

# Anxiety and Depression According to the Hospital Anxiety Depression Scale in Patients with Acne Vulgaris at the Ho Chi Minh City Hospital of Dermato-Venereology, Vietnam

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## ABSTRACT

**Background:** Acne is a chronic disease that commonly affects the face and has significant psychological effects on individuals. Because of its negative effect on physical appearance, the disease may result in several mental disorders, particularly anxiety and depression. Our aim was to determine the prevalence of anxiety and depression among patients with acne and to assess the factors associated with these two conditions in patients at the Ho Chi Minh city (HCMC) Hospital of Dermato-Venereology, Vietnam.

**Methods:** In this cross-sectional study, 384 patients with acne and 100 age- and sex-matched healthy volunteers without acne were enrolled from October 2018 to July 2019. The anxiety and depression levels were evaluated with the Hospital Anxiety and Depression Scale (HADS) questionnaire, and acne severity was graded with the Global Acne Grading System (GAGS). Data were analyzed with STATA version 14.2 software.

**Results:** The prevalence of anxiety and depression were 57.55% and 23.7%, respectively, for the patient group, versus 27% and 14%, respectively, for the control group, and the differences between the two groups were statistically significant ( $P < 0.05$ ). The age of onset and the severity of acne

were related to anxiety, while occupation was associated with depression ( $P < 0.05$ ). Anxiety and depression also showed a significant association among individuals ( $P < 0.05$ ).

**Conclusion:** Levels of anxiety and depression were higher in patients with acne than in healthy controls. Increased psychosocial morbidities were also associated with acne severity, the age of onset, and the patient's occupation. Therefore, anxiety and depression should be taken into consideration in acne treatment and management protocols.

**Keywords:** Acne vulgaris, anxiety, depression, Vietnam.

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## INTRODUCTION

Acne vulgaris, a chronic inflammatory condition of the pilosebaceous units, frequently deteriorates the face and upper part of the trunk during adolescence. In most cases, this condition can develop due to the presence of pleomorphic lesions, including comedones, papules, pustules, and nodules, with disfigurement depending on the severity of the lesion. Current estimates indicate that 85% of people aged 12 to 25 years old suffer from acne.<sup>1</sup> A large number of acne cases often occur in the middle stage of puberty and in the teen years, with the condition then decreasing steadily with age. However, acne can persist until the age of 30 and even later in women, with 14% of females aged from 26-44 years continuing to have acne. The finding that 19.9% of high school students suffering from moderate to severe acne also had a family history of this condition, compared to 9.8% of students without a family history of acne, also suggests a familial association. Therefore, acne could be related to genetic factors, as the proclivity for acne is nearly 80% in patients whose parents had acne.<sup>1</sup>

Four types of pathogenesis are recognized for acne vulgaris: an increase in sebum production, follicular hyperkeratinization, the presence of *Propionibacterium acnes* (*Cutibacterium acnes*), and inflammation.<sup>2</sup> In addition to these pathogenic factors, psychiatric disorders have also been considered as factors that can trigger and worsen the condition, because they can be also associated with thyroid autoimmunity,<sup>3</sup> androgen excess,<sup>4</sup> or the consumption of cor-ticosteroids.<sup>5</sup>

Acne can be treated effectively with different therapies; however, it usually lasts chronically for years and often recurs. The sequelae of the condition can also last a lifetime due to the formation of keloids and pitted scars, which lower the patient's physical attractiveness. As a result, acne may bring about

numerous devastating effects on the quality of life, self-esteem, social relationships, and working performance among patients with acne. These patients can suffer from psychosocial problems on a regular basis, including feeling ashamed and lacking in self-confidence.<sup>6</sup> If these difficulties cannot be resolved, they will contribute to anxiety, depression and, more seriously, even thoughts of suicide in these patients.

The medical literature contains various studies conducted to determine the level of anxiety and depression in patients with acne. Many studies have shown that the prevalence of depression is two to three times higher in patients with acne than in the general population, with 8.8% of patients with acne having clinical depression. A previous study indicated the percentage of female patients with acne who had depression at approximately 65.2%, which was double the corresponding figure for males.<sup>7</sup> In Albania, Brizida et al. used the Depression Anxiety Stress Scale (DASS) to assess the presence of three emotional states-depression, anxiety, and stress-in patients with acne and found symptoms or signs of depression, anxiety, and stress in 105 (27%), 227 (60%), and 238 (62%) cases, respectively.<sup>8</sup> Furthermore, their study highlighted that anxiety and depression were not associated with socio-demographic characteristics (age, gender, marital status, education, and occupation). These results were also similar to those of Goldchai et al.<sup>9</sup> However, a number of other studies have reported a relationship between age, gender, marital status, and anxiety and depression in patients with acne. Female patients tend to be more prone to anxiety and depression compared to male patients.<sup>6,10</sup> Patients under 20 years old are more likely to feel anxious and depressed than are those over 20 years old. Additionally, higher proportions of anxiety and depression were seen in single patients compared to married patients.

Studies about anxiety and depression in patients with acne are lacking in Vietnam. The aim of this study was therefore to investigate the prevalence of anxiety and depression in patients with acne and to determine the relationship between these symptoms and socio-demographic characteristics of patients at the Ho Chi Minh city (HCMC) Hospital of Dermato-Venereology, Vietnam. The overall goal is to build an orientation platform that will facilitate collaboration between dermatologists and psychiatrists in the treatment of patients with acne.

## METHODS

### Study population

A cross-sectional study was carried at HCMC Hospital of Dermato-Venereology, Vietnam, from October 2018 to July 2019. A total of 384 patients with acne and 100 gender- and age-matched people without acne were recruited into the study. In the acne group, patients were included in the study if they were 15 years old or older or were clinically diagnosed with the presence of white head comedones, black head comedones, papules, pustules, cysts, and scars. The healthy participants did not differ from the acne group in terms of age or gender. We excluded people based on the following criteria: i) patients or healthy individuals with a history of any psychiatric illness, ii) those with other skin and somatic system disorders that negatively affect their mental status; iii) pregnant or breastfeeding women; iv) patients taking systemic drugs, such as oral corticosteroids, acitretin, isoniazid, and cyclosporine, during the one month period prior to their interview.

### Data collection

A structured questionnaire consisting of questions about socio-demographic characteristics, the severity of acne, and the prevalence of anxiety and depression was designed to collect data from patients with acne. Information related to socio-demographic aspects comprised age, age groups, gender, education, occupation, marital status, the age of acne onset, disease duration, and isotretinoin therapy. The severity of acne was graded using the Global Acne Grading System (GAGS). This system divides the face, chest, and upper back into 6 areas: the forehead, right cheek, left cheek, nose, chin, and torso (chest and upper back combined). Each acne lesion is described and scored as a comedo (1 point), papule (2 points), pustule (3 points), or nodule (4 points); the absence of an acne lesion in an area results in a score of 0 points. The local score for each anatomic area is determined by multiplying the score of the most severe lesion by an area factor (1 to 3), and the local scores of the 6 areas are then added together to obtain the total score. The severity of acne is graded based on the total score as none (0 points), mild (1–18 points), moderate (19–30 points), severe (31–38 points), and very severe (>38 points).<sup>11</sup> The Hospital Anxiety Depression Scale (HADS) is a self-reported measure that helps to evaluate the level of anxiety and depression in patients. The questionnaire consists of 14 items divided into two separate subscales, with 7 depression-related items (HADS-D) and 7 anxiety-related items (HADS-A). All the questions are scored based on a 4-point Likert scale from 0 (low/negative perception) to 3 (high/positive perception). The total scores of each subscale range from 0 to 21, with higher scores reflecting worse anxiety and depression levels. The subscale scores were also categorized as normal (0–7),

borderline (8–10), and greatly abnormal/disordered (11–21).<sup>12</sup> The HADS was translated into Vietnamese, and the validity of this version was confirmed previously by Do et al.<sup>13</sup> Data from the previous study highlighted that both subscales had good internal consistency, with Cronbach's alpha = 0.80 for the depression subscale and 0.85 for the anxiety subscale.<sup>13</sup>

Participants were provided with a sufficient explanation of the purpose and design of our research. They were then asked to sign a written consent form before enrollment in face-to-face interviews.

### Statistics

Data were collected in coded form from the questionnaires, entered into Microsoft Excel, cleaned, and exported to the STATA version 14.2 software for the analysis. Categorical variables were described as frequency and percentage. Continuous variables with a normal distribution were presented as mean and standard deviation (SD); if the distribution was not normal, then medians and quartiles were used for presentation. The Chi-squared test was applied to compare categorical variables unless frequencies were less than 5%, in which case the Fisher's exact test was employed. A P-value less than 0.05 was considered statistically significant, and factors relevant to statistical significance were entered into a multivariate logistic regression model to build a predictive model for anxiety and depression. The odds ratios were reported with 95% confidence intervals.

### Ethical considerations

This study was approved by the Biomedical Research Ethics Committee of Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam. Our research was conducted on a voluntary basis. Patients were informed that they could withdraw from the research at any time during the interviews, without any effects on their current treatment at the hospital. During the interview, if we realized that patients were at risk of anxiety and depression (HADS scale score of 8 points or higher) or showed intent to commit suicide, we would inform the dermatologists immediately. All the collected information was kept strictly confidential and only used for research purposes.

## RESULTS

A total of 384 patients with acne were enrolled in this study; 61.2% were females. The mean age of patients with acne was  $21 \pm 4$  years old, with a mean age of onset of  $17 \pm 4$  years old. The majority of the patients were aged 15 to 24 years (83.83%), had an age of onset of 12 to 19 years (75.26%), were living in Ho Chi Minh City (66.67%), and were white-collar workers (85.14%). Regarding education, patients who had completed university or a college degree dominated at 61.72%, whereas illiterate people and postgraduates accounted for only 0.26% and 0.52%, respectively. Of the 384 patients, 95.83% were single and 17.45% were taking isotretinoin. The mean duration of disease was  $3.5 \pm 3$  years and most patients (68.75%) had suffered from acne for over one year, followed by 6–12 months (21.61%) and under 6 months (9.64%). The overall socio-demographic characteristics of both groups are shown in **Table 1**.

**Table 1. Socio-demographic characteristics of Vietnamese patients with acne (n = 384)**

Characteristics	Frequency (n)	Percentage (%)
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<b>Gender</b>		
Male	149	38.80
Female	235	61.20
<b>Age (Mean±SD)</b> 21±04 years old		
<b>Age groups (years old)</b>		
15-24	320	83.33
≥25	64	16.67
<b>The age of onset (Mean±SD)</b> 17±04 years old		
<b>Age groups of onsets (years old)</b>		
12 -19	289	75.26
≥20	95	24.74
<b>Living area</b>		
Ho Chi Minh City	256	66.67
Others	128	33.33
<b>Occupation</b>		
Blue-collar worker	57	14.84
White-collar worker	327	85.14
<b>Education</b>		
Illiterate	01	0.26
Primary school	00	0.00
Secondary school	26	6.77
High school	118	30.73
University/ College	237	61.72
Postgraduate	02	0.52
<b>Marital status</b>		
Single	368	95.83
Married	15	3.91
Separated/ Divorced	1	0.26
<b>Duration of disease (Mean±SD)</b> 3.5±3 years		
< 6 months	37	9.64
6-12 months	83	21.61
>12 months	264	68.75
<b>Taking Isotretinoin</b>		
Yes	67	17.45
No	317	82.55

**Table 2. Acne severity among patients according to the Global Acne Grading System (GAGS)**

The severity of acne	Frequency (n)	Percentage (%)
None	00	00.00
Mild	142	36.98
Moderate	235	61.20
Severe	07	1.82
Very severe	00	00.00

The severity of acne among patients was classified based on the total Global Acne Grading System score (Table 2). The highest proportion of patients with acne were in the moderate group, accounting for 61.2%. The mild group was second in proportion, at 36.98%, and only 1.82% of the patients suffered from severe acne.

Among the 100 healthy people who participated in this study, 60% were female. The mean age of people without acne was 21 ± 03 years old and most of them (78%) were aged 15 to 24 years, whereas 22% were aged 25 or older. No statistically significant differences were noted between patients with acne and the healthy group in terms of gender or age ( $P > 0.05$ ). Therefore, the two groups of patients had similar demographic characteristics (Table 3).

**Table 3. Comparison of socio-demographic characteristics between the acne and control groups**

Characteristics	Patients with acne (n=384)	Healthy people (n=100)	P-value (*)
<b>Gender</b>			
Male	149 (38.80)	40 (40.00)	0.83
Female	235 (61.20)	60 (60.00)	
<b>Age (mean±SD)</b>	21±04	21±03	0.53
<b>Age groups (years old)</b>			
15-24	320 (83.33)	78 (78.00)	0.21
≥25	64 (16.67)	22 (22.00)	

The Hospital Anxiety Depression Scale (HADS) scores indicated that 57.5% and 23.7% of the patients with acne suffered from anxiety and depression, respectively, while the corresponding figures for healthy people were lower, at 27% and 14%, respectively. More than half (50.75%) of the patients taking oral isotretinoin were suffering from anxiety and 13.43% had depression disorder (Figure 1).

The differences in the incidence of anxiety and depression between patients with acne and those without acne were statistically significant ( $P < 0.05$ ) (Table 4).

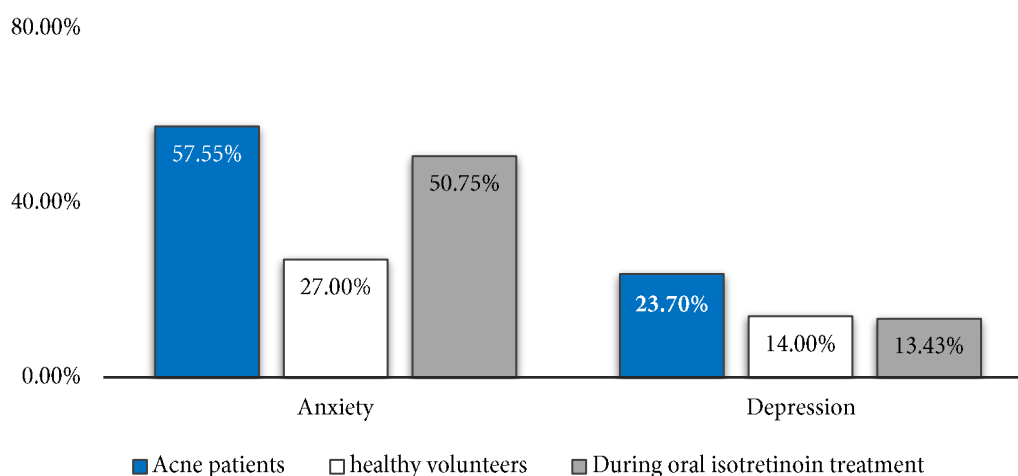
The associations between several socio-demographic factors of the patients and anxiety and depression is illustrated in Table 5. The risk of anxiety in patients with acne was significantly associated with the age of acne onset and with acne severity ( $P < 0.05$ ). Patients whose age of onset was under 20 years old were less likely to have anxiety than were patients whose age of onset was 20 or older ( $P = 0.007$ ). Patients with moderate to severe acne had a 1.17-fold and 1.37-fold increased risk of anxiety, respectively, when compared with patients with mild acne ( $P < 0.039$ ). No significant differences were found for anxiety and patient gender, age, occupation, marital status, or isotretinoin habit ( $P > 0.05$ ).

Depression was significantly associated with occupation, marital status, and isotretinoin habit of patients with acne ( $P < 0.05$ ). Blue-collar workers were more likely to suffer from depression than were white-collar workers ( $P = 0.001$ ). Married patients had a 2.08-fold increase in the risk of depression when compared to patients who were single ( $P = 0.008$ ). The proportion of patients treated with isotretinoin who had depression was 52% and was significantly different from the proportion of patients with depression who did not take that medicine ( $P = 0.03$ ). A significant association was detected between anxiety and depression in the study sample ( $P < 0.001$ ). No significant differences were noted for the risk of depression and gender, age, age of acne onset, or acne severity ( $P > 0.05$ ).

After the adjustment with multivariate logistic regression (Table 6), the patients whose age of acne onset was under 20 years old had 0.48-fold increased odds for anxiety when compared with patients with onset at 20 years old or older ( $P = 0.009$ ). Patients with moderate and severe acne had a higher level of anxiety, with 1.67-fold increased odds compared to those with mild acne ( $P = 0.023$ ). A significant association was observed between depressive individuals and anxiety, with 13.6-fold increased odds of co-occurrence both conditions ( $P < 0.001$ ). Likewise, patients suffering from anxiety had a 13.95-

fold increase in their odds of having depressive symptoms ( $P < 0.001$ ). In addition, patients who were blue-collar workers had a 2.61-fold increase in their odds of being depressed when compared with white-collar workers. The multivariate logistic

regression showed that marital status and isotretinoin therapy were not associated with symptoms of depression in the patients with acne ( $P > 0.05$ ).



**Figure 1.** The incidence of anxiety and depression in patients with acne, patients without acne, and patients undergoing isotretinoin treatment

**Table 4.** Comparison of anxiety and depression rates between the acne and control groups

	Patients with acne (n=384) (%)	Healthy people (n=100) (%)	P-value
Anxiety	57.55 (221/384)	27 (27/100)	<0.001
Depression	23.7 (91/384)	14 (14/100)	0.036

**Table 5.** Socio-demographic characteristics associated with anxiety and depression of in patients with acne

Variables	Anxiety					Depression				
	Yes (%)	No (%)	P-value (*)	PR	95% CI	Yes (%)	No (%)	P-value (*)	PR	95% CI
<b>Gender</b>										
Male	78 (52.35)	71 (47.65)	0.10	0.86	0.72-1.03	32 (21.48)	117 (78.52)	0.42	0.86	0.59-1.25
Female	143 (60.85)	92 (39.15)				59 (25.11)	176 (74.89)			
<b>Age groups (years old)</b>										
15-24	180(56.25)	140 (43.75)	0.25	0.88	0.71-1.08	70 (21.88)	250 (78.13)	0.06	0.67	0.44-1.00
≥ 25	41 (64.06)	23 (35.94)				21 (32.81)	43 (67.19)			
<b>Age groups of onset (years old)</b>										
12-19	155 (53.63)	134 (46.37)	0.007	0.77	0.65-0.92	63 (21.80)	226 (78.20)	0.127	0.74	0.51-1.08
≥ 20	66 (69.47)	29 (30.53)				28 (29.47)	67 (70.53)			
<b>Occupation</b>										
Blue-collar workers	36 (63.16)	21 (36.84)	0.35	1.12	0.89-1.39	23 (40.35)	34 (59.65)	0.001	1.94	1.33-2.84
White-collar workers	185 (56.57)	142 (43.43)				68 (20.80)	259 (79.20)			
<b>Marital status</b>										
Single	210 (57.07)	158 (42.93)	0.41	1.17	0.81-1.69	84 (22.83)	284 (77.17)	0.008	2.08 <sup>0</sup> =1	2.08 <sup>1</sup> =2.08
Married	10 (66.67)	05 (33.33)				06 (40.00)	09 (60.00)			
Separated/ Divorced	01(100.00)	00 (00.00)				01 (100.00)	00 (00.00)			
<b>Education</b>										
Illiterate	01(100.00)	00 (00.00)	1	1	1	01 (100.00)	00 (00.00)	1	1	1
Primary school	00 (00.00)	00 (00.00)				00 (00.00)	00 (00.00)			

Variables	Anxiety					Depression				
	Yes (%)	No (%)	P-value (*)	PR	95% CI	Yes (%)	No (%)	P-value (*)	PR	95% CI
Secondary school	14 (53.85)	12 (46.15)	0.92	1.08	0.26-4.50	06 (23.08)	20 (76.92)	0.77	1.12	0.53-2.35
High school	74 (62.71)	44 (37.29)	0.70	1.25	0.31-5.05	35 (29.66)	83 (70.34)	0.058	1.43	0.99-2.08
University/ College	131(55.27)	106 (44.73)	0.89	1.10	0.27-4.44	49 (20.68)	188 (79.32)			1
Post graduation	01 (50.00)	01 (50.00)			1	00 (00.00)	02 (100.00)			1
<b>Duration of disease (months)</b>										
< 6	24 (64.86)	13 (35.14)		1		07 (18.92)	30 (81.08)			1
6-12	51 (61.45)	32 (38.55)	0.72	0.95	0.71-1.27	25 (30.12)	58 (69.88)	0.22	1.59	0.76-3.35
>12	146(55.30)	118 (44.70)	0.23	0.85	0.66-1.11	59 (22.35)	205 (77.65)	0.64	1.18	0.58-2.39
<b>Taking Isotretinoin</b>										
Yes	34 (50.75)	33 (49.25)	0.21	0.86	0.67-1.12	09 (13.43)	58 (86.57)	<b>0.03</b>	0.52	0.27-0.98
No	187(58.99)	130 (41.01)				82 (25.87)	235 (74.13)			
<b>The severity of acne</b>										
Mild	70 (49.30)	72 (50.70)			1.17 <sup>0</sup> =1	29 (20.42)	113 (79.58)			
Moderate	148(62.98)	87 (37.02)	<b>0.039</b>		1.17 <sup>1</sup> =1.17	61 (25.96)	174 (74.04)	0.23	1.27	0.86-1.88
Severe	03 (42.86)	04 (57.14)			1.17 <sup>2</sup> =1.37	01 (14.29)	06 (85.71)	0.70	0.70	0.11-4.42
Very severe	00 (00.00)	00 (00.00)				00 (00.00)	00 (00.00)			
<b>Depression</b>										
Yes	84 (92.31)	07 (7.69)	<b>&lt;0.001</b>	1.97	1.72-1.26	-	-	-	-	-
No	137 (46.76)	156 (53.24)				-	-	-	-	-

\*: The Chi-squared test; PR: Prevalence Ratio; 95% CI: 95% Confidence Intervals

**Table 6. Factors associated with anxiety and depression in multivariate logistic regression model**

Factors	Anxiety			Factors	Depression		
	OR	P-value (*)	95% CI		OR	P-value (*)	95% CI
Age group of onset	0.48	<b>0.009</b>	0.28-0.83	Anxiety	13.95	<b>&lt; 0.001</b>	6.16–31.58
The severity of acne	1.67	<b>0.023</b>	1.07–2.58	Occupation	2.61	<b>0.006</b>	1.31–5.2
Depression	13.60	<b>&lt; 0.001</b>	5.98–30.24	Marital status	1.83	0.26	0.64–5.22
				Taking Isotretinoin	0.46	0.062	0.21–1.04

## DISCUSSION

### Socio-demographic characteristics

Our study showed that female patients accounted for a greater percentage (61.2%) of our patients, or 1.6 times more than male patients. This result was opposite to that reported by Adityan et al.<sup>14</sup> in India or Yahya et al.<sup>15</sup> in Nigeria, whose samples were dominated by male patients. However, Gupta et al. reported an equivalent prevalence of acne in both men and women.<sup>16</sup> These contradictory results may reflect differences in ethnicity, geographic areas, and climate zones. The average age of patients with acne in our study was 21±4 years old, ranging from 15 to 38 years old, and the majority of patients (83.33%) were aged 15–24 years. Likewise, the greatest proportion of patients belonged to the 15–24 age group, in agreement with the findings of Adityan et al.<sup>17</sup> The average age of onset for patients with acne was 17±4 years old, which was older than the age of onset reported by Adityan et al. in India, where the patients had an average age of onset of 15.97 years.<sup>17</sup> This can be explained by ethnicity and environmental factors, as acne tends to manifest early in people who live in countries with long periods of sunlight.<sup>18</sup> The average duration of the

disease in our study was 3.5±0.3 years, and 68.75% of patients had acne for more than 12 months. Our findings were quite similar to those of Samanthula,<sup>19</sup> who recruited 483 patients with acne and found that 60.4% of them had suffered from the disease for over one year. This is completely consistent with the nature of acne, which is considered a chronic disease.

Acne has negative impacts on the quality of life as well as on the professional efficiency of the patients. Prolonged acne potentially makes patients feel anxious and afraid to engage in face-to-face communication. With regard to marital status, the vast majority of patients were single (95.83%), in agreement with the findings by Samanthula,<sup>19</sup> who reported that 68.3% of the patients were not married. In fact, most patients with acne were still young and they had only just started to build social relationships and further their careers; therefore, they would most likely visit the hospital for acne treatment because they might have more interest in their appearance and physical attractiveness. According to HADS, the greatest percentage of patients (98.18%) in this study had moderate and mild acne. Aktan et al.<sup>6</sup> and Al-Huzali et al.<sup>20</sup> similarly reported that the largest proportions of patients with

acne were in the moderate and mild groups (at 97.9% and 85.5%, respectively). However, the number of patients who suffered from severe and very severe acne in our study was much lower than that reported by Al-Huzali et al.<sup>20</sup> This may possibly indicate that patients in Saudi Arabia might not pay attention to treatment or they cannot afford the cost of treatment for financial reasons. For that reason, Saudi patients may only have visited physicians when their acne conditions were already severe.

#### **Anxiety and depression based on HADS**

An increasing number of studies now indicate that anxiety and depression are common in patients with acne. In the present study, the prevalence of anxiety and depression in the acne group was 57.55% and 23.7%, respectively. Golchai et al. used HADS to determine the level of anxiety and depression and found higher figures for anxiety and depression, at 68.3% and 25.6%, respectively.<sup>9</sup> The proportion of psychiatric disorders among patients with acne clearly varied by country, ranging from 6 to 76.7% for anxiety and from 6% to 51.5% for depression.<sup>21,22</sup> The different versions of the HADS, as well as the socioeconomic characteristics of each country, could contribute to the disparity seen in the results from different studies.

The results of the present study supported the observation that 50.75% of patients had anxiety and 13.43% had depression during oral isotretinoin treatment. This observation was consistent with two distinct studies by Kellett et al. and Chia et al.,<sup>23,24</sup> but the percentages were lower than those reported by Kaymak et al., who reported depression in 33.3% of isotretinoin-treated patients with acne.<sup>25</sup> The prevalence of depression symptoms among isotretinoin-treated patients in some previous studies was documented as between 1% and 11%.<sup>26</sup> The reasons for these different results might be the numerous separate tools used to assess anxiety and depression, the differences in the study populations, and the duration and dosage of isotretinoin therapy for acne treatment.

The findings reported here also confirmed a greater incidence of anxiety and depression in the acne group than in the control group ( $P < 0.05$ ).<sup>21</sup> In accordance with our findings, Behnam et al.,<sup>21</sup> in a study of 103 patients with acne and 106 people without disease in India, reported percentages of 76.7% and 51.5% for anxiety and depression, respectively, in patients with acne, whereas the corresponding figures in the control group were almost half those values, at 34.9% and 29.2%, respectively. These researchers concluded that acne had devastating effects on the patients' psychological status, as anxiety and depression were more likely to strike patients with acne than those without this disease. Anxiety and depression were deemed psychological health issues that need to be addressed by proper and punctual treatment and with appropriate advice to improve this condition.

#### **Factors associated with anxiety and depression in patients with acne**

We found no statistically significant difference in anxiety and depression for gender or age. Similarly, other studies carried out by Ozturk et al.<sup>27</sup> and Duman et al.<sup>28</sup> shared the same view that no significant difference existed in terms of gender and age. By contrast, Al-Huzali et al.<sup>20</sup> and AlShahwan<sup>29</sup> reported that the total score for anxiety and depression was higher for males than for females. The findings of the present study also demonstrated that socio-demographic factors, such as

occupation and marital status, were associated with depressive symptoms among patients with acne. Blue-collar workers had a 1.94-fold higher risk of depression than white-collar workers. Married patients were twice as depressed as single patients. AlShahwan conducted one of the few studies focused on this topic and also noted a relationship between depression and social factors, including occupation ( $P < 0.05$ ) and marital status ( $P = 0.014$ ), in patients with acne.<sup>29</sup> By contrast, when we applied multivariate logistic regression for factors such as anxiety, marital status, occupation, and isotretinoin therapy, occupation was the only independent factor that led to a depressive condition in patients with acne ( $P = 0.006$ ).

Our data also indicated that patients with an age of acne onset of less than 20 years old were less likely to suffer from anxiety than were those who were aged 20 or older. Individuals having a later age of onset could possibly become more psychologically vulnerable and more pessimistic. These findings differed from results of Duman et al.,<sup>28</sup> who found no association between anxiety, depression, and the age of onset of patients with acne in Turkey. Discrepancies in ethnicity, study samples, and the lifestyle of the participants could have caused the difference between our study and the Turkish study. We were also unable to detect any statistically significant differences in psychological disorders according to the duration of acne, in agreement with earlier findings by Ozturk et al.<sup>27</sup> and AlShahwan.<sup>29</sup>

Atallahb et al.<sup>30</sup> and Li et al.<sup>31</sup> found that successful oral isotretinoin therapy in patients with acne made individuals feel more optimistic and minimized depressive symptoms. These findings agreed with our results that patients who took isotretinoin had only a 0.52-fold increased risk of depression over those who did not. However, after adjusting for other factors, such as anxiety, occupation, and marital status, in the multivariate analysis model, no statistically significant association was detected between isotretinoin therapy and depression in patients with acne ( $P > 0.05$ ).

Our findings indicated that the severity of acne was associated with anxiety ( $P < 0.05$ ) but not with depression ( $P > 0.05$ ). The proportion of patients with moderate and severe acne having anxiety were 1.17 times and 1.37 times higher, respectively, than the proportion with mild acne. This result was in accordance with the findings of Jain et al.,<sup>22</sup> who demonstrated a significant association between acne severity and anxiety in 50 patients with acne. In another study, Wen et al. emphasized that the levels of anxiety and depression were positively associated with the severity of acne.<sup>32</sup> In addition, a close bidirectional relationship was found to exist between anxiety, depression, and acne.

Anxiety and depression are complicated psychiatric disorders that are frequently seen in the general population, but they are particularly common in patients with chronic diseases, where more than 50% of patients have symptoms of both anxiety and depression.<sup>33</sup> Actually, these two conditions often seem to occur concomitantly. In our study, patients who were depressed had a 1.97-fold increased risk of anxiety, while those who suffered from anxiety were highly likely to also have depression. Studies on the relationship between anxiety and depression among patients with acne are presently lacking. Our results may provide initial knowledge for the development of further research.

## Limitations

Our study had several potential limitations that should be considered. One was that the study design was cross-sectional, which might limit the demonstration of causal relationships. A second limitation is that we used HADS to determine the incidence of anxiety and depression among patients with acne. Like other psychological questionnaires, the results obtained from the scale did not provide any solid pieces of evidence for a clinical diagnosis, but only aided in the identification of individuals who were at risk for anxiety and depression. Moreover, because problems related to mental health are considered sensitive issues, respondents may feel confused or may deliberately give incorrect answers. Another issue was that the participants often could not remember all their daily activities in order to complete the questionnaire.

## CONCLUSION

The prevalence of anxiety and depression is relatively high among patients with acne when compared with the general population. Therefore, dermatologists should pay attention to the risk of anxiety and depression when treating and managing patients with acne. Also needed is collaboration between dermatologists and psychiatrists in clinical examinations, combined with the use of appropriately diagnosed scales, to prevent the onset of psychiatric comorbidities like anxiety and depression and to improve the mental health of patients with acne.

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## CONFLICT OF INTEREST

All of the authors have no conflicts of interest to declare.

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