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**Authors' Affiliation:**
[1]Department of Family Medicine, King Fahad Medical City, Riyadh, Saudi Arabia
[2]Department of Family and Community Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia
[3]Department of Occupational Therapy, College of Applied Medical Sciences, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

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# Prevalence of depression and its associated factors among elderly. Cross sectional study in health cluster two, Saudi Arabia, Riyadh

**Bashaer A Alzahrani**[1], **Abdulaziz A Alodhayani**[2], **Faris A Alzahrani**[3], **Faisal F Alotaibi**[3]

## ABSTRACT

*Background:* Major Depression Disorder (MDD) is considered one of the challenging issues to diagnose in elderly due to its atypical presentation in this particular group of age. This issue can be easily missed or under diagnosed. Ignoring this issue can lead to unfortunate consequences. Besides, limited studies were found regarding the prevalence of depression and the associated factors in elderlies globally and locally. *Methodology:* This is a cross-sectional study that was conducted in Riyadh, the capital of Saudi Arabia using self-administrated paper-based questionnaire. Short version of Geriatric Depression Scale (GDS-15) questionnaire was used to assess the prevalence and severity of depression among the participants. *Results:* In this study, we were able to collect data from 402 participants aged more than 60 years old. Moreover, 92.8% of them were Saudi Arabian and 58.6% were males. According to the Geriatric depression scale, it was found that 71.6% of the participants in the current study were detected to have features suggestive for depression. It was found that age did not significantly affect the prevalence of depression (P=0.198), neither nationality (P=0.910), gender (P=0.944), nor education (P=0.106). Married, employed and those living with families reported significantly lesser prevalence of depression. *Conclusion:* The current study reported high prevalence of depression among elderly participants receiving care at Riyadh's Primary Health Care Centers - second cluster. Assisting elderly population to get jobs and being financially secure may contribute in lowering the level of depression, in addition to other factors.

**Keywords:** Depression, elderly, geriatrics, prevalence, factors, disability.

## 1. INTRODUCTION

Change in mood or sadness is one of the normal phases in human being emotions. However, those feelings must be distinguished from Major Depression Disorders (MDD) or in another medical term known as Clinical

Depression (Cologne, 2006). Clinical Depression is known to be one of the commonest mood disorders worldwide (WHO, 2021). Psychatritis defined MDD based on certain criteria therefore it can't be missed with normal emotions.

MDD is characterized by emotional (affective) symptoms such as excessive sadness, feeling down nearly all day and or loss of passion (anhedonia) in a manner that can be devastating. These are main symptoms which must occur at least for 14 days or more to be diagnosed with MDD. Also, other elements can be present with depression such as, lack of energy, loss of concentration, being agitated, change in sleep pattern or appetite, feeling guilty as well as ideas of death or even suicidal thoughts. At least 5 of the previous diagnostic criteria must be present to make a diagnosis of depression (in the absence of other condition that mimics MDD) (Regier et al., 2013).

Although there are clear guidelines and valid diagnostic tools are available and commonly used, sometimes it is difficult to diagnose depression especially in elderlies. Elderlies in particular have a unique presentation of depression, since they tend to be present with atypical symptoms such as somatic and cognitive symptoms rather than emotional (e.g., weight loss or lack of concentration which have lots of serious differential diagnosis rather than depression), which in return can be a barrier for early diagnosis and treatment (Fiske et al., 2009). Additionally, there is a common misconception which is that many elderlies think that being depressed is part of normal aging. This can prevent them from seeking medical help and delay their diagnosis (Weber, 2015).

Depression in old person can evolve from numerous factors, such as chronic disease, side effects of medications, change in the daily dependency and being alone or even abused, etc. (Sözeri-Varma, 2012; Alfalogy et al., 2022). More importantly, studies showed that the suicidal rate is higher in old adult in compared to adult patients (Conejero et al., 2018; Conwell et al., 2011; Suresh-Kumar et al., 2015).

Therefore, health care providers must pay special attention to this associated factor its following prognosis. For example, studies showed that increased fatigability can lead to unfortunate event e.g., suicidal attempts or the recurrence of depression even after going through treatment (Kim et al., 2011). Locally, there are few studies focused on depression in elderlies or explore more about likelihood factors. In 2018 in Makkah, the prevalence of depressed elderlies in primary health care (PHC) was more in female and increased with age and was also associated with chronic diseases. Another local study was conducted during the COVID-19 pandemic that showed that depression and stress were high in old, retired adults (Hafiz and Jarwan, 2020).

We believe that depression in elderlies and its related factors are crucial areas for precise investigation, due to their unusual presentation in elderlies and their dire consequences. Since PHCs are the first gate for handling such a patient, protective measures can be applied for early detection and prevention (Park and Unützer, 2011). Limited studies were found regarding the prevalence of depression and the associated factors in elderlies globally and locally. Therefore, the aim of the study was to identify the prevalence of depression in elderlies in Riyadh's Primary Care Centers - second cluster (PHCs-C2) and to identify associated factors related to depression.

## 2. MATERIAL AND METHODOLOGY

This is a cross-sectional study that was conducted in Riyadh, the capital of Saudi Arabia. In Riyadh, there are more than 460 centers which are divided into three clusters under the supervision of Ministry of Health from January 2023 to April 2023. Second cluster PHCs cover Northern and Eastern of Riyadh. While the first and third covered the rest of the Riyadh area. Our focus was in the second which has 41 centers. The aim of choosing this cluster because of our cooperation between our research center in King Fahad Medical City (KFMC) and PHC-C2. Due to the vast number of PHCs in C2, a random selection method was applied among them.

The data collection process was taken around 28 days, which included collecting data on weekdays and weekend including PHCs-C2 that has 24 h service. A total of 400 participants were needed to estimate the point prevalence of depression in elderlies. The sample size estimated for this cross-sectional study based on international prevalence between 10% and 20%, we used following formula =Z 1-$\alpha$/2 2 SD2 / d2, where Z1-$\alpha$/2= is standard normal variate (5% type 1 error), SD standard deviation of variable, d = absolute precision and is taken as 0.05.

Inclusion criteria included all Saudi and non-Saudi, male and female of the age 60 and above attending the PHCs-C2 in Riyadh, who are able to understand Arabic language and willing to participate in this study. The patients were informed regarding the study and were asked to sign the consent form. Moreover, they must all be willing to complete all sections of questionnaires. On the other hand, exclusion criteria included patients who are unable to understand Arabic, patients who are not willing to participate, and patients with dementia, diagnosed with mental or intellectual illness or any disease that prevents them from being able to answer effectively.

A self-administrated paper-based questionnaire was distributed. The following sections were included in this study: Consent form, 1) demographics: Gender, age, marital status, education, economic status and living alone or with the family 2) health status:

Any chronic diseases, number of medications. 3) Selected items of daily living activities to determine the functional capacity: If the participants were able to walk, sit, eat and dress him. The answers were arranged between no help needed, some help needed or complete help. The scoring system was: Zero for no help, one for some help, two for complete help.

The second part of the questionnaire was a short version of Geriatric Depression Scale (GDS-15) questionnaire which had 15 questions designed to screen for depression in elderly patients. The participant must choose either yes or no for each item. Then the score was computed as following (0-4=normal), (5-8= mild depression), (9-11= moderate depression) and (12-15 =severe depression). This questionnaire was chosen due to its validities and reliabilities in the Arabic version (Chaaya et al., 2008; Mc-Ilvenny et al., 1999). Additionally, it was written in a simple manner and can be done in few minutes (approximately less than 5 minutes).

The distribution of these questionnaires were done by four trained volunteering medical interns among the patients in the waiting area, we aim for equal numbers of male and female participants during the period of the aforementioned 80 days. Furthermore, this gathered data was collected daily from the interns and handled by the research team for data entry.

Statistical Packages for the Social Sciences v28.0 (SPSS Inc., Chicago, IL) software was used for statistical analysis. Categorical and continuous data were compared by the Chi-square (or Fisher's Exact test if required by sample size) and Independent-samples T-test, respectively. Bivariate correlation analysis for categorical variables was done by Spearman's correlation analysis. Univariate comparisons with a P value <0.1 were included in multivariate analyses in which statistical significance threshold was accepted as $P<0.05$.

Ethical approval was taken from KFMC research center, as well taking permission from the administration of the PHCs- C2. Nonetheless, written consent in the questionnaire was provided, this consent form was explained to the patients and signed by them. Moreover, all information and data was confidential and anonymous and was handled by the authorized researchers only and kept in a safe place.

## 3. RESULTS

In this study, we were able to collect data from 402 participants. In regard to age 59.1% aged between 60-64 years old and 92.8% of them were Saudi Arabian and 58.6% were males. Moreover, 84.3% of the participants reported being married and 29.9% of them reported having high educational level while 26.2% of them reported being uneducated. Considering the employment status of the participants, 71.6% of them were retired and 14.7% were unemployed. In addition, we found that 89.5% of the participants reported living with family members (Table 1).

**Table 1** Demographic factors of the participants

| | | Count | Column N % |
|---|---|---|---|
| Age | 60-64 | 237 | 59.1% |
| | 65-70 | 90 | 22.4% |
| | 71-74 | 36 | 9.0% |
| | 75-80 | 23 | 5.7% |
| | 81 or above | 15 | 3.7% |
| Nationality | Non-Saudi | 29 | 7.2% |
| | Saudi | 372 | 92.8% |
| Gender | Female | 166 | 41.4% |
| | Male | 235 | 58.6% |
| Marital status | Unmarried | 63 | 15.7% |
| | Married | 338 | 84.3% |
| Education | Uneducated | 105 | 26.2% |
| | Primary | 77 | 19.2% |
| | Middle | 62 | 15.5% |
| | High | 120 | 29.9% |
| | Diploma | 8 | 2.0% |
| | Bachelor | 28 | 7.0% |
| | Doctorate | 1 | 0.2% |
| Employme | Retired | 287 | 71.6% |

| | | | |
|---|---|---|---|
| nt status | Employee | 55 | 13.7% |
| | Unemployed | 59 | 14.7% |
| Living status | Alone | 42 | 10.5% |
| | With family | 359 | 89.5% |

In addition, we found that 71.8% of the participants reported having chronic condition where 27.4% of them reported taking 3-4 medications and 25.7% reported taking 5 or more medications for different chronic condition. Moreover, 43.6% of the participants reported that they did not need any financial support while 29.4% taken them from their sons. Considering the functional capacity of the patients, most of the participants did not need help in their walk (61.6%), sitting (69.1%), dressing (69.6%) and eating (69.6%). Eating was the most common disability in 15% of the participants who reported need for complete help to practice it (Table 2).

**Table 2** Health status and functional capacity

| | | Count | Column N % |
|---|---|---|---|
| Chronic condition | No | 113 | 28.2% |
| | Yes | 288 | 71.8% |
| Number of taken medication | None | 88 | 21.9% |
| | 1-2 | 100 | 24.9% |
| | 3-4 | 110 | 27.4% |
| | 5 and more | 103 | 25.7% |
| Financial support | Self | 175 | 43.6% |
| | Sons | 118 | 29.4% |
| | Government | 95 | 23.7% |
| | Charity | 13 | 3.2% |
| Ability to walk | No help needed | 247 | 61.6% |
| | Some help needed | 117 | 29.2% |
| | Complete help | 37 | 9.2% |
| Ability to sit | No help needed | 277 | 69.1% |
| | Some help needed | 91 | 22.7% |
| | Complete help | 33 | 8.2% |
| Ability to dress | No help needed | 279 | 69.6% |
| | Some help needed | 89 | 22.2% |
| | Complete help | 33 | 8.2% |
| Ability to eat | No help needed | 279 | 69.6% |
| | Some help needed | 62 | 15.5% |
| | Complete help | 60 | 15.0% |

According to the Geriatric depression scale, it was found that 71.6% of the participants in the current study were detected to have symptoms of depression (Figure 1). Among patients with depression, 37.3% of them had mild symptoms of depression (26.7% of the total sample), 37.6% had moderate symptoms of depression (26.9% of the total sample) and 25.1% had severe symptoms of depression (18.0% of the total sample) (Figure 2).

Moreover, in Table 3, we assess the demographic factors that affect the prevalence and severity of depression among geriatric populations. It was found that age did not significantly affect the prevalence of depression (P=0.198), however, it is significantly affecting the severity of the existing depression where younger participants had milder degree of depression and severity increases with the increase of depression (P=0.027). In addition, neither nationality nor gender had any significant impact on both of depression (P=0.910, 0.944 respectively) or depression severity (0.357, 0.836 respectively).

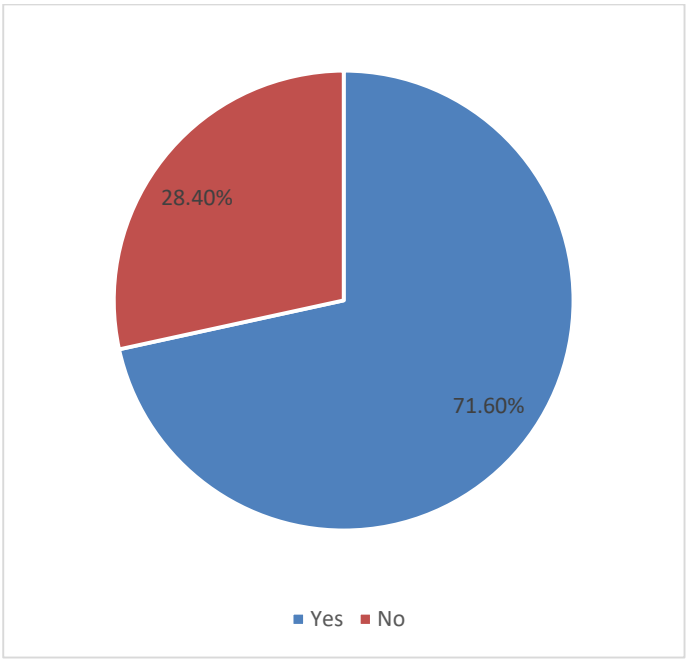


**Figure 1** Prevalence of depression among the participants

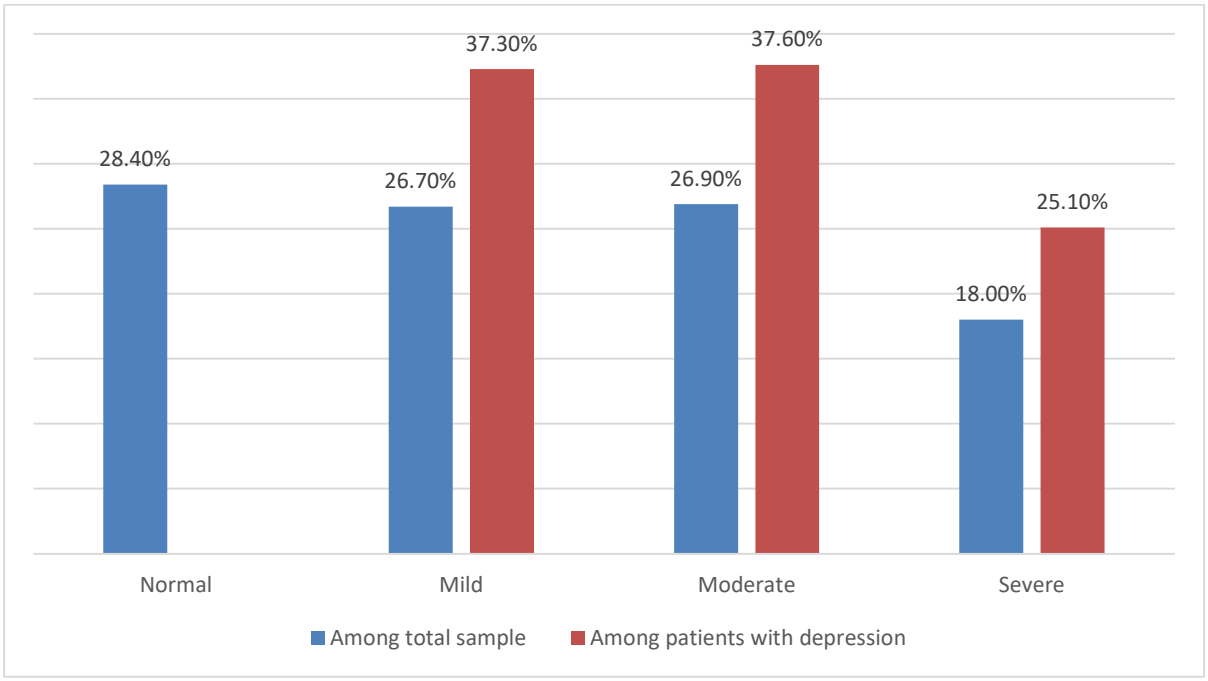


**Figure 2** The severity of depression

Moreover, it was found that marital status of the participants nor their education did not have any significant impact on the prevalence of depression (P-0.292, 0.106 respectively) instead, it was found that married depressed patients had significantly milder condition (39.2% had mild depression) compared with 26.5% of unmarried patients who had mild depression (P=0.049). Moreover, lower educated patients reported more severe symptoms of depression significantly (P=0.001). Moreover, it was found that the prevalence of depression was the highest among retired participants (76.3%) and unemployed participants (65.5%) compared with only 52.7% in employed participants (P=0.001). Furthermore, living alone significantly increase both of the prevalence of depression and severity of depression (P=0.031, 0.002 respectively) (Table 3).

**Table 3** The relation between depression, depression severity and demographic factors of the participants

| | | Depression | | | | | Depression severity | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No | | Yes | | P-value | Mild | | Moderate | | Severe | | P-value |
| Age | 60-64 | 75 | 31.6% | 162 | 68.4% | 0.198 | 69 | 42.6% | 54 | 33.3% | 39 | 24.1% | 0.027* |
| | 65-70 | 22 | 24.7% | 67 | 75.3% | | 25 | 37.3% | 29 | 43.3% | 13 | 19.4% | |
| | 71-74 | 5 | 13.9% | 31 | 86.1% | | 7 | 22.6% | 13 | 41.9% | 11 | 35.5% | |
| | 75-80 | 8 | 34.8% | 15 | 65.2% | | 1 | 6.7% | 6 | 40.0% | 8 | 53.3% | |
| | 81 or above | 4 | 26.7% | 11 | 73.3% | | 4 | 36.4% | 6 | 54.5% | 1 | 9.1% | |
| Nationality | Non-Saudi | 8 | 27.6% | 21 | 72.4% | 0.910 | 6 | 28.6% | 11 | 52.4% | 4 | 19.0% | 0.357 |
| | Saudi | 106 | 28.6% | 265 | 71.4% | | 100 | 37.7% | 97 | 36.6% | 68 | 25.7% | |
| Gender | Female | 47 | 28.3% | 119 | 71.7% | 0.944 | 46 | 38.7% | 45 | 37.8% | 28 | 23.5% | 0.836 |
| | Male | 67 | 28.6% | 167 | 71.4% | | 60 | 35.9% | 63 | 37.7% | 44 | 26.3% | |
| Marital status | Unmarried | 14 | 22.2% | 49 | 77.8% | 0.229 | 13 | 26.5% | 26 | 53.1% | 10 | 20.4% | 0.049* |
| | Married | 100 | 29.7% | 237 | 70.3% | | 93 | 39.2% | 82 | 34.6% | 62 | 26.2% | |
| Education | Uneducated | 22 | 21.2% | 82 | 78.8% | 0.106 | 25 | 30.5% | 37 | 45.1% | 20 | 24.4% | 0.001* |
| | Primary | 18 | 23.4% | 59 | 76.6% | | 13 | 22.0% | 20 | 33.9% | 26 | 44.1% | |
| | Middle | 19 | 30.6% | 43 | 69.4% | | 17 | 39.5% | 19 | 44.2% | 7 | 16.3% | |
| | High | 39 | 32.5% | 81 | 67.5% | | 36 | 44.4% | 29 | 35.8% | 16 | 19.8% | |
| | Diploma | 3 | 37.5% | 5 | 62.5% | | 3 | 60.0% | 1 | 20.0% | 1 | 20.0% | |
| | Bachelor | 12 | 42.9% | 16 | 57.1% | | 12 | 75.0% | 2 | 12.5% | 2 | 12.5% | |
| | Doctorate | 1 | 100.0% | 0 | 0.0% | | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | |
| Employment status | Retired | 68 | 23.7% | 219 | 76.3% | 0.001* | 74 | 33.8% | 87 | 39.7% | 58 | 26.5% | 0.3019 |
| | Employee | 26 | 47.3% | 29 | 52.7% | | 15 | 51.7% | 8 | 27.6% | 6 | 20.7% | |
| | Unemployed | 20 | 34.5% | 38 | 65.5% | | 17 | 44.7% | 13 | 34.2% | 8 | 21.1% | |
| Living status | Alone | 6 | 14.3% | 36 | 85.7% | 0.031* | 8 | 22.2% | 15 | 41.7% | 13 | 36.1% | 0.002* |
| | With family | 108 | 30.2% | 250 | 69.8% | | 98 | 39.2% | 93 | 37.2% | 59 | 23.6% | |

In addition, it was found that having chronic condition significantly increase the prevalence of depression (77.7% compared with 55.8% of non-chronic patients, P=0.000) and severity of depression (30.5% had mild condition compared with 60.3% of those without chronic condition, P=0.000). Moreover, it was found that increasing the number of medications taken by the participants significantly increase the prevalence of depression (P=0.000) and severity of depression (P=0.000). Furthermore, those who reported having self-financial statement reported lower prevalence of depression significantly (P=0.000) and milder conditions among depressed patients (P=0.000).

Moreover, we found that disability in any daily activity was associated with higher prevalence of depression significantly increasing its prevalence from 62.6% in those with no help need to work to 91.9% in those with complete need (P=0.000), from 64.1% in those with no help need to sit to 90.9% in those with complete need (P=0.000), from 63.3% in those with no help need to dress to 84.8% in those with complete need (P=0.000) and from 63.7% in those with no help need to eat to 91.7% in those with complete need (P=0.000). In addition, disability was found to significantly increase the severity of depression among depressed patients (Table 4).

**Table 4** The relationship between prevalence of depression, severity of depression and health status and functional capacity

| | | Depression | | | | | Depression severity | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No | | Yes | | P-value | Mild | | Moderate | | Severe | | P-value |
| Chronic condition | No | 50 | 44.2% | 63 | 55.8% | 0.000* | 38 | 60.3% | 19 | 30.2% | 6 | 9.5% | 0.000* |
| | Yes | 64 | 22.3% | 223 | 77.7% | | 68 | 30.5% | 89 | 39.9% | 66 | 29.6% | |
| Number of taken medication | None | 45 | 51.1% | 43 | 48.9% | 0.000* | 24 | 55.8% | 14 | 32.6% | 5 | 11.6% | 0.000* |
| | 1-2 | 29 | 29.0% | 71 | 71.0% | | 28 | 39.4% | 36 | 50.7% | 7 | 9.9% | |
| | 3-4 | 22 | 20.2% | 87 | 79.8% | | 34 | 39.1% | 34 | 39.1% | 19 | 21.8% | |
| | 5 and more | 18 | 17.5% | 85 | 82.5% | | 20 | 23.5% | 24 | 28.2% | 41 | 48.2% | |
| Financial | Self | 70 | 40.0% | 105 | 60.0% | 0.000* | 57 | 54.3% | 32 | 30.5% | 16 | 15.2% | 0.000* |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| support | Sons | 19 | 16.2% | 98 | 83.8% | | 26 | 26.5% | 44 | 44.9% | 28 | 28.6% | |
| | Government | 22 | 23.2% | 73 | 76.8% | | 22 | 30.1% | 29 | 39.7% | 22 | 30.1% | |
| | Charity | 3 | 23.1% | 10 | 76.9% | | 1 | 10.0% | 3 | 30.0% | 6 | 60.0% | |
| Ability to work | No help needed | 92 | 37.4% | 154 | 62.6% | | 70 | 45.5% | 63 | 40.9% | 21 | 13.6% | |
| | Some help needed | 19 | 16.2% | 98 | 83.8% | 0.000* | 33 | 33.7% | 38 | 38.8% | 27 | 27.6% | 0.000* |
| | Complete help | 3 | 8.1% | 34 | 91.9% | | 3 | 8.8% | 7 | 20.6% | 24 | 70.6% | |
| Ability to sit | No help needed | 99 | 35.9% | 177 | 64.1% | | 86 | 48.6% | 63 | 35.6% | 28 | 15.8% | |
| | Some help needed | 12 | 13.2% | 79 | 86.8% | 0.000* | 18 | 22.8% | 33 | 41.8% | 28 | 35.4% | 0.000* |
| | Complete help | 3 | 9.1% | 30 | 90.9% | | 2 | 6.7% | 12 | 40.0% | 16 | 53.3% | |
| Ability to dress | No help needed | 102 | 36.7% | 176 | 63.3% | | 87 | 49.4% | 63 | 35.8% | 26 | 14.8% | |
| | Some help needed | 7 | 7.9% | 82 | 92.1% | 0.000* | 17 | 20.7% | 38 | 46.3% | 27 | 32.9% | 0.000* |
| | Complete help | 5 | 15.2% | 28 | 84.8% | | 2 | 7.1% | 7 | 25.0% | 19 | 67.9% | |
| Ability to eat | No help needed | 101 | 36.3% | 177 | 63.7% | | 83 | 46.9% | 69 | 39.0% | 25 | 14.1% | |
| | Some help needed | 8 | 12.9% | 54 | 87.1% | 0.000* | 13 | 24.1% | 27 | 50.0% | 14 | 25.9% | 0.000* |
| | Complete help | 5 | 8.3% | 55 | 91.7% | | 10 | 18.2% | 12 | 21.8% | 33 | 60.0% | |

## 4. DISCUSSION

Depression is a common public health problem among elderly persons worldwide. However, about half of cases are undiagnosed. The current study revealed that the prevalence of depression among elderly in in Riyadh's Primary Care Centers - second cluster (PHCs-C2) was 71.6%. This is significantly higher than reported in many previous studies including the study of Mulat et al., (2021) in Ethiopia who reported a prevalence of 45%. Study of Awunor et al., (2018) in Nigeria who reported prevalence among elderlies of 44.7% and study of Mohamed and Abd-Elhamed, (2011) in Egypt who reported a prevalence of 44.4%.

In addition, our prevalence is higher than reported in other studies conducted in different regions including India (52.5%) (Paul et al., 2019), Nepal (57.8%) (Chalise, 2014), Vietnam (66.9%) (Dao et al., 2018), Portuguese (61.4%) and Brazil (49.76%) (Leal et al., 2014). On the other hand, our prevalence of depression was similar to the results of another study conducted un urban India which resulted in a prevalence of 75.5% among elderly participants (Buvneshkumar et al., 2018) and it was lower than reported in another study showed a prevalence of 89.1% (Pradhan, 2014).

The explanation of this great difference in the prevalence of depression among the elderly in different studies could be because of the variation in the study design, sampling technique, the used geriatric depression scales and socioeconomic - demographic factors. Moreover, reasons for high prevalence of depression in the current study included the inclusion all participants even those older than 80 years old while most of the studies included between 60 and 70 years old. Moreover, we included our sample from patients who visited PHCs which resulting in high population of those with chronic conditions which significantly associated with higher prevalence of depression.

In the current study, we could not find a significant relation between age and prevalence of depression. The relation between age and prevalence of depression in the literature was unclearly where one study reported that the elderly persons of 85 or more years old were less likely to have symptoms of depression than those of 60-75 years old (El-Gilany et al., 2018) while another study showed that elderly individuals with age more than 70 years old had a significant higher risk for developing depression and this risk increases more with increase the age of more than 75 years old (Abdo et al., 2011).

In addition, in our study, we found that there is no significant difference between the two genders considering the prevalence of depression. This is contrast with the results of some previous studies including study of El-Gilany et al., (2018) who reported that depression was statistically significantly higher among females than males and study of Abdo et al., (2011) who reported that females had significantly higher level of depression (57.7%) compared with males (34.8%) and study of Pilania et al., (2017) who stated that depression in the elderly population was significantly associated with female gender.

In addition, another study concluded that prevalence of depression was significantly higher among female elderlies (42.2%) than males (19.5%) (El-Okda, 2009) and study of Chong et al., (2001) who found that depressive disorders were 2.1 times higher among women than males as well as the study of Guallar-Castillón et al., (2006) who reported depression prevalence was more among females than males (57% and 37.6%; respectively).

Moreover, in our study we found that the prevalence of depression was significantly higher among participants who reported being unmarried. This is similar to the results of El-Gilany et al., (2018) who reported that depression was significantly higher

among elderly persons with disturbed marital life or singles and study of Abdo et al., (2011) who reported similar results as well as the study of Chong et al., (2001) who reported that widows had a significantly higher risk of developing depression. This result may be related with the sensation of loneliness and lack of social support among unmarried participants increasing the prevalence of depression. This is confirmed with the results of our study which showed that living alone increases the prevalence of depression significantly which is also reported by some previous studies (Abdo et al., 2011; El-Gilany et al., 2018).

Moreover, our study showed that the prevalence and severity of depression was significantly higher among participants who reported having chronic conditions and taking many medications. This is in agreement with the results of El-Gilany et al., (2018) who reported that prevalence of depression was statistically significant higher with presence of co-morbidities and study of Chong et al., (2001) who reported that presence of physical illness increases the risk for depression developing among elderly by almost four times.

In contrast, a previous study showed that chronic medical conditions are not considered significant risk factors for developing depression among elderly (Dessoki et al., 2013). In addition, we found that disability in the daily activities were associated significantly with developing of depression and with more severe symptoms of depression. This is also reported by different studies which showed that disability and limitations in activities of daily living are considered a significant risk factor for developing depression among elderly participants (Charoensakulchai et al., 2019; El-Gilany et al., 2018; Mulat et al., 2021; Padayachey et al., 2017; Sharma et al., 2016; Subramaniam et al., 2016).

## 5. CONCLUSION

In conclusion, the current study reported high prevalence of depression among elderly participants who visited the Riyadh's Primary Care Centers - second cluster (PHCs-C2) indicating the significant need for developing intervention to control this prevalence. Depression may lead to many limitations in live which are existing already in this population. Helping elderly population to have jobs, stable social life, not living alone, helping them with financially and their daily activities may be associated with lower level of depression among them. More investigations to assess the depression among elderly population in different places in the Riyadh are required to confirm our results.

**Institutional Review Board Statement**

The study was approved by the Institutional Review Board of King Fahad Medical City Research Center (#22-614C).

**Funding**

This study has not received any external funding.

**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

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