

# Depression and associated factors in hospitalized elderly: a cross-sectional study in a Saudi teaching hospital

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**BACKGROUND:** Depression in the elderly is a serious and often underdiagnosed psychiatric disorder that has been linked to adverse outcomes in the hospital setting.

**OBJECTIVES:** To determine the prevalence of depression and possible associated factors among hospitalized elderly.

**DESIGN:** An analytical cross-sectional study.

**SETTINGS:** Medical and surgical wards of King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

**PATIENTS AND METHODS:** The study included 200 consecutively hospitalized patients aged 60 years and older. Participants were evaluated within 48 hours of admission using an interviewer-administered questionnaire to provide basic demographic and clinical information.

**MAIN OUTCOME MEASURE(S):** Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9) screening method and the Structured Clinical Interview for the Diagnostic and Statistical Manual, Fifth Edition (DSM-5) mood disorder module.

**RESULTS:** According to PHQ-9, 17% and 10.5% of the hospitalized patients were diagnosed with a major depressive disorder and other depressive disorders, respectively. The DSM-5 criteria identified 12% of elderly with major depression. Overall, the number of comorbidities associated with depression was significantly higher in the major depressive disorder group than in the no depression group (post hoc  $P=.022$ ). Depression was also associated with female gender, unmarried status, lower income, and polypharmacy. In addition, cardiovascular disease and cancer were the most prevalent medical illnesses associated with depression among hospitalized elderly.

**CONCLUSION:** Major depressive disorder was prevalent among hospitalized elderly, especially among those with comorbid conditions. Hospital physicians must, therefore, maintain a high index of suspicion to identify early and manage depressive symptoms in these patients.

**LIMITATION:** The small size of certain subgroups limits the statistical power to examine for associations of depression with particular conditions.

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**M**ental disorders account for almost 10% of all disabilities among the elderly, with depression as one of the most prevalent psychiatric disorders in this population worldwide.<sup>1,2</sup> Despite the lower estimated prevalence of depression among older adults compared to younger adults,<sup>3</sup> depression is associated with several adverse health outcomes including functional decline, reduced quality of life,<sup>4</sup> increased mortality,<sup>5</sup> and substantial health costs.<sup>6</sup> The prevalence of

depressive symptoms is especially high in hospitalized elderly: reportedly in the range of 5.9-81% compared to the general population.<sup>7</sup> Moreover, several studies have reported depressive symptoms to be significantly higher in hospitalized geriatric patients with medical conditions such as heart disease, diabetes, osteoporosis, stroke and dementia, adding to the complexity of detecting depression early in this population.<sup>8-11</sup> Nevertheless, depression remains under-recognized and often untreated

in medical settings.<sup>12,13</sup> Previous studies have shown that the rate of under-detection of depressive disorders ranges between 35-50%.<sup>14</sup>

Brief screening questionnaires have been advocated to improve recognition of depression in various clinical settings.<sup>15</sup> One of the most common screening methods is the Patient Health Questionnaire (PHQ-9).<sup>16</sup> The diagnostic accuracy of the PHQ-9 screening method for depression among patients with chronic medical conditions was more accurate (sensitivity=84%; specificity=88%) than other screening tools that were evaluated in a systematic review.<sup>15</sup> This study aimed to determine the prevalence of depression among hospitalized elderly. In addition, we have evaluated the association between depression and selected sociodemographic and clinical factors.

## PATIENTS AND METHODS

### *Study design and participants*

Based on previous studies,<sup>17,18</sup> we estimated the prevalence of depression among hospitalized elderly of 15%. We calculated a sample size of 195 using a margin of error of 5% and a confidence interval of 95%.<sup>19</sup> From March to June 2016, we included a consecutive series of patients aged 60 years and older who were admitted to the medical and surgical wards of King Abdulaziz University Hospital (KAUH), Jeddah, Saudi Arabia. The study protocol was reviewed and approved by the Research Ethics Committee of KAUH.

Patients with severe cognitive dysfunction, acute psychosis, bipolar disorder, schizophrenia, language barrier, aphasia, hearing impairment, reduced level of consciousness, or with unstable medical illnesses were excluded from the study. Consenting eligible participants were evaluated by a trained research team member within 48 hours of hospital admission using a questionnaire on age, gender marital status, education level and employment as well as clinical characteristics including hospital mortality, comorbidities, polypharmacy and length of hospital stay.

### *Depression measures*

The Patient Health Questionnaire-9 (PHQ-9) is a short self-administered questionnaire consisting of nine items based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-4) for major depressive disorder (MDD).<sup>20,21</sup> The PHQ-9 items scored a total of 27 ranging from 0 (not at all) to 3 (almost every day) for each item according to the experience of the participant over the last two weeks prior to questionnaire administration. A depressive disorder is consid-

ered major if 5 or more symptoms are present at least "more than half the days", and one of the symptoms is low mood or lack of interest. Other depressive disorders are considered if only 2-4 of the symptoms are present at least "more than half the days" and one of the symptoms is low mood or lack of interest.<sup>22</sup> The standard cutoff  $\geq 10$  and  $\geq 5-9$  have demonstrated high sensitivity and specificity in identifying major depression and other depressive disorders, respectively.<sup>22</sup> This scale also provides a rubric for determining depression severity based on the score: minimal, 1-4; mild, 5-9; moderate, 10-14; moderately severe, 15-19; and severe, 20-27. It has been found to be specific and effective for the assessment of depression severity in different clinical settings.<sup>20,23,24</sup> The PHQ-9 screening method has also been successfully administered to subsets of medically ill elderly, validated in different settings, and translated into many languages.<sup>25-28</sup> The PHQ-9 version used in our study was validated in Arabic.<sup>29</sup> The Structured Clinical Interview for the Diagnostic and Statistical Manual, Fifth Edition (DSM-5) mood disorder module is a well-recognized and frequently used guide that ascertains the diagnosis of depression and ensures that the DSM-5 criteria for Major Depressive Disorder are systematically evaluated.<sup>30</sup>

### *Statistical methods*

PHQ-9 instrument and DSM-5 diagnostic criteria were used to calculate the prevalence of depression. The frequency of severity (mild/minimal, moderate, moderate severe/severe) was also described for patients diagnosed with depression based on the PHQ-9 measures. Summary statistics for the depression groups included mean (standard deviation) for normally distributed continuous variables and median (interquartile range) for skewed continuous variables and n (%) for categorical variables. The sociodemographic and clinical measures of the groups were compared using t tests/ANOVA when distributions were normal and Mann-Whitney U/Kruskal Wallis tests otherwise. For categorical measures, the group comparison was performed with chi-square and Fisher exact tests when the expected cell sizes were small. A post-hoc pairwise comparison was applied with Bonferroni correction if significant results were found among the three PHQ-9 depressive categories. All tests were two-sided at a significance level of  $<.05$  and were performed using R version 3.3.0.<sup>31</sup>

## RESULTS

### *Participant characteristics*

The study included 200 hospitalized patients with an

mean (SD) age of 70.2 (8.1) years, predominantly females (59%), married (61.5%), low income (56%) and with a low level of formal education (81.5%). The sociodemographic and clinical characteristics of the patients are presented in **Table 1**. Slightly more than half of the sample admitted were from the medical wards (51%) and the rest were from the surgical wards of the hospital. The most frequent reasons for admission to the hospital were gastrointestinal illnesses (19.5%), metabolic disorders (14%), oncology conditions (13.5%), genitourinary (13%), and cardiovascular diseases (12.5%). The percentage of patients with one or more comorbidities at the time of admission was 92.5% or a total of 185 patients mean and SD of 2.9 (1.8); and the number of patients on multiple medications ( $\geq 5$  medications) was 69 (34.5%). It was also noted that the median length of hospital stay was 7 days (IQR: 3-19) in 75% of the patients.

#### Characteristics of depression groups by PHQ-9 screening method

The prevalence rates for major depression and other depression screened by PHQ-9 are shown in **Table 2**. Overall, there were 34 (17%) and 21 (10%) of the 200 patients identified with major depression and other depression, respectively. There was no statistically significant difference between major depressive disorder, other depressive disorder and no depression patients screened by PHQ-9 in terms of sociodemographic and health measures except for the number of comorbidities, which was significantly higher in the major depressive disorder group than the no depression group (post hoc  $P=.022$ ). Although the other depressive disorder group also had a higher mean number of comorbidity than the no depression group (3.14 vs. 2.66), the difference was not statistically significant (post hoc  $P=.765$ ). Among the 55 patients with depression, 11 (20%) had minimal or mild depression, 25 (45%) had moderate depression and 19 (36%) had severe or moderately severe depression.

Patients with major depression had lower BMI (6.39% versus 11.68%), were less likely to be married (52.9% versus 64.8%), more likely to be employed (11.8% versus 8.3%) and had lower income (67.6% versus 52.4%) than patients with no depression, although the difference was not statistically significant (**Table 2**). While not statistically significant, there were some health differences noted between the major depressive disorder and no depression groups. Compared to the group with no depression, the group with the major depressive symptoms was more likely to experience gastrointestinal problems (23.5% versus 19.3%), cardiovascular disease (14.7% versus 11.7%) and can-

**Table 1.** Baseline sociodemographic and clinical characteristics (n=200).

Male	82 (41)
Female	118 (59)
Age, years (mean, SD)	70.23 (8.07)
BMI (mean, SD)	29.48 (10.49)
Married	123 (61.5)
Employed	17 (8.5)
<b>Income</b>	
Low	112 (56)
Median	56 (28)
High	32 (16)
<b>Clinical characteristics</b>	
Department surgical wards	98 (49)
Department medical wards	102 (51)
<b>Admission</b>	
Cardiovascular	25 (12.5)
Cancer	27 (13.5)
Gastrointestinal	39 (19.5)
Genitourinary	26 (13)
Infectious	20 (10)
Metabolic-endocrine	10 (14)
Musculoskeletal	22 (11)
Neurological	14 (7)
Respiratory	11 (5.5)
Other	6 (3)
Hospital mortality	19 (9.5)
Any comorbidity	185 (92.5)
Polypharmacy ( $\geq 5$ medications)	69 (34.5)
Number of comorbidities (mean, SD)	2.87 (1.83)
Length of stay, days (median, IQR)	7 (3-19)

cer (14.7% versus 13.1%). This order was very similar to the prevalence of the medical illnesses characterised at baseline (**Table 1**). Also patients identified with major depressive disorders were taking a greater number of medications (46.4%) compared to patients with no depression (33.6%) and hospital mortality was higher

**Table 2.** Prevalence by PHQ-9 screening method.

Variables	PHQ-9 screening instrument			P
	Major depressive disorder	Other depressive disorder	No depression	
Prevalence	34 (17)	21(10.5)	145(72.5)	
Age, mean (SD)	69.5 (7.0)	71.1 (7.5)	70.3 (8.4)	.771
Male	14 (41.2)	7 (33.3)	61 (42.1)	.749
Female	20 (58.8)	14 (66.7)	84 (57.9)	
BMI, mean (SD)	29.2 (6.4)	28.9 (6.7)	29.6 (11.7)	.943
Education grade 12 or below	28 (82.4)	18 (85.7)	117 (80.7)	.849
Married	18 (52.9)	11 (52.4)	94 (64.8)	.291
Employed	4 (11.8)	1 (4.8)	12 (8.3)	.699
<b>Income</b>				.149
Low	23 (67.6)	13 (61.9)	76 (52.4)	
Median	9 (26.5)	7 (33.3)	40 (27.6)	
High	2 (5.9)	1 (4.8)	29 (20.0)	
Department surgical wards	21 (61.8)	7 (33.3)	70 (48.3)	.116
Medical Wards	13 (38.2)	14 (66.7)	75 (51.7)	
<b>Admission</b>				.974
Cardiovascular	5 (14.7)	3 (14.3)	17 (11.7)	
Cancer	5 (14.7)	3 (14.3)	19 (13.1)	
Gastrointestinal	8 (23.5)	3 (14.3)	28 (19.3)	
Genitourinary	4 (11.8)	2 (9.5)	20 (13.8)	
Infectious	3 (8.8)	3 (14.3)	14 (9.7)	
Metabolic-endocrine	2 (5.9)	1 (4.8)	7 (4.8)	
Musculoskeletal	4 (11.8)	1 (4.8)	17 (11.7)	
Neurological	1 (2.9)	3 (14.3)	10 (6.9)	
Respiratory	2 (5.9)	1 (4.8)	8 (5.5)	
Other	0 (0.0)	1 (4.8)	5 (3.4)	
Hospital mortality	6 (17.6)	2 (9.5)	11 (7.6)	.160
Any comorbidity	33 (97.1)	21 (100.0)	131 (90.3)	.158
Polypharmacy (≥5 medications)	13 (46.4)	9 (47.4)	47 (33.6)	.265
Number of comorbidities, mean (SD)	3.6 (1.8)	3.1 (1.8)	2.7 (1.8)	.022 <sup>a</sup>
Length of stay (days), median (IQR)	7.0 (15.5)	7.0 (11.0)	8.0 (17.0)	.667

Values are n (%) unless noted otherwise. <sup>a</sup>Pairwise comparison (major depression vs no depression) with Bonferroni correction.

**Table 3.** Prevalence by DSM-5 diagnostic criteria.

Variables	Major depression	No depression	P
Prevalence	24 (12)	176 (88)	
Age, mean (SD)	70.6 (8.1)	70.2 (8.1)	.8
Male	9 (37.5)	73 (41.5)	.88
Female	15 (62.5)	103 (58.5)	
BMI, mean (SD)	28.59 (5.3)	29.60 (11.0)	.66
Education grade 12 or below	19 (79.2)	144 (81.8)	.97
Married	13 (54.2)	110 (62.5)	.57
Employed	0 (0.0)	17 (9.7)	.23
<b>Income</b>			
Low	14 (58.3)	98 (55.7)	.96
Median	6 (25.0)	50 (28.4)	
High	4 (16.7)	28 (15.9)	
Department surgical wards	12 (50.0)	86 (48.9)	1.000
Medical wards	12 (50.0)	90 (51.1)	
<b>Admission</b>			
Cardiovascular	5 (20.8)	20 (11.3)	.873
Cancer	4 (16.7)	23 (13.1)	
Gastrointestinal	3 (12.5)	36 (20.5)	
Genitourinary	3 (12.5)	23 (13.1)	
Infectious	1 (4.2)	19 (10.8)	
Metabolic-endocrine	1 (4.2)	9 (5.1)	
Musculoskeletal	2 (8.3)	20 (11.4)	
Neurological	3 (12.5)	11 (6.2)	
Other	1 (4.2)	5 (2.8)	
Respiratory	1 (4.2)	10 (5.7)	
Hospital mortality	1 (4.2)	18 (10.2)	.480
Any comorbidity	20 (83.3)	165 (93.8)	.160
Polypharmacy (≥5 medications)	10 (45.5)	59 (35.8)	.516
Number of comorbidities, mean (SD)	2.71 (1.9)	2.89 (1.8)	.646
Length of stay (days), median (IQR)	7.0 (16.5)	6.5 (9.0)	.382

Values are n (%) unless noted otherwise.

(17.6%) in the former group than in the no depression group (7.6%).

### Characteristics of depression groups by DSM-5 Diagnostic Criteria

The characteristics and prevalence of depression among the same sample of patients diagnosed according to the DSM-5 criteria is summarised in **Table 3**. Twenty-four (12%) of the patients were diagnosed with major depression using DSM-5 criteria, which is relatively lower than the number identified by PHQ-9 screening (17%).

There were no statistically significant differences in the sociodemographic characteristics of patients between the DSM-5 depression and no depression groups, but as with the PHQ screening sociodemographic data, there were some distinct differences. The group with depressive disorders had a lower BMI (5.34% versus 11.01%), were less likely to be married (52.4% versus 62.5%), and had a slightly lower income (58.3% versus 52.4%). In addition, despite no statistical significance in the sample study, there were differences in clinical characteristics of the group diagnosed with major depression compared to the no depression group that were notably highest for cardiovascular disease (20.8% versus 11.3%), cancer (16.7% versus 13.1%) and neurological disease (12.5% versus 6.2%), respectively. Also patients diagnosed with major depressive disorders were taking more medications (45.5%) compared to patients with no depression (35.8%), but unlike depression defined by PHQ-9 screening, the hospital mortality of the major depression group was lower (4.2%) than the no depression group (10.2%). While the reason for this difference is unclear, one possibility could be the lower sensitivity of PHQ-9 screening criteria.

## DISCUSSION

Previous studies have shown that the prevalence of major depression in the hospitalized elderly is strongly associated with various medical illnesses.<sup>32-36</sup> In our study, the prevalence of major depression in hospitalized elderly with medical disorders was 12% based on the structured clinical interviews guided by DMS-5 criteria, which was comparable to other studies with a similar patient age and gender distribution that used DMS-IV diagnostic criteria.<sup>17,37-39</sup>

The primary findings from PHQ-9 screening method was the major depression prevalence of 17% among the hospitalized elderly with medical disorders. The slight overestimation by the PHQ-9 screening method might be due to the relatively higher sensitivity of the currently recommended cut-off score of  $\geq 10$ .<sup>40</sup> A previous review of depression management in the United Kingdom re-

vealed that the diagnostic accuracy of PHQ-9 could be improved by using a slightly higher cut-off score of 12.<sup>41</sup> Overall, the results of both assessment methods are clinically similar possibly owing to the PHQ-9 method being based on the DMS-IV criteria and use of the standard cut-off of  $\geq 10$ , which has increased specificity in our study. Interestingly, the most recent study that used PHQ-9 and DMS-IV criteria reported a significant difference in major depression diagnosis of hospitalized patients between the two methods possibly due to lower PHQ-9 cut-off value ( $\geq 6$ ) which reduces specificity while increasing sensitivity leading to more false negative cases in a hospital setting.<sup>7</sup>

Also, for both the PHQ-9 and DMS-5 assessment methods of major depression, a significantly higher number of hospitalized women were affected by depression than men, which is consistent with previous findings that depression is more prevalent in women.<sup>7,42-44</sup> Other sociodemographic factors found to be associated with depression in this population were less likelihood of being married and having a lower income, which supports previous findings by other studies.<sup>17,38,45</sup>

The most common comorbid conditions associated with major depression identified by both DMS-5 and PHQ-9 were cardiovascular disease and cancer, both have been shown in recent studies to be relatively prevalent in patients with major depression.<sup>7,46-48</sup> A recent systematic review found that depression was a high risk factor associated with poor prognosis in patients hospitalized with acute cardiovascular disease.<sup>49</sup> Similarly, another study showed that there was an increased risk of mortality after myocardial infarction among hospitalized patients with depression.<sup>50</sup> The findings of a recent meta-analysis further confirmed that depressive symptoms in hospitalized patients were associated with a high risk of adverse events especially post discharge.<sup>51</sup> Similarly, a previous meta-analysis reported a prevalence of 17% among cancer patients affected with depression as defined by clinical interview in a primary care setting.<sup>12</sup> Findings from another meta-analysis showed the prevalence of DSM-defined major depression to be 16.7% in hospitalized cancer patients, which is almost identical to our findings of 16.6% in cancer patients.<sup>48</sup> Altogether, these studies suggest that early identification of depression is imperative to reduce adverse events associated with depression in medically ill hospitalized elderly.

The primary limitation of this study was the moderate size of certain subgroups within our sample population, limiting statistical power to examine for associations of depression with particular conditions. Future studies may include larger sample sizes stratified by diagnosis,

in order to precisely estimate the prevalence of depression and its correlates within each stratum.

In summary, depression was prevalent among the hospitalized elderly, especially among patients with comorbid conditions. The PHQ-9 self-report questionnaire yielded a slightly higher estimate of depression (17%) than the DSM-5 diagnostic criteria (12%). Depressive symptoms were more common in females, the unmarried, the less educated and in patients with polyphar-

macy. Our results should encourage hospital physicians to adopt a brief screening instrument such as PHQ-9 to early identify and manage depressive symptoms in such patients. However, they should be aware that, the current suggested cut-off point of 10 on the PHQ-9 could lead to over detection of major depressive disorder.

#### Conflict of interests

*The authors report no conflict of interests.*

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