Depression and anxiety are common in hospitalized patients especially those waiting for surgery and with chronic or hard-to-treat conditions. Psychological disorders are not only related to a poor adjustment to hospitalization distress, but is associated with adverse events and unsatisfactory outcomes. Although the mechanism of action in psychological disorders and its relation to adverse outcomes in hospitalized patients has been explained to some extent, screening strategies to identify patients at higher risk for hospital-related mood disorders are not robust. Moreover, risk factors for depressive and anxiety disorders in inpatient settings have not been exclusively determined.

Risk stratification in hospitalized patients for mood disorders could help in identifying those with a higher probability to develop poor outcomes. This is of particular importance when considering that depression and anxiety disorders have been associated with readmission, higher morbidity and mortality, and even post-discharge psychiatric diagnosis. The Hospital Anxiety and Depression Scale (HADS) has been used extensively as a screening instrument for mood disorders and its appropriateness for the general population and applicability in an inpatient setting has been well documented.

On this basis, our study sought to use the HADS to screen patients admitted to a surgical ward of a tertiary care center to determine the prevalence and risk factors for developing depression and anxiety symptoms in such a setting.

METHODS

Patients admitted to the surgical ward of Shariati Hospital, affiliated with the Tehran University of Medical Sciences in Tehran, Iran, were enrolled.
consecutively in this prospective observational cross-sectional study, which took place between June 2011 and June 2012.

The institutional review board of Shariati Hospital approved the study protocol, which was in accordance with the tenets of the Declaration of Helsinki. The ethics committee of Tehran University of Medical Sciences granted ethical approval.

Patients aged ≥ 18 years who were conscious and cooperative and gave their informed consent were enrolled in the study. Patients with a diagnosis of current psychiatric disorder, who were taking antidepressive, anxiolytic, or antipsychotic medications, or had an altered mental status were excluded from the study.

A trained nurse used the HADS to evaluate patients’ mood symptoms at the first inpatient visit. This was either 12 hours after admission for electively scheduled surgeries or 12–24 hours after the surgery for patients undergoing emergency surgery. The questionnaire was repeated weekly until the patient was discharged. Demographics and other clinical and surgical characteristics of patients were also recorded.

HADS is a self-reported 14-item questionnaire composed of two seven-item anxiety (HADS-A) and depression (HADS-D) subscales that are rated on a Likert-type scale from zero (the least) to four (the most severe). The total score is obtained from the sum of the 14 items. For each subscale, the score is the sum of the corresponding seven scores ranging between zero and 21. We used a validated Persian translation of HADS in this study.

HADS scores in each construct were divided to normal (0–7), doubtful (8–10), and definite (11–21) cases.

To produce a binary regression model, patients with HADS scores ≥ 11 (definite cases) were compared to those with normal scores. Patients with scores in the doubtful range were not included in regression analysis.

Data were analyzed using SPSS Statistics (SPSS Inc., Chicago, US) version 16. In univariate analysis, chi-square test for categorical and independent t-test for continuous variables was used. Repeated measure analysis of variance (ANOVA) was used to determine changing pattern of HADS scores with hospital stay. A binary logistic regression analysis was also performed for early psychiatric symptoms (within 24 hours of admission) including factors with a p-value < 0.200 in the univariate analysis.

RESULTS
A total of 392 patients were enrolled in this study with a mean age of 35.1±12.9 years. The female: male ratio was 194:198 (female 49.5%, male 50.5%). Table 1 summarizes patient’s demographic, clinical, and surgical characteristics. The majority of our study population had an intermediate socioeconomic status, supportive familial relationships, and religious belief.

The prevalence of depressive and anxiety symptoms according to HADS definition are presented in Table 2. Definite and doubtful depression became more prevalent as the length of hospital stay increased. Although doubtful anxiety scores increased in the second week, the prevalence of definite cases decreased. Repeated measure ANOVA revealed that HADS-D score at the time of admission was 5.0±3.7, 9.2±2.5 in the first week and 11.3±1.7 in the second week (p = 0.009). Furthermore, HADS-A score was 6.7±4.0 at the time of admission, which increased significantly (p = 0.027) to 7.5±3.1 in the first week and to 8.8±3.5 in the second week [Figure 1].

Univariate analysis was performed to identify two-sided p-values < 0.200 for HADS subscales and their predictors to include in the regression model and to determine the relationship of HADS subscales in the third week with other determinants.

The analysis revealed that HADS3-D was associated with a lack of familial support and being under the poverty line (p < 0.050). HADS3-A did not demonstrate a significant relationship with any variable (p > 0.050).

Regression analysis was also carried to include predictors with a significant two-sided association of < 0.200 with HADS subscales at the time of admission and in the second week [Table 3]. Both HADS1-D and HADS1-A were associated with
female gender \((p = 0.040\) and \(p = 0.002\), respectively). Regarding HADS1-A, a higher education level was protective \((p = 0.060)\) while a history of mood disorder was a risk factor \((p = 0.005)\). HADS2-A was also associated with a longer hospital stay \((p = 0.039)\).

**DISCUSSION**

Our study was carried out in an inpatient setting to screen patients admitted to the surgical ward for symptoms of depression and anxiety. One of the unique features of our study was its exclusive discrimination between levels of HADS scores in relation to the predicting variables. Other studies have rarely distinguished between mood components and have discussed psychiatric symptoms as mood disorders.

Our findings suggest that factors including a lack of familial support, type of diseases, need for reoperation, postoperative complications, previous history of mood disorders, and unsatisfactory outcomes may play an important role in the development of mood symptoms among surgical inpatients with varying significance. A study investigating psychiatric morbidity among patients admitted for abdominal aortic surgery showed that preoperative and surgical factors were more

### Table 2: HADS subscales according to admission week, n (%).

<table>
<thead>
<tr>
<th>Score</th>
<th>HADS1-D(^1)</th>
<th>HADS2-D(^2)</th>
<th>HADS1-A(^3)</th>
<th>HADS2-A(^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>304 (77.6)</td>
<td>6 (21.4)</td>
<td>250 (63.8)</td>
<td>13 (46.4)</td>
</tr>
<tr>
<td>Doubtful</td>
<td>49 (12.5)</td>
<td>13 (46.4)</td>
<td>79 (20.2)</td>
<td>13 (46.4)</td>
</tr>
<tr>
<td>Definite</td>
<td>39 (10.0)</td>
<td>9 (32.1)</td>
<td>63 (16.1)</td>
<td>2 (7.1)</td>
</tr>
</tbody>
</table>

\(^1\)HADS: depression subscale at the time of admission; \(^2\)HADS: depression subscale in the second week; \(^3\)HADS: anxiety subscale at the time of admission; \(^4\)HADS: anxiety subscale in the second week.
predictive of psychiatric symptoms. This study, in accordance with our findings, pointed out that a high prevalence of depression and anxiety symptoms in surgical patients (58.8%) does not reflect reactivation of previous mood disorders (2.3%) but contributes to surgery-related psychiatric symptoms.

Our study showed that depression increases in surgical patients with longer hospital stay with doubtful depression scores four times more prevalent in the second week (46.4%) than at the time of admission (12.5%). Definite depression scores increased three-fold. Definite anxiety scores decreased by 50% over hospital stay while doubtful anxiety scores nearly doubled. Additionally, the prevalence of mood disorders recorded at the time of admission was 32.7% for doubtful scores compared to 26.1% for definite scores. This was much higher when compared to the prevalence of psychiatric disorders in a similar study (58.8% vs. 32%).

In a large administrative study by Daratha et al.2 in a hospital setting, only 2.3% of adult patients who had been hospitalized for any medical conditions were diagnosed with co-occurring mood disorders. In contrast, a study by Rentsch et al.23 looking at hospitalized patients in an internal medicine department identified 26.9% of patients with depressive disorders and 11.3% with major depression based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria and 34.9% with depressive disorder and 18.4% with major depression according to Patient Health Questionnaire (PHQ-9) criteria.

As this study highlights and with extensive variations observed between existing studies, the diagnostic instrument used plays a major role in the reported prevalence of mood disorders among populations. However, virtually all the studies have emphasized that mood disorders in non-psychiatric patients should be attended with more seriousness.

Depression at the time of admission was significantly associated with longer hospital stay, a previous history of mood disorders, the need for surgery or reoperation, underlying diseases, surgical complication, and lack of familial support. Indeed, these predictors are either a stressor to newly admitted patients or a supporting factor that if present would help the patients to adopt their conditions. Admission-time anxiety symptoms were significantly associated with female gender, lower educational level, and previous history of

<table>
<thead>
<tr>
<th>Feature</th>
<th>HADS1-D 1</th>
<th>HADS2-D 2</th>
<th>HADS1-A 3</th>
<th>HADS2-A 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2.1 (1.0–4.2) *</td>
<td>N/A</td>
<td>2.5 (1.4–4.4) *</td>
<td>1.7 (0.0–1.0)</td>
</tr>
<tr>
<td>Academic education</td>
<td>N/A</td>
<td>N/A</td>
<td>0.6 (0.3–1) *</td>
<td>N/A</td>
</tr>
<tr>
<td>Urban living</td>
<td>1.1 (0.6–2.2)</td>
<td>N/A</td>
<td>1.4 (0.8–2.7)</td>
<td>N/A</td>
</tr>
<tr>
<td>History of mood disorder</td>
<td>5.4 (0.9–33.5)</td>
<td>N/A</td>
<td>10.7 (2.0–56.5) *</td>
<td>N/A</td>
</tr>
<tr>
<td>Serious diseases</td>
<td>1 (1.0–1.1)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Morbidity</td>
<td>0.0 (-)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Familial support</td>
<td>0.4 (0.1–1.3)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Complication</td>
<td>1.0 (0.4–2.8)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Reoperation</td>
<td>0.0 (-)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Underlying diseases</td>
<td>N/A</td>
<td>0.6 (0.2–2.0)</td>
<td>0.9 (0.6–1.3)</td>
<td>N/A</td>
</tr>
<tr>
<td>Employed</td>
<td>N/A</td>
<td>1.3 (0.8–1.9)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Alcohol</td>
<td>N/A</td>
<td>0.0 (-)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Admission length</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>1.1 (1.0–1.2) *</td>
</tr>
<tr>
<td>Need to surgery</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0.6 (0.0–1.0)</td>
</tr>
<tr>
<td>Reoperation</td>
<td>N/A</td>
<td>0.0 (-)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Data displayed as OR (95% CI). *p < 0.050. 1HADS: depression subscale at the time of admission; 2HADS: depression subscale in the second week; 3HADS: anxiety subscale at the time of admission; 4HADS: anxiety subscale in the second week. N/A: Not Applicable (p > 0.200 in univariate analysis).
mood disorders in univariate analysis. Anxiety in the second week was also related to the need for a surgical procedure for the admission-related condition. Later depression also correlated with lack of familial support and being under the poverty line. Liberzon et al., identified risk factors for post-traumatic stress disorders or depressive symptoms in patients with an aortic aneurysm or occlusive diseases as younger age, having increased preoperative blood pressure and being intubated at the end of the surgery. However, in contrast to our finding that a longer hospital stay was associated with depression, their study did not confirm a longer hospital stay to be a risk factor.1

The regression model revealed that female gender is a risk factor for HADS1-D and HADS1-A. In contrast, a higher education level was protective for anxiety in the admission time while a history of mood disorders was a risk factor. Longer hospital stay also predicted more anxiety in the second week. Liberzon et al., also performed regression analysis showing that demographics, pre-surgical and surgical variables can predict postoperative psychiatric morbidity. However, postoperative complications, length of hospital stay, or longer intensive care unit admission did not relate to such symptoms.

Another study using HADS investigated factors associated with suicidal thoughts among hospitalized patients. The study revealed that admission to the infectious disease department and oncology and hematology units present a higher probability of suicidal ideation (7.9%, 7.8%, and 7.2%, respectively).26 Their results also revealed that suicidal ideation was associated with depression (OR 8.3), younger age (18–35 years old; OR 2.5), alcohol abuse (OR 2.3), and smoking (OR 1.8). A similar study conducted in a general hospital concluded that female gender, retired or in a disabled job-condition, low income and bad family relationships, and presence of chronic somatic illness were risk factors for depression among hospitalized patients. Depression had a high comorbidity with organic mental and anxiety disorders.27

A systematic review has recently questioned the ability of HADS to differentiate between the constructs of anxiety and depression and suggested that it should be used to measure the general aspects of distress.28 Moreover, it has been stated that HADS could not be used for diagnostic purposes. However, our study did not primarily aim to compare mood entities but to determine predictors of depression and anxiety in patients hospitalized for surgery. Future randomized clinical trials should focus on treating patients with depression and mood disorders in hospital settings to explore the cost-effectiveness of such therapeutic approach as well as preventing coincidence of psychiatric and somatic disorders.

CONCLUSION
Depression and anxiety symptoms are of major concern to admitted surgical patients especially in females and those with a history of mood disorders or lower educational level. Patients with longer hospital stay are also at increased risk notably with underlying diseases, postoperative complications, lack of familial support, and need for reoperation.

Disclosure
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REFERENCES


