Research Article

Psychological Stress among Acne Vulgaris Patients in PHCs, Riyadh, Saudi Arabia

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Abstract

Acne vulgaris is one of the most prevalent chronic skin disease, a mainly adolescent and young adults. Acne vulgaris is a multi-factorial disease, apart from basic factor of hormonal changes and bacterial outbreaks, there are several other factors that may impact acne prevalence including emotional stress, which has long been thought to aggravate acne vulgaris, although previous reports have mainly been anecdotal in nature. In this research we aim to assess the severity of acne vulgaris in relation to stress.

Objectives: To identify the prevalence of stress among acne vulgaris patients in PHC in Riyadh. To identify the demographic characteristics of acne vulgaris patients. To determine the association between psychological stress and acne vulgaris.

Methodology: A cross sectional study. 119 Acne vulgaris patients in Prince Sultan Military Medical City (PSMMC). Aged 12-45 years old, male and female, married and unmarried. With educational level including primary, intermediate, secondary, university, master, and PH.D. and socioeconomic status including low, middle, and high. Patients with other dermatological disorders, chronic medical illness, past history of psychiatric disorders, pregnancy, lactation, mental retardation, and patients who were on other drugs which can aggravate acne was excluded from the study. Participants receiving sedatives, antidepressants, or exogenous glucocorticoids was excluded. Participants was assessed and diagnosed with acne vulgaris by dermatologist. Data was collected by using self-administered questionnaire. Covering sociodemographic characteristics and stress level using perceived stress scale (PSS). Data was interpreted using excel, and was analyzed using SPSS.

Results: Ales representing 72.3% of the total population. The largest group of less than 25 years old who represented 47.1% of the total population. Most of the participants were Saudi Arabian in nationality and the vast majority of the population are not married (74.8%). there was a strong association between stress and the acne grade as the more the stress increases the higher the grade of the acne.

Conclusion: Stress is associated with the severity of acne, as stress worsens and increases acne by numerous mechanisms, therefore, relaxation activities such as meditation, yoga, deep breathing exercises, and physical exercises could be used with the pharmacological treatment to treat the acne. To enhance the level of evidence and set up more robust evidence, we recommend conducting studies on larger cohorts with an equal number of males and females.

Keywords: Stress; Yoga, Deep Breathing

Introduction

Stress is widely recognized as a factor contributing to acne, but few studies have assessed this link. A study was done at King Abdulaziz University, the objective was to determine whether stress and acne severity are related. They conducted a cross-sectional study involving 144 female medical students in their 6th year who ranged from 22 to 24 years old. As part of this study, acne severity was assessed according to the global acne grading system (GAGS) and how stressed individuals perceive stress using the Perceived Stress Scale (PSS). The questionnaire also included some variables that could confound acne severity. According to the results, 3 students (2.1%) did not have acne, 104 students (72.2%) had mild acne, 33 students (22.9%) had moderate acne, and 4 students (2.8%) had severe acne. There was a statistically significant correlation between greater stress severity and greater acne severity (r = 0.23; p < 0.01). Based on these results, it was concluded that stress and acne severity are positively correlated. Higher stress scores, as determined by the PSS, were associated with more severe acne on examination, and acne severity was graded by the GAGS [1].

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous glands characterized by polymorphic lesions, including blackheads, pustules, papules, and nodules. Stress is one of the triggers for acne vulgaris. An observational study, involving 100 patients with acne vulgaris, was conducted to determine the relationship between stress scale and severity of acne vulgaris. Each patient underwent a dermatological examination to determine their level of acne vulgaris severity using the Acne Grading Indonesian Acne Expert Meeting 2015 and the Holmes-Rahe stress scale to determine their level of psychological stress. Spearman correlation analysis was performed on the collected data. The study found that out of 100 samples, the majority of patients with acne vulgaris were aged 17-25 (71%) and were female (68%). The majority of research subjects were classified with moderate acne vulgaris (45%), followed by mild (43%) and severe (12%). In this study, a low-stress scale (44%) was predominant, followed by a medium stress scale (29%) and a high stress scale (27%). Stress scale and the severity of acne vulgaris with moderate strength have a positive correlation (r = 0.4561; p = 0.001). In conclusion the results of this study indicate that stress scale has an association with acne vulgaris severity [2].

Aim

To determine the association between psychological stress and acne vulgaris.

Objectives

- To identify the prevalence of stress among acne vulgaris patients in PHC in Riyadh.
- To identify the demographic characteristics of acne vulgaris patients.
- To determine the association between psychological stress and acne vulgaris.

Review of Literature

Emotional stress may play a causal role in the development of various skin diseases. However, the role of stressful life events in acne remains inconclusive. In this context, the present study explored its role in acne. From the age group of 12 to 45 years, one hundred consecutive patients suffering from acne vulgaris were included in the study. We used controls that matched age and gender. A semi structured proforma was used to collect sociodemographic details. An assessment of stressful life events was conducted using the presumptive stressful life event scale. The Hamilton Anxiety Rating Scale was used to assess anxiety and the Hamilton Depression Rating Scale to assess depression. Patients and controls had similar levels of stressful life events during the past year. It was found that 66 patients and 50 controls experienced the undesirable life event. This difference was statistically significant. The most stressful life event among patients was getting married or taking a test. In the sample, 40 patients had comorbid psychiatric illness, whereas the control group had 24. This difference was statistically significant. It is more common in acne patients to have stressful life events and psychiatric comorbidity compared to controls [3].

An objective of this study is to determine the frequency of depression, anxiety, and stress among acne vulgaris patients. This cross-sectional study was approved by an ethical review committee while taking place at Sahiwal Medical College, Department of Dermatology, DHQ, GHAQ Teaching Hospital, and department of dermatology, GHAQ Teaching Hospital, Sahiwal.. The study enrolled 100 patients with acne vulgaris who met the inclusion and exclusion criteria. The severity of acne was categorized as

mild, moderate, and severe. The depression anxiety stress scale (DASS) questionnaire (21 questions) has been translated and completed on a proforma. Analyses were carried out using SPSS. The study involved 100 patients, 58 of whom were female and 42 of whom were male. Both genders had a mean age of 21 years. The number of patients with acne vulgaris in their family history was significant (39%). Students (59%) and singles (82%) constituted the majority of respondents. A total of 90% of acne vulgaris patients have mild (47%) or moderate (43%) severity, with the remainder (10%) having a severe form. In different severity levels of acne patients, depressive symptoms were observed in most cases (62%) compared to anxiety (51%) and stress (40%). A moderate level of depression was recorded in 48% of the cases (n = 30) and anxiety in 49% of the cases (n = 25) and mild degree of stress was observed in 50% of the cases (n = 20). In Conclusion, psychological issues have a significant impact on acne vulgaris patients, as demonstrated by the frequency of depression, anxiety, and stress in this study. Highlight the importance of close collaboration between dermatologists and psychiatrists in the treatment of acne vulgaris [4].

Worldwide, there are more than 85% of adolescents with acne vulgaris. In 2016, over a quarter of medical students complained of acne and stress. It is likely that the stress levels will increase due to the burden of academy assessments, as well as other factors that can cause stress, such as psychosocial psychological stress and triggers from other causes. By the PSS questionnaire, stress levels can be classified as mild (≤13), moderate (14-26) and severe (>27). While stress and acne flares are widely accepted, few studies have been conducted to measure this connection. Therefore, this study advocates that the severity and appearances of acne may be influenced by stress. The goal of this study was to correlate stress levels with acne vulgaris stages among students at the Faculty of Medicine at Universitas Airlangga. Researchers used correlative analysis with a cross sectional approach and an overall sampling of all medical school students in 2016 in this study with the exclusion of students who are using corticosteroid, psychotherapy drugs and non acne vulgaris by staging the acne vulgaris using GAGS and stress level using PSS (perceived stress scale) questionnaires that relate to the research. Taking pictures for measuring and correlating the stage of acne vulgaris sufferers with spearmen's correlations will also be undertaken. In total, 60 males participated in the study, which represented 27,6% of the total number of respondents, and 157 females, which represented 72,4%. 69 people were affected by acne, including 46 with mild acne, 17 with moderate acne, and 6 with severe acne. There were three major factors that triggered acne vulgaris stage: the final exam (91.3%), eating habits (87%) and premenstrual acne (71%). The degree of stress has significant correlation with the appearance of the skin and the stage of acne vulgaris, and there is evidence that the other factors in the questionnaire could also increase the acne to become more aggressive [5].

It has long been suspected that emotional stress can exacerbate acne vulgaris, but the evidence has been mostly anecdotal. Researchers used a prospective cohort study, evaluating changes in severity of acne during non-examination and examination periods, and then applying scales previously validated to measure acne severity and perceived stress, in order to elucidate possible relationships between stress and acne exacerbation. The sample included 22 university students (15 women and 7 men) with a minimum acne vulgaris severity of 0.5 on the photonumeric Leeds acne scale (0.50-1.75 as baseline scores). While taking both nonexamination and examination periods, participants were graded on their acne severity using Leeds acne scales, and their subjective stress levels were assessed with Perceived Stress Scale questionnaires. Results showed that during examinations, Subjects had a higher mean grade of acne severity and a higher mean perceived stress score (P < 0.01 for both). Based on regression analysis and controlling for variables such as sleep hours, sleep quality, diet quality, and meals per day, decreased acne severity was significantly associated with increased stress levels (r = 0.61, P < 0.01). The only other significant association involved changes in diet quality (P = .02). Therefore, patients with acne may have their condition worsened during examination. Additionally, changes in acne severity are highly correlated with increasing stress, suggesting that external stress can have an important influence on acne [6].

A large part of acne vulgaris in adolescents is believed to be caused by excessive sebum production. Psychological stress can lead to acne exacerbation; however, it is unknown whether increased sebum production is responsible for the connection. TIn this study, two main objectives were addressed: (i) whether psychological stress is associated with increased sebum production in adolescents; and (ii) whether psychological stress is associated

with increased acne severity independently of, or in combination with, increased sebum production. A prospective cohort study in which 94 secondary school students (mean age 14.9 years) participated was conducted in Singapore. In a study designed to investigate stress levels prior to mid-year examinations and low stress levels during summer vacations, three variables were assessed: (i) self-reported stress level using the Perceived Stress Scale; (ii) sebum level at baseline and at 1 h; and (iii) acne severity. In this study population, 95% of males and 92% of females reported having acne. Majority subjects had mild to moderate acne. There were no significant differences in sebum measurements between high stress and low stress conditions. In the study population as a whole, stress levels and severity of acne papulopustulosa were statistically correlated (r = 0.23, p = 0.029). The quantity of sebum produced by adolescents does not seem to be affected by psychological stress. According to the study, stress is significantly associated with severity of acne papulopustulosa, especially in males. Stress may lead to more severe acne if it's not caused by sebum production [7].

Acne vulgaris is the most common form of skin inflammation. It affects people of all races, ages, and ethnicities. Depression and acne are known to be linked. Aim of the study was to determine if depression influenced adherence to acne vulgaris treatment using The Expectation Confirmation Theory (ECT). In a cross-sectional study, 204 acne sufferers were evaluated on four scales (depression, satisfaction, intention to adhere to acne medication, and control for confirmation of results). Patients' satisfaction and intent to adhere to their medication were assessed using the ECT scales. Statistical analyses were also performed on demographic data and descriptive statistics. There were 204 completed questionnaires in total. There were 167 respondents with majority female (80.50%), and the mean age was 25 ± 7.2. When all other variables are held constant, multiple linear regression analysis showed a negative relationship between depression and satisfaction, and the expected medication effect (confirmation) showed a positive relationship with satisfaction. When all other covariates were kept constant, male sex was negatively associated with satisfaction. When all other factors were held constant, residency in central provinces correlated significantly with satisfaction. In conclusion, adherence is the cornerstone of a successful treatment plan as well as the prevention of relapses and failures, while satisfaction is an essential indicator for developing health policies and providing social services [8].

Most studies of acne and its effects on mental health have focused on western populations. An effort was made to investigate the relationship between acne and stress by combining two surveys from central China: the Adolescent Self-Rating Life Events Check (ASLEC) and the Hospital Anxiety and Depression Scale (HADS). Using three questionnaires posted on the Chinese professional survey website, the Questionnaire Web, we conducted an online survey of 2,284 high school and college students in central China. Pillsbury grading was used to assess acne prevalence and severity, whereas the ASLEC scale was used to measure the role of stress in acne formation. In order to assess psychological well-being, the HADS was used. The study found that 50.61 % of high school and college students in central China suffer from acne for more than 6 months, and 19.72 % of them have severe acne. There is an association between negative life events and the condition's occurrence and exacerbation. Patients with acne had significantly higher anxiety and depression scores on the HADS-A and HADS-D survey than controls (7.31 vs. 4.37 vs. 3.85, respectively; p < 0.01). Although acne appears to be neglected among Chinese high school and college students, stress and acne had a bidirectional relationship. Students must be educated about acne at school and prevented from developing psychological disorders as a consequence of the acne [9].

Patients with acne experience frustration, embarrassment, anger, stress, anxiety, and depression due to visible facial disfigurement. Study remains under way on the role of demographic characteristics such as age, gender, educational level, occupation, or marital status in causing these symptoms in Albanians. In this study, their goal was to determine the frequency of symptoms of depression, anxiety, and stress among acne patients in relation to their demographic characteristics to help identify higher-risk patients with these symptoms. A total of 382 patients with varying ages and genders were studied from January 2012 to December 2013. Acne vulgaris patients were assessed for depression, anxiety, and stress using the Depression Anxiety Stress Scale (DASS). The results indicated that 382 of the 382 (F:M 229:153) patients were between ages of 18 and 25 (297 patients) and 26 to 40 (85 patients). We observed symptoms/signs of depression, anxiety, and stress in 105 (27%) cases, 227 (60%) cases, and 238 (62%). According to a statistical analysis, these symptoms are not affected by their gender, age, education, occupation, or marital status (p > 0.05). The occurrence of depression, anxiety, and stress in Albanian

acne patients cannot be influenced by demographic characteristics such as age, gender, education, occupation, or marital status. Accordingly, each patient should be evaluated and treated for these symptoms individually regardless of their age, gender, education, marital status, or occupation [10].

A study was done in Turkey, to determine social anxiety levels in patients with acne vulgaris and to investigate sociodemographic and clinical characteristics, depression symptoms, and their effects on the quality of life of the patients. It included 70 acne patients and 50 healthy controls. The used Structured Clinical Interview for DSM-IV Axis I Disorders, Hospital Anxiety and Depression Scale, Liebowitz Social Anxiety Scale, Quality of Life Scale Short Form, and Acne Quality of Life Questionnaire. Results showed that Anxiety and depression scores in acne patients were statistically higher when compared with the control group, while in subgroup comparisons of acne patients, anxiety and depression scores did not differ statistically significantly between mild and severe acne groups. Interestingly, patients with acne manifested more serious psychological discomfort when compared with patients with asthma, diabetes, arthritis, back pain, or coronary artery disease. Some studies emphasized that acne patients had higher anxiety and depression scores even when compared with patients with psoriasis and those referred to oncology and dermatology clinics [11].

Justifications

Acne vulgaris is one of the most prevalent chronic skin disease, a mainly adolescent and young adults. Severe acne can result in scarring, dyspigmentation, and low self-esteem as potential sequelae. Acne may be classified as mild, moderate, or severe. There are a variety of treatment agents and formulations available. The treatment selected depends on the severity of the disease, the patient's preferences, and the treatment's tolerability. Acne vulgaris is a multi-factorial disease, apart from basic factor of hormonal changes and bacterial outbreaks, there are several other factors that may impact acne prevalence including emotional stress, which has long been thought to aggravate acne vulgaris, although previous reports have mainly been anecdotal in nature. In this research we aim to assess the severity of acne vulgaris in relation to stress.

Methods

Study design: Cross sectional study.

Target population

Acne vulgaris patients in primary health care in Prince Sultan Military Medical City (PSMMC).

Inclusion criteria

- Patients diagnosed with acne vulgaris PHC
- Age group 12-45 years.
- Gender: male and female
- Marital: married and unmarried
- Educational: primary, intermediate, secondary, university, master, and PH.D. Socioeconomic status: low, middle, and high
- Exclusion criteria:
- Patients with other dermatological disorders, chronic medical illness, past history of psychiatric disorders, pregnancy, lactation, mental retardation, and patients who were on other drugs which can aggravate acne. Participants receiving sedatives, antidepressants, or exogenous glucocorticoids.

Sampling method

Simple random sample.

Sample size calculation

90 patients.

The sample size was calculated using the following formula:

$$n = \left[\frac{Z_{\alpha/2} + Z_{\beta}}{P_1 - P_2}\right]^2 (p_1 q_1 + p_2 q_2)$$

Data collection form

A brief overview of the study was provided to participants before the study begins.

Participants was assessed and diagnosed with acne vulgaris by dermatologist.

Data was collected by using self-administered questionnaire. It was comprised of two sections. Section one covered sociodemographic characteristics (age, gender, marital status, nationality, educational level, income, employment status). Section two covered stress level using perceived stress scale (PSS).

Questionnaire was translated in Arabic language.

Validation of data collection form

Sociodemographic characteristics questionnaire is widely used in previous researches.

Perceived stress scale (PSS) is considered valid and reliable measure used in many languages based on researches.

Data management plan

The participants was briefed about the study beforehand and willingness to fill the questionnaire was considered with documented informed consent. The participants was also notified that their participation in the study is voluntary and they can withdraw from the study at any time if they do not want to be part of the study.

Participants was provided a perceived stress scale (PSS) for stress level. After receiving the survey from the respondents, PSS scores was calculated. Data was interpreted using excel, and was analyzed using SPSS.

Ethical considerations

After containing IRB approval, we illustrated to participant the analysis purpose and its objectives before filling the forms and the signed the consent.

The confidentiality of participants are maintained through all the study phases.

The anonymity, where the participants will not need to write their names on the questionnaire.

List and types of variables

Name	Type	Description
Age	Continuous	Respondent will be able to determine his actual age, rather than choosing the age group. Mean age will be calculated.
Gender	Nominal	Respondent will determine his gender by choosing from: 1) male. 2) female.
Nationality	Nominal	Respondent will determine his nationality by choosing from: 1) Saudi. 2) non-Saudi.
Educational level	Ordinal	Respondent will determine his educational level by choosing from: 1) primary. 2) intermediate. 3) secondary. 4) university. 5) master. 6) PH.D.
Marital status	Nominal	Respondent will determine his marital status by choosing from: 1) married. 2) unmarried.
Income (SR)	Continuous	Respondent will determine his income by choosing from (in SR): 1) <3000 2) 3000-5000. 3) 5000-7000. 4) 7000-10,000. 5)>10,000.
Employment status	Nominal	Respondent will determine his employment status by choosing from: 1) employed. 2) unemployed.

Table 1

Statistical analysis

Data were analyzed using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean ± standard deviation and categorical variables were expressed as percentages.

Kruskal-Wallis Test was used for continuous variables without normal distribution. Chi square test was used for categorical variables. Pearson Correlation Coefficient was used to assess the Correlations between the mean of the stress severity and acne grade. Shapiro-Wilk test was used to assess normality distribution for the variables. A p-value <0.05 was considered statistically significant.

Results

		Number	**%**
Gender	Male	33	27.7
	Female	86	72.3
Age	<25 years	56	47.1
	25-35 years	46	38.7
	35-45 years	11	9.2
	>45 years	6	5.0
Nationality	Saudi	105	88.2
	Non-Saudi	14	11.8
Marital status	Married	30	25.2
	Not married	89	74.8
Educational level	Intermediate	12	10.1
	Secondary	34	28.6
	University	63	52.9
	Master	9	7.6
	PH.D.	1	.8
Income	<3000	52	43.7
	3000-5000	21	17.6
	5000-7000	14	11.8
	7000-10,000	13	10.9
	>10,000	19	16.0

Acne severity	Mild acne	44	37.0
	Moderate acne	55	46.2
	Severe acne	20	16.8

Table 1: Demographic characteristic for the participants (n = 119).

	Number	**Prevalence (%)**
Low stress	30	25.2
Moderate stress	72	60.5
High stress	17	14.3

Table 2: Prevalence of stress among acne vulgaris patients.

		Stress	**Severity**	
		Mean	**SD**	**P value**
Acne grade	Mild acne	13.64	3.38	<0.001*
	Moderate acne	20.20	5.24	
	Severe acne	25.70	4.68	

Table 3: Relationship between mean of the stress severity and acne grade.
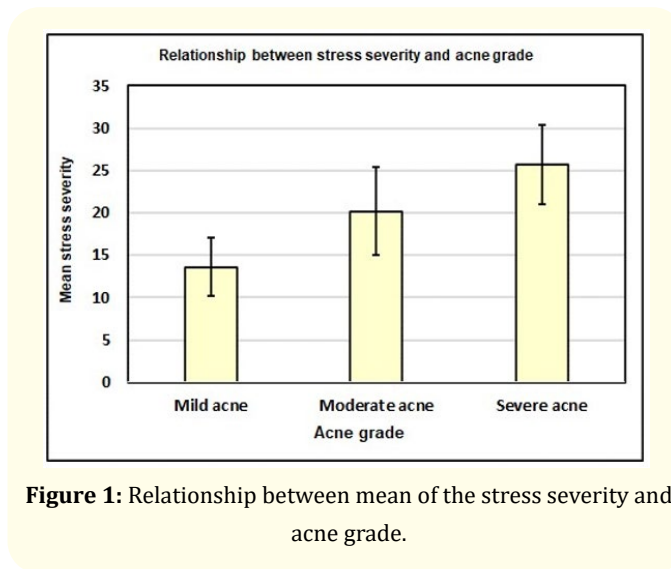
* Significant p value.

Figure 1: Relationship between mean of the stress severity and acne grade.

	PSS score	
	r**	**p value**
Acne severity	.694**	<0.001*

Table 4: Correlations between mean of the stress severity and acne grade.

* Significant p value.

** Pearson Correlation Coefficient.

From table 4 there is high significant directly Correlations between mean of the stress severity and acne grade (r = 0.694, p < 0.001).

		Stress severity						P value
		Low (n = 30)		Moderate (n = 72)		High (n = 17)		
		Number	%	Number	%	Number	%	
Gender	Male	11	36.7	15	20.8	7	41.2	0.109
	Female	19	63.3	57	79.2	10	58.8	
Age	<25 years	9	30.0	37	51.4	10	58.8	0.256
	25-35 years	16	53.3	25	34.7	5	29.4	
	35-45 years	2	6.7	7	9.7	2	11.8	
	>45 years	3	10.0	3	4.2	10	58.8	
Nationality	Saudi	26	86.7	69	95.8	7	41.2	<0.001*
	Non-Saudi	4	13.3	3	4.2	3	17.6	
Marital status	Married	13	43.3	14	19.4	14	82.4	0.030*
	Not married	17	56.7	58	80.6	3	17.6	
Educational level	Intermediate	3	10.0	6	8.3	3	17.6	0.347
	Secondary	10	33.3	19	26.4	5	29.4	
	University	14	46.7	42	58.3	7	41.2	
	Master and PHD	3	10.0	5	6.9	2	11.8	
Income	<3000	6	20.0	38	52.8	8	47.1	0.009*
	3000-5000	5	16.7	10	13.9	6	35.3	
	5000-7000	7	23.3	6	8.3	1	5.9	
	7000-10,000	7	23.3	6	8.3	0	0	
	>10,000	5	16.7	12	16.7	2	11.8	
Acne severity	Mild acne	28	93.3	16	22.2	0	0	<0.001*
	Moderate acne	2	6.7	50	69.4	3	17.6	
	Severe acne	0	0	6	8.3	14	82.4	

Table 5: Relation between the characteristic of acne vulgaris patients and stress severity.

* Significant p value.

Regarding the participants' characteristics, our study enrolled 119 participants from Prince Sultan medical military city in Riyadh, with a majority of females representing 72.3% of the total population. The ages of our population varied as we included four different age categories with the largest group of less than 25 years old who represented 47.1% of the total population. Most of the participants were Saudi Arabian in nationality and the vast majority of the population are not married (74.8%). Almost half the population was university students (52.9%). The income was divided into five categories: less than 3000, from 3000 to 5000,

from 5000 to 7000, from 7000 to 10,000, and over 10,000 per month. Most of our population's income is less than 3000 riyals. The acne severity was categorized into three main categories, the patients with moderate acne was the highest number as 55 patients presenting 45.2% were in this category, while the lowest in number were the patients with severe acne (Table 1).

We assessed the prevalence of stress among individuals with acne vulgaris. Our findings revealed that moderate stress had the highest prevalence, accounting for 60.5% of the total population, while high stress had the lowest prevalence, comprising only 14.3% of the entire group (Table 2).

When examining the relationship between acne severity and stress levels, we observed statistically significant results across the board, with a p-value less than 0.001, and r = .694. Mild acne was associated with an average stress level of 13.64, whereas moderate acne showed a higher stress level, averaging 20.20. Finally, the severe acne category exhibited the highest stress levels, with an average of 25.70 (Tables 3, and 4). Therefore, there was a strong association between stress and the acne grade as the more the stress increases the higher the grade of the acne (Figure 1).

The stress severity of the participants did not vary significantly by gender, as the p-value of 0.11 indicated that the difference was not statistically significant. Also, age was found to have no significant impact on the stress severity as the p-value was 0.26. Moreover, there was no significant difference between the stress severity categories among educational levels (p-value = 0.35). On the other hand, nationality, marital status, and income were associated with a significant correlation with stress severity as the p-value was <0.001, 0.03, and 0.009 respectively. Finally, acne severity was significantly correlated with stress severity as the p-value was <0.001. Table 5

Discussion

Acne is a common condition that affects approximately 85% of the global population [12,17]. According to Sachdeva et al. [18], the occurrence of acne vulgaris varied between 34.38% and 97.9% in nine different studies. While the connection between stress and acne exacerbations is widely acknowledged, there have been relatively few investigations conducted to evaluate this association. Our findings indicated a meaningful correlation between the degree and intensity of acne and the severity of stress. Specifically,

as stress levels escalated, the acne symptoms became more severe. These results align with a study conducted at Taif University in Saudi Arabia for a similar population [19], which also identified a link between stress and dietary habits concerning the onset and severity of acne. Also, another study was conducted for a population of female medical in Jeddah, Saudi Arabia (1); the study revealed a strong significant relationship (p < 0.01) between heightened stress severity and more pronounced acne severity. Our study also found that low income is associated with higher stress as the group that has a salary of less than 3000 riyal per month had the highest percentage of moderate and severe acne. The results matched Isaacsson et al. [20] who had similar findings related to income as they found that lower income was associated with higher rates of acne. Several mechanisms tried to explain why stress worsens acne such as in adult women experiencing acne, persistent stress leads to an elevated secretion of adrenal androgens, ultimately causing an increase in sebaceous hyperplasia [21]. Androgens can stimulate the sebaceous glands in the skin to produce more oil and excess sebum which lead to clogged pores, setting the stage for acne development. Stress can also disrupt the balance of sex hormones, further contributing to hormonal acne [22]. Moreover, high-stress levels can increase the production of pro-inflammatory cytokines and exacerbate inflammation, which worsen redness, swelling, and discomfort associated with acne lesions [23]. In addition, dealing with acne itself can be stressful, leading to a vicious cycle. The visible nature of acne lesions can negatively affect self-esteem and body image, causing emotional distress. This emotional stress can, in turn, trigger or worsen physical stress responses in the body [24]. Stress can weaken the immune system's ability to fend off bacteria and inflammation. When the immune system is compromised, it may struggle to control the growth of Propionibacterium acnes, bacteria commonly associated with acne. This can lead to more severe and persistent acne breakouts [25]. Stress can impair the skin's natural protective barrier. A compromised skin barrier is more susceptible to environmental irritants and bacteria, which can further aggravate acne and contribute to its persistence [25,26]. People under stress may adopt unhealthy habits like smoking, consumption, or an imbalanced diet. These behaviors can indirectly affect acne by increasing inflammation in the body and reducing overall skin health which is considered a direct relation to psychological state [27]. There are other methods along with pharmacological treatment to manage acne, as we can manage stress to manage the acne indirectly through relaxation techniques

like deep breathing, meditation, yoga, or regular exercise can help mitigate its impact on acne. Stress reduction can lead to a more balanced hormonal profile and improved immune function. Numerous factors have been identified as potential contributors to the exacerbation of acne, including fluctuations in blood hormones during the menstrual cycle, hot and humid conditions, sweating, the application of makeup and cosmetic products, the use of oily hair care products, and the utilization of topical corticosteroids [28,29].

Our study possesses several strengths, such as its alignment with previous research regarding the connection between acne severity and stress. The study had an adequately sized population, ensuring the availability of valuable data. We also conducted all of the available analyses in order to investigate the relationship and its factors affecting. However, certain limitations were present, including the absence of specific acne details in the description and the lack of some common characteristics among the study population, leading to significant variability.

Conclusion

Stress is associated with the severity of acne, as stress worsens and increases acne by numerous mechanisms, therefore, relaxation activities such as meditation, yoga, deep breathing exercises, and physical exercises could be used with the pharmacological treatment to treat the acne. Also, low-income levels were associated with a significant correlation with stress severity, so, extra attention should be given to this category. To enhance the level of evidence and set up more robust evidence, we recommend conducting studies on larger cohorts with an equal number of males and females.

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