affective) disorders excluding F30 – Manic episode; F41.2 (Mixed anxiety and depressive disorder), F53.0 (Mild mental and behavioural disorders associated with the puerperium, not elsewhere classified)]; 12) Malignant diseases; 13) Increased fats in the blood serum; 14) Allergy, such as rhinitis, hay fever, eye inflammation, dermatitis, food allergy or other allergy (allergic asthma excluded) [J30 (Vasomotor and allergic rhinitis), L20-L30 (Dermatitis and eczema excluding L21 – Seborrhoeic dermatitis), and other allergies irrespective of the origin]; 15) Cirrhosis of the liver [K70 (Alcoholic liver disease), as secondary to other diseases (K71.7 – Toxic liver disease with fibrosis and cirrhosis of liver), part of

K74 (Fibrosis and cirrhosis of liver); K76.1 (Chronic passive congestion of liver)]; 16) Urinary incontinence, problems in controlling the bladder [R32 (Unspecified urinary incontinence); N39.3 (Stress incontinence); N39.4 (Other specified urinary incontinence)]; 17) Kidney problems [Chronic conditions under N00- N08 (Glomerular diseases), N10-N16 (Renal tubulointerstitial diseases) and N17- N19 (Renal failure), N25-N29 (Other disorders of kidney and ureter)].

Multimorbidity, i.e. a simultaneous presence of two or more chronic diseases/conditions in one person, was also taken into consideration.

### Statistical analysis

All the data of interest obtained through the above described methods were analyzed by adequate statistical tools. The proportions between different population groups were compared with the Chi-square ( $\chi^2$ ) test. The results with probabilities lower than 5% are considered as statistically significant. The relations between a dependent variable (depressive symptoms) and a set of independent variables were examined by univariate and multivariate logistic regressions. The unadjusted odds ratios (ORs) with their corresponding 95% confidence intervals (CIs) were also obtained. All statistical calculations were performed with a commercial, standard software package SPSS, version 18.0. [The Statistical Package for Social Sciences software (SPSS Inc, version 18.0, Chicago, IL)].

### Results

The sample included 1,528 men and 2,012 women whose mean age was 73.9 years [standard deviation (SD) = 6.3 years]. Based on PHQ-8 scores, the depression prevalence was 10.0%. There were statistically significant differences between women (12.6%) and men (6.5%) ( $\chi^2 = 95.534$ ,  $p < 0.001$ ). Mild depressive symptoms (sub-syndrome depression) were present in every fifth female (21.2%) and every eighth male subject (12.7%). More than a half of the depressive episodes were mild (57.9%). Moderately severe depression episodes were recorded in 26.3% and severe depressive episodes in 15.8% of the cases. There were no statistically significant gender differences with respect to the severity of depression ( $\chi^2 = 0.293$ ,  $p = 0.864$ ) (Table 1).

**Table 1**

#### The gender prevalence of depression in the population aged 65 and over

PHQ-8 score (range)	Total		Males		Females		<i>p</i>
	n	%	n	%	n	%	
0–4 (non-depressive)	2,656	72.5	1,235	80.8	1,330	66.1	< 0.001
5–9 (mildly depressive)	621	17.5	194	12.7	427	21.2	
10–24 (depressive episodes)	354	10.0	99	6.5	255	12.7	
10–14 (moderate)	205	5.8	56	3.7	149	7.4	
15–19 (moderately severe)	93	2.6	28	1.8	65	3.2	
20–24 (severe)	56	1.6	15	1.0	41	2.1	

The mean PHQ-8 depression score for the elderly in Serbia was estimated at  $3.6 \pm 4.6$ . The difference between women and men was statistically significant ( $t = -10.763$ ,  $p < 0.001$ ). The mean depression score for females amounted to  $4.2 \pm 4.9$  and for males it was  $2.6 \pm 4.1$  points.

88.9% of the participants claimed to suffer from the investigated chronic diseases and medical conditions. 19% of them reported just one diagnosis while 69.9% reported two or more chronic health issues (multimorbidity). The most prevalent diseases were: increased blood pressure (65.8%), lower back and neck deformities or other chronic back conditions (35.2%), coronary heart disease and angina pectoris (28.8%), arthrosis (24%) and increased blood fats (22%). Malignant diseases were the least frequent among those suffering from depression (2.7%).

The prevalence of depression was significantly higher in respondents with multimorbidity (13.4%) in comparison to individuals without chronic diseases and medical conditions (27.1%). There were statistically significant differences in the likelihood of depression co-occurring with the given diagnoses. Depressive episodes appeared with every third person who had had a stroke (30.1%), and almost every fifth individual who had suffered from urinary incontinence (21.4%), myocardial infarction (20.0%) or arthrosis (18.6%). The distributions of depression with respect to chronic diseases and medical conditions in the Serbian elderly population are given in Table 2.

There were wide discrepancies among the results obtained through PHQ-8 and patients' claims. Namely, only

33.0% of respondents suffering from mild depression (according to PHQ-8) reported depressive symptoms. In other words, among those who claimed not to suffer from depression, 211 (6.8%) were evaluated as depressed by PHQ-8 instrument.

The univariate logistic regression analysis showed that depression was more likely to occur with any analyzed chronic disease than without them. Those differences proved to be statistically significant in each particular case. The respondents with two or more chronic medical conditions were five times more likely to undergo depressive episodes (OR = 5.63). Depressive symptoms were most likely to develop in those who had suffered from: a stroke (OR = 3.64), arthrosis (OR = 3.01), lower back deformities (OR = 2.94) neck deformities (OR = 2.85) and urinary incontinence (OR = 2.51). Chronic bodily pain made it five times more likely for an individual to suffer a depressive episode (OR = 5.37). Self-evaluations of poor medical conditions proved to be a strong indicator of depression. Namely, individuals who evaluated their health status as bad were 17 times more likely to be depressed with respect to those who evaluated it as good (OR = 17.99).

The multivariate analysis showed that multimorbidity (OR = 1.89), chronic bodily pain (OR = 2.35) and negative health self-evaluations (OR = 8.37) were strongly associated with depression. When it comes to individual diseases, we must note that strokes doubled the chances for suffering from depression (OR = 1.82) while lower spine deformities increased those chances by 27% (Table 3).

**Table 2**

**Depressive symptoms and chronic diseases/conditions (number of diseases)**

Disease/condition	Non-depressive		Mildly depressive		Depressive episodes		<i>p</i>
	n	%	n	%	n	%	
No chronic diseases	390	93.3	20	4.8	8	1.9	
One chronic disease	601	89.7	51	7.6	18	2.7	< 0.001
Two or more chronic diseases	1574	64.2	550	22.4	328	13.4	
Asthma	145	60.2	55	22.8	41	17.0	< 0.001
Chronic bronchitis/chronic obstructive pulmonary disease	166	56.1	83	28.0	47	15.8	< 0.001
Myocardial infarction	140	55.1	63	24.8	51	20.0	< 0.001
Coronary disease or angina pectoris	614	60.7	249	24.6	149	14.8	< 0.001
Hypertension	1576	68.4	458	19.9	270	11.7	< 0.001
Stroke	85	44.0	50	25.9	58	30.1	< 0.001
Arthrosis	459	54.4	227	26.9	158	18.6	< 0.001
Lower back deformities	722	58.2	313	25.2	205	16.6	< 0.001
Neck deformities	428	54.8	212	27.1	141	18.0	< 0.001
Diabetes	418	65.4	146	22.8	75	11.8	< 0.001
Malignant diseases	59	60.8	25	25.8	13	13.4	< 0.001
Increased blood fats	491	65.4	172	22.9	88	11.8	< 0.001
Depression	115	30.3	125	33.0	139	36.7	< 0.001
Allergy	203	61.7	81	24.6	45	1	< 0.001
Cirrhosis of the liver	8	57.1	5	35.7	1	7.1	0.202
Urinary incontinence	244	56.2	101	22.4	100	21.4	< 0.001
Kidney problems	228	56.6	104	25.8	71	17.6	< 0.001

Table 3

**Odds ratios (OR) and 95% confidence intervals (CI) for the depression depending health characteristics**

Disease	Univariate analysis		Multivariate analysis	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Asthma	1.83 (1.39–2.40)	< 0.001	0.85 (0.60–1.21)	0.368
Chronic bronchitis/chronic obstructive pulmonary disease	2.23 (1.75–2.85)	< 0.001	1.26 (0.92–1.72)	0.151
Myocardial infarction	2.29 (1.77–2.97)	< 0.001	1.02 (0.75–1.39)	0.908
Coronary disease or angina pectoris	2.22 (1.89–2.60)	< 0.001	1.07 (0.88–1.30)	0.497
Hypertension	1.92 (1.62–2.26)	< 0.001	1.06 (0.85–1.32)	0.600
Stroke	3.64 (2.72–4.89)	< 0.001	1.82 (1.29–2.58)	< 0.001
Arthrosis	3.01 (2.55–3.54)	< 0.001	1.28 (1.04–1.57)	0.190
Lower back deformities	2.94 (2.52–3.43)	< 0.001	1.27 (1.02–1.59)	0.034
Neck deformities	2.85 (2.42–3.38)	< 0.001	1.22 (0.97–1.55)	0.094
Diabetes	1.53 (1.27–1.83)	< 0.001	0.96 (0.77–1.20)	0.727
Malignant diseases	1.73 (1.15–2.62)	< 0.05	0.96 (0.60–1.52)	0.851
Allergy	1.73 (1.37–2.19)	< 0.001	1.08 (0.82–1.44)	0.585
Cirrhosis of the liver	1.98 (0.69–5.73)	0.206	1.37 (0.41–4.56)	0.605
Urinary incontinence	2.51 (2.05–3.08)	< 0.001	1.38 (1.08–1.77)	< 0.05
Kidney problems	2.26 (1.83–2.79)	< 0.001	1.15 (0.89–1.49)	0.294
Multimorbidity	5.63 (4.51–7.05)	< 0.001	1.89 (1.38–2.57)	< 0.001
The presence of moderate, severe or very severe bodily pain	5.37 (4.46–6.46)	< 0.001	2.35 (1.88–2.93)	< 0.001
Self-evaluation of poor medical condition	17.99 (13.01–24.89)	< 0.001	8.37 (5.79–12.08)	< 0.001

### Discussion

The WHO has estimated that the total depression prevalence rate among older adults in the world varies from 10–20%<sup>21</sup>. The rate among the Serbian elderly population, as found in this study, was 10.0%. Similar values (10.3%) were reported in a meta-analysis of 84 independent studies which reported the rate variations ranging from 4.7–16.0%<sup>22</sup>. However, some countries documented considerably higher rates of depression prevalence among elderly population. The community-based studies conducted in India reported the variations within the 13–25% range<sup>21</sup>. The meta-analysis for the older Chinese calculated this rate as 23.6%<sup>23</sup>. In Brasil, nearly 30% of the elderly people suffered from depression<sup>24</sup>. The studies carried out in America recorded the depression prevalence rates ranging from 15% to 19%<sup>25</sup>. The findings of the studies indicated that mean depression prevalence rates in elderly population are similar in Asia, Europe and America, but significantly lower in Australia<sup>22</sup>. About 8% of older Australians are currently experiencing depressive symptoms<sup>26</sup>. These huge variations in depression prevalence among older adults may result from the differences in methodological approaches to data collection, from the use of different scales for geriatric depression, as well as from the socio-demographic and cultural variations<sup>2</sup>. They may also arise from the existent regional and racial differences between the countries<sup>27</sup>.

It was shown in our study that older women were more likely to suffer from depression than men. This finding is in accordance with the results of the previous studies in the field<sup>2, 28, 29</sup>. Quite contrary, Baiyewu et al.<sup>27</sup> found no differences between the opposite sexes. Higher

likelihood for developing depression in an older age in female population may be attributed to numerous factors (i.e. genetic, biological and psychological factors), as well as to different social roles of the two genders and the more unfavorable social positions of females<sup>24</sup>. These findings may also follow from the fact that, due to their longer life expectancy, women are generally more exposed to medical problems and undesirable events which all may contribute to depression<sup>7</sup>.

Population studies have indicated that depression is a disorder of high comorbidity. They have also emphasized the strong links between chronic diseases and depressive symptoms in elderly population<sup>5</sup>. Chronic medical conditions may trigger depression or worsen its symptoms, but depression may also precede chronic diseases and deteriorate their outcomes<sup>30</sup>. This study showed that depression was higher in respondents with multimorbidity. Even though the studies have shown that the relations between chronic diseases and depressive symptoms vary among different chronic diseases, the number of chronic diseases is more strongly related to depression than any specific individual diagnosis<sup>17</sup>. The studies have shown that depression prevalence increases with the number of chronic diseases<sup>31</sup>. The WHO research carried out in 60 countries documented the depression prevalence of 23% in individuals with two or more chronic medical conditions and depression prevalence of 3.2% in healthy population<sup>32</sup>.

The Netherlands Study of Depression in Old Persons (NESDO) found that the presence of cardiovascular, musculoskeletal and somatic diseases was strongly associated with depressive disorder during the two-year monitoring of the patients<sup>33</sup>. With each additional chronic

somatic disease, the chances of developing moderate and severe chronic depression increased by 92%<sup>34</sup>.

The study conducted in the U.S. showed that people with chronic diseases were three times more likely to experience depressive episodes with respect to a control group. Three times higher depression rates were also recorded in patients with terminal-stage kidney insufficiency, chronic obstructive pulmonary disease and cerebrovascular diseases. Twice as high depression rates were detected in patients suffering from coronary diseases, hypertension and diabetes<sup>35</sup>. The evaluations of depression prevalence in patients with chronic diseases like coronary heart disease, diabetes and previous strokes ranged from 15% to 25%, depending on the screening method<sup>36</sup>.

Cardiovascular diseases frequently coexist with psychiatric disorders, but they can also develop as a complication of psychiatric problems and *vice versa*. In almost a half of the patients with cardiovascular diseases, there were depressive episodes which were getting worse as the disease was progressing and which eventually increased the risk of deadly outcomes by two to three times<sup>37</sup>.

Some studies have shown that depression co-occurring with coronary arterial disease is a factor of high risk for this disease; besides, numerous studies have determined the depression prevalence of 18% after an acute myocardial infarction<sup>38</sup>. The other study showed that about 25% of the individuals developed severe depression after myocardial infarction while an additional 25% of them ended up with mild depression. During 4-month period following an acute myocardial infarction, fatal outcomes were almost four times more likely in depressed than in non-depressed patients<sup>39</sup>.

According to Jiang<sup>40</sup>, almost 25% of the patients who had had a stroke developed clinical depression during the same year. Ozaki et al.<sup>38</sup> confirmed these results by proving

that depression appeared in 19–23% stroke survivors and by concluding that depression increased the risk of strokes in the time interval ranging from 10 to 15 years ahead. The depression prevalence in patients suffering from diabetes ranged from 11% to 31% with diabetes doubling the risks for developing depression.

Finally, it must be noted that depressive symptoms may follow almost all chronic diseases. Their existence can contribute to poorer adherence to prescribed treatments, lifestyle deterioration and increased morbidity and mortality<sup>38</sup>.

This study has certain limitations. The study had a cross-sectional design so causal relations between depression and chronic diseases are not strong and clear. Secondly, one may argue that PHQ-8 is not a clinical tool for diagnosing depression. Thus, depression may not be accepted as a definite diagnosis. However, this instrument is most commonly used in evaluating depression prevalence in general population and we decided to follow this widespread practice. We also relied on comorbidities that were reported by participants without being able to check the real morbidity prevalence from their medical records.

## Conclusion

Depression is very frequent in older persons who suffer from chronic diseases and medical conditions. It is crucial to enable adequate screening in primary healthcare institutions in order to diagnose depression in its early stages and start its treatment as soon as possible. The key factors for reducing more severe outcomes of depressive disorders for individuals, their families and larger communities include: the proper identification of risk factors for developing depression in older population, an early diagnosis, a timely and efficient treatment and a proper depression management.

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