The impact of facial acne scars on quality of life, anxiety, depression and its associated risk factors

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ABSTRACT

Introduction: Acne scars negatively impact psychosocial and emotional wellbeing. However, data on the impact of acne scarring on anxiety and depression as well as quality of life are limited. This study assessed the effects of facial acne scars on quality of life, anxiety, and depression, and identifies risk factors associated with scar severity.

Materials and Methods: We conducted an observational cross-sectional study between February 2023 and January 2024 at dermatology clinics in two public hospitals. A total of 175 patients with facial acne scars were recruited. Data collection included patient demographics, acne severity, scar severity (SCAR-S) and questionnaires such as Dermatology Life Quality Index (DLQI) and Hospital Anxiety and Depression Scale (HADS). The association between scar severity, quality of life, anxiety, and depression was analyzed using Chi-square tests and ordinal logistic regression.

Results: The median age of participants was 26.9 years and 56% were female. Most patients had mild (37.7%) to moderate (28.6%) acne scars. Among patients with severe/very severe scars, 69.2% reported a significant impact on quality of life (DLQI>10). A significant association was observed between scar severity and anxiety (p=0.009) as well as depression (p<0.001). There was a positive correlation between HADS and DLQI scores (r=0.602, p<0.001). Delayed or absent treatment after acne onset was a significant risk factor for acne scar severity.

Conclusion: Facial acne scars are associated with impairment in quality of life and increased anxiety and depression. Timely and effective acne treatment is essential to reduce the severity of scarring and its psychosocial burden.

KEYWORDS:
Acne, scars, quality of life, anxiety, depression

INTRODUCTION

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit that frequently affects adolescents and young adults. Estimated prevalence of acne ranged from 35% up to 100%, varying between countries and age groups.[1] Acne scar may be permanent depending on its severity and persists to adulthood leading to a negative impact on psychosocial and emotional wellbeing. However, little is known about the impact of acne scarring on psychosocial health due to limited literature reviews and data.

Early intervention of acne scars may prevent consequential psychosocial debilitation for our patients. Scarring can be a major concern for patients as it persists and is often undermined and overlooked. A few studies have investigated the impact of facial acne scarring on quality of life. These studies showed that quality of life deteriorates as the severity of acne scarring increases.[2-4] Most patients reported embarrassment, self-consciousness and poor self-esteem. To the best of our knowledge, the direct relationship between acne scarring with anxiety and depression has not been investigated.

Prevention remains a primary strategy for acne scarring management. Recognizing potential risk factors early is imperative in preventing post acne scar formation. While risk factors for the development of acne vulgaris have been widely studied, little is known about the risk factors for acne scar development. From the very limited literature available, risk factors such as acne severity, time between acne onset and first effective treatment, recurrent acne, gender, family predisposition and dietary and social habits play a role in acne scar severity.[5-8]

In this study, we aimed to determine the impact of facial acne scars on quality of life and its association with anxiety and depression. We aimed also to assess risk factors that may be associated with acne scar severity.

MATERIALS AND METHODS

Study Design

This observational cross-sectional study was conducted between February 2023 to January 2024 at the dermatology clinics in two tertiary public hospitals. All patients with acne scars were screened for eligibility. Patients with facial acne scars, aged between 18-55 years old with acne in remission either on or off treatment were included. Exclusion criteria were patients with active acne, post inflammatory erythema or hyperpigmentation and patients who were unable to complete the study questionnaires. Informed consent was

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obtained. Approval from the Medical Research and Ethics Committee (MREC) of the Ministry of Health (MOH) Malaysia was obtained prior to initiation of the study. The study was conducted in compliance with ethical principles outlines in the Declaration of Helsinki and Malaysian Good Clinical Practice guidelines.

Data on socio-demographics, history of acne and its treatment were recorded. Patients were required to grade their previous acne severity based on worst acne ever experienced. Standard photographs for the classification of acne severity which were developed by Hayashi et al. were shown to the patients.[9] There were 2 photographs each for mild, moderate, severe and very severe acne. Patients scored their acne severity during most active disease by referencing to these photographs.

Patients completed two self-administered questionnaires, the Dermatology Life Quality Index (DLQI) and Hospital Anxiety and Depression Scale (HADS) which were aimed to assess their response in relation to their current acne scars.[10,11] The DLQI comprised of 10 questions, each with four possible answers with scores from 0-3. The total overall score is 0-30, with higher scores indicating greater impairment in quality of life. The clinical interpretation of the DLQI scores are as follows: 0-1, no effect at all on the patient's life; 2-5, a small effect on the patient's life; 6-10, a moderate effect on the patient's life; 11-20, a very large effect on the patient's life and 21-30, an extremely large effect on the patient's life. The HADS questionnaire had a total of 14 questions, 7 for each anxiety and depression domain. The scores were summed to produce two subscales corresponding to anxiety and depression; 0-7 for normal; 8- 10 for borderline abnormal; 11-21 for abnormal. Participants were required to endorse a response based on their current acne scars.

All patients were examined by a single investigator to determine their acne scar severity based on the Scale for Acne Scar Severity (SCAR-S). SCAR-S is a validated grading tool, which include both atrophic and hypertrophic scars.[12] A score of 0 is for clear skin, 1 for almost clear, 2 for mild, 3 for moderate, 4 for severe and 5 for extremely severe. The types of scars; namely ice pick, boxcar, rolling, hypertrophic/keloid were documented. Patients may have more than one type of acne scar.

Statistical Analyses

Despite an extensive literature search, we found no similar studies which can be used as reference for our sample size calculation. The methodology and outcome measures of the existing literature differ from that of our proposed study. Thus, our proposed pilot study uses a sample size of 30 subjects per category of acne scar severity (ranging from 1 to 5). The minimum sample size needed was 150 subjects. A total of 175 patients were recruited.

Descriptive analysis summarized sociodemographic and clinical characteristics. Categorical variables were presented as frequency and percentage while continuous variables were expressed as median and interquartile range (IQR). The relationship between grades of acne scarring and HADS-Anxiety groups, HADS-Depression groups and DLQI groups were analysed using Chi-square test. Bonferroni correction was used for pairwise comparison. DLQI scores were categorized into 3 groups; score of 0 – 5, score 6 – 10 and score 11 – 30. HADS scores were categorized into 2 groups; score 0 – 7 and score 8 – 20 for both HADS-A and HADS-D. Pearson coefficient assessed the correlation between HADS and DLQI scores.

Ordinal logistic regression was used to model the association between acne scar severity and risk factors. Acne scar severity was categorized into three groups: almost clear and mild, moderate, and severe and very severe. Potential risk factors analysed included sociodemographic and clinical characteristics. This method was also employed to identify the risk factors associated with the development of different acne scar severity which were ordinally scaled. The model was appropriate. Results are presented in odds ratio and corresponding 95% confidence interval (CI). Univariate ordinal logistic regression was performed to evaluate factors associated with scar severity. A multivariate ordinal logistic regression was then conducted with all the 13 variables to control confounding factors.

RESULTS

Socio-Demographic and Clinical Characteristics

A total of 175 patients with facial acne scars were included in this study (Table I). The median age was 26.9 (12.1) years. Most of the participants were females (56%). The majority ethnic group was Malay, followed by Chinese and Indian/others. Most did not smoke (88.6%) nor consume alcohol (88.6%). Nuts, cereals and butter were least consumed; mostly never or occasionally, while most patients consumed fast food (60.6%) and milk (45.7%) at least once or twice a week.

Patient self-reported assessment showed that grade of acne severity during active disease were mostly moderate (42.3%), followed by severe (31.4%), mild (16%) and lastly; very severe (10.3%). Most patients either took more than a year to seek treatment (29.1%); or never sought treatment (29.1%) prior to presentation to our clinic. The majority of patients had mild (37.7%) to moderate (28.6%) acne scars, followed by severe (21.7%) and very severe (8%) scarring based on SCAR-S (Table II). The most common types of scars were ice pick (72.8%), rolling (57.1%), boxcar (30.9%) and hypertrophic/keloid (2.3%).

Impact of Facial Acne Scar Severity on Quality of Life (QOL)

Significant association was observed between the severity of acne scar and quality of life (Table III). Mean DLQI score was higher with worsening of scar severity. Overall, 69.2% of patients with severe and very severe scars reported a DLQI score > 10 (very / extremely large impact). A proportion of patients with mild acne scarring; 24.7% and 28% of patients with moderate scarring also reported a DLQI score > 10.

Relationship between Facial Acne Scar Severity on Anxiety and Depression

We observed a significant association between scar severity with anxiety and depression (Table III). Post-hoc test with Bonferroni correction resulted in a significance level set at p

Table I: Socio-demographic characteristics of the study population

Characteristics	N= 175 n (%) or median (IQR)
Age (year)	26.9 (12.1) [a]
Gender	
Female	98 (56.0)
Male	77 (44.0)
Race	
Malay	98 (56.0)
Chinese	62 (35.4)
Indian/ others	15 (8.5)
BMI (kg/m2)	22.8 (5.7) [a]
Smoking status	
No	155 (88.6)
Yes	15 (8.6)
Ex-smoker	5 (2.9)
Alcohol	
No	155 (88.6)
Yes	20 (11.4)
Diet – Nuts	
Never/ occasionally	89 (50.9)
Once or twice a week	75 (42.9)
Most or all days	11 (6.3)
Diet – Fast food	
Never/ occasionally	56 (32.0)
Once or twice a week	106 (60.6)
Most or all days	13 (7.4)
Diet – Cereals	
Never/ occasionally	84 (48.0)
Once or twice a week	66 (37.7)
Most or all days	25 (14.3)
Diet – Butter	
Never/ occasionally	82 (46.9)
Once or twice a week	78 (44.6)
Most or all days	15 (8.6)
Diet – Milk	
Never/ occasionally	46 (26.3)
Once or twice a week	80 (45.7)
Most or all days	49 (28.0)

BMI Body Mass Index, IQR Interquartile Range
[a] The distribution is skewed to the right

< 0.017. There was significant association with anxiety (χ^2 = 6.775; p = 0.009) and depression (χ^2 = 14.773; p < 0.001) when patients with almost clear/mild acne scars were compared with patients with severe and very severe acne scars. Marginally significant association in development of anxiety (χ^2 = 5.759; p = 0.016) and depression (χ^2 =6.069; p = 0.014) were observed in comparing patients with severe and very severe scars versus patients with moderate scars. There was no difference in anxiety (χ^2 = 0.001; p = 0.977) and depression (χ^2 = 1.314; p = 0.252) between patients with almost clear/mild scars and patients with moderate scars. In the anxiety domain, patients scored highest with questions of 'feeling tensed' and 'excessive worrying'; while within the depression domain, 'loss of interest' and 'depressed mood' scored the highest.

Correlation between HADS and DLQI scores

There was significant positive correlation between HADS total scores and DLQI total scores (r =0.602, p < 0.001). This suggests that the greater the HADS scores, the greater the DLQI scores.

Risk Factors for the Development of Facial Acne Scars

Thirteen potential risk factors were analysed using univariate ordinal logistic regression (Table IV). Alcohol consumption, grade of acne severity during active disease and delayed treatment initiation (>1 year) were significantly associated with acne scar severity. Factors such as gender, race, smoking status, acne sites, family history of acne/ acne scar and dietary habits did not show any statistical significant association with acne scar severity.

Multivariate logistic regression revealed that the odds of developing more severe acne scar were 37.61 (95% CI: 6.16 - 229.72), 89.39 (95% CI: 14.16 - 564.28) and 880.98 (95% CI: 88.73 - 8747.36) times higher among patients with moderate, severe and very severe acne compared with patients with mild acne. Patients who received treatment after a year of acne onset or who were never treated had 2.78 (95% CI:1.14 - 6.80) and 3.89 (95% CI: 1.44 – 10.49) times higher odds to develop more severe acne scars respectively; compared to those who received treatment within 6 months of acne onset.

Table II: Clinical characteristics of the study population

Characteristics	N= 175, n (%)
Grade of acne severity during active disease	
Mild	28 (16.0)
Moderate	74 (42.3)
Severe	55 (31.4)
Very severe	18 (10.3)
Sites affected by acne	
Face	109 (62.3)
Face & trunk	66 (37.7)
Duration of acne prior to seeking treatment (doctors'/ over-the-counter treatments)	
0 – 3 months	23 (13.1)
3 – 6 months	24 (13.7)
6 – 9 months	12 (6.9)
9 – 12 months	14 (8.0)
> 1 year	51 (29.1)
Never treated	51 (29.1)
Family history of acne/ acne scars	
No	73 (41.7)
Parent(s)	23 (13.1)
Sibling(s)	61 (34.9)
Parent(s) & sibling(s)	18 (10.3)
Grade of acne scar severity	
Almost clear	7 (4.0)
Mild	66 (37.7)
Moderate	50 (28.6)
Severe	38 (21.7)
Very severe	14 (8.0)
Quality of life, DLQI	
0 – 1 no effect	27 (15.4)
2 – 5 small effect	42 (24.0)
6 – 10 moderate effect	38 (21.7)
11 – 20 very large effect	60 (34.3)
21 – 30 extremely large effect	8 (4.6)
Anxiety, HADS-A score	
0 – 7 normal	103 (58.9)
8 – 10 borderline abnormal	42 (24.0)
11 – 21 abnormal	30 (17.1)
Depression, HADS-D score	
0 – 7 normal	120 (68.6)
8 – 10 borderline abnormal	25 (14.3)
11 – 21 abnormal	30 (17.1)

DLQI Dermatology Life Quality Index, HADS-A Hospital Anxiety and Depression Scale-Anxiety, HADS-D Hospital Anxiety and Depression Scale-Depression

Table III: Relationship between acne scar severity with quality of life / anxiety and depression

Parameters	Acne scar severity N = 175			p-value[b]
	Almost clear & mild n (%)	Moderate n (%)	Severe & very severe n (%)	
Quality of life, DLQI				
No / small effect	39 (53.4)	21 (42.0)	9 (17.3)	< 0.001
Moderate effect	16 (21.9)	15 (30.0)	7 (13.5)	
Very / extremely large effect	18 (24.7)	14 (28.0)	36 (69.2)	
Anxiety, HADS-A				
0 – 7 normal	48 (65.8)	33 (66.0)	22 (42.3)	0.015
8 – 21 abnormal	25 (34.2)	17 (34.0)	30 (57.7)	
Depression, HADS-D				
0 – 7 normal	59 (80.8)	36 (72.0)	25 (48.1)	< 0.001
8 – 21 abnormal	14 (19.2)	14 (28.0)	27 (51.9)	

DLQI Dermatology Life Quality Index, HADS-A Hospital Anxiety and Depression Scale-Anxiety, HADS-D Hospital Anxiety and Depression Scale-Depression
b Chi-square test for independence

Table IV: Factors associated with acne scar severity

Variables	β	Crude OR	(95% CI OR)	p-value
Gender				
Male	Ref.	1.00		
Female	-0.06	0.94	(0.54; 1.64)	0.835
Race				
Indian/ others	Ref.	1.00		
Malay	0.27	1.31	(0.46; 3.75)	0.612
Chinese	0.60	1.82	(0.61; 5.37)	0.281
Smoking status				
Ex-smoker	Ref.	1.00		
No	0.62	1.86	(0.32; 10.98)	0.485
Yes	1.81	6.08	(0.79; 46.55)	0.075
Alcohol				
Yes	Ref.	1.00		
No	-0.94	0.39	(0.16; 0.95)	0.035
Grade of acne severity during active disease				
Mild	Ref.	1.00		
Moderate	2.76	15.80	(3.50; 71.23)	<0.001
Severe	3.67	39.28	(8.49; 181.85)	<0.001
Very severe	5.26	192.95	(30.30; 1228.74)	<0.001
Sites affected by acne				
Face & trunk	Ref.	1.00		
Face	-0.21	0.81	(0.46; 1.42)	0.456
Time to seek treatment for acne				
0 – 6 months	Ref.	1.00		
6 – 12 months	0.14	1.15	(0.47; 2.82)	0.761
> 1 year	0.78	2.19	(1.05; 4.59)	0.039
Never treated	0.18	1.19	(0.57; 2.51)	0.641
Family history with acne/ acne scars				
Parent(s) & sibling(s)	Ref.	1.00		
Parent(s)	-0.46	0.63	(0.21; 1.88)	0.430
Sibling(s)	-0.15	0.86	(0.34; 2.15)	0.758
No	-0.11	0.89	(0.36; 2.20)	0.816
Diet – Nuts				
Most or all days	Ref.	1.00		
Once or twice a week	-0.14	0.87	(0.25; 3.04)	0.814
Never/ occasionally	-0.40	0.67	(0.19; 2.32)	0.493
Diet – Fast food				
Most or all days	Ref.	1.00		
Once or twice a week	0.55	1.73	(0.54; 5.52)	0.341
Never/ occasionally	1.12	3.06	(0.91; 10.27)	0.062
Diet – Cereals				
Most or all days	Ref.	1.00		
Once or twice a week	0.76	2.13	(0.87; 5.26)	0.088
Never/ occasionally	0.29	1.34	(0.56; 3.19)	0.501
Diet – Butter				
Most or all days	Ref.	1.00		
Once or twice a week	0.46	1.59	(0.55; 4.61)	0.383
Never/ occasionally	0.33	1.40	(0.48; 4.04)	0.528
Diet – Milk				
Most or all days	Ref.	1.00		
Once or twice a week	-0.09	0.91	(0.47; 1.79)	0.785
Never/ occasionally	-0.45	0.64	(0.30; 1.35)	0.238

B coefficients, CI Confidence Interval, OR Odds Ratio, Ref Reference

DISCUSSION

Impact of Acne Scar on Quality of Life

Acne scars have been shown to impact quality of life, with DLQI scores ranging from 5.6 to 6.2.[2-4] Our study revealed an overall mean DLQI score of 8.8, suggesting a moderate effect which is comparable to other skin diseases such as Behcet's syndrome (DLQI 5.7), Darier's disease (DLQI 5.89), Hailey-Hailey disease (DLQI 6.06), rosacea (DLQI 6.1) and cutaneous lupus erythematosus (DLQI 6.5).[13]

Our findings showed the impact on the domains of quality of life increases with acne scar severity. A reasonable explanation behind this is that treatment options for acne scars are limited, mostly time consuming and costly especially with physical modalities such as peels and lasers, microneedling, dermabrasion and platelet-rich plasma injections. They require multiple visits to the dermatologist and pose a great financial burden and in patients who are severely scarred, results may be less than optimal. In terms of

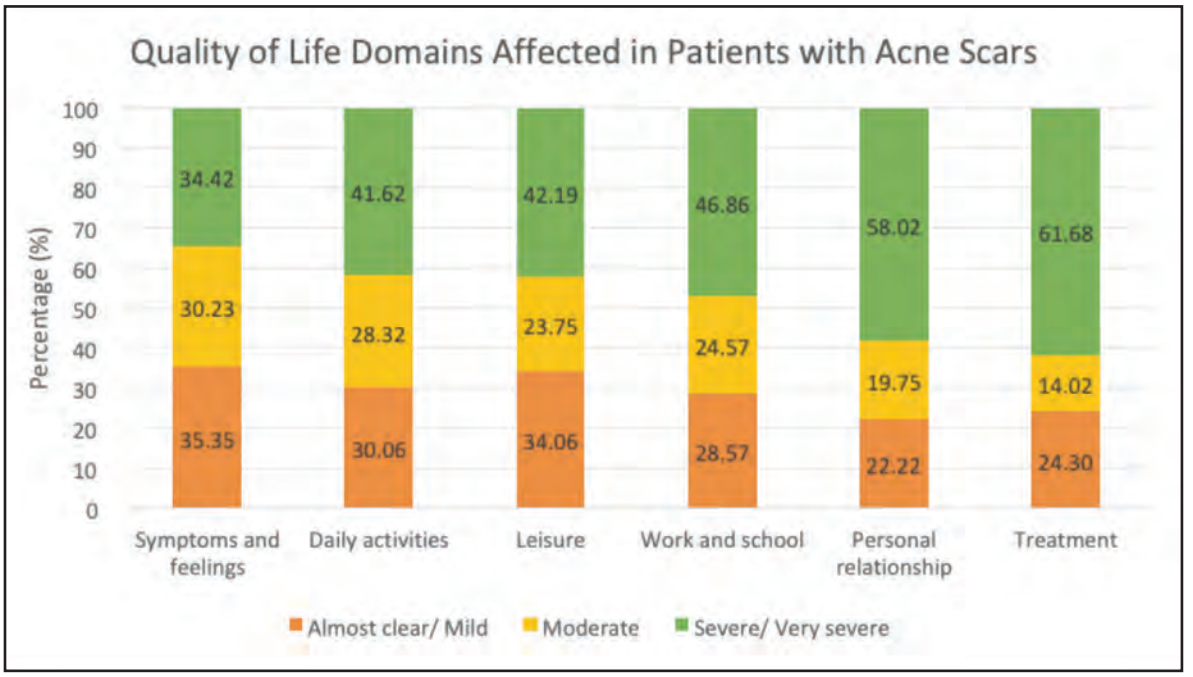

Fig. 1: Domains of Quality of Life Affected in Patients with Acne Scars

personal relationships, due to the reserved and introverted nature of our Asian culture, patients may find it a challenge to open up their feelings to friends, family and partner. A Singaporean study which evaluated the impact of post acne scars in young adults reported similar findings in this domain. Their lowest mean DLQI score was 0.26 for question nine on sexual difficulties.[2] This local Asian population data further supports our postulation. In the work / school domain, patients with significant acne scars may be perceived differently by society and this can negatively impact perceived attributes, skills and prospects. As a result, patients may find it challenging to appear in public and would try to avoid places where they could be seen, compounded by their own feelings of self-consciousness and embarrassment. Tan et al. evaluated the psychological well-being and social impact of atrophic acne scarring in a multi-national study which reported similar findings. In that study, a large group of patients reported significant impact with engaging and exposing daily activities such as swimming, yoga and sunbathing. Some patients also felt that they have been treated unfairly at work.[14]

Overall, quality of life is largely affected as acne scar severity worsens. However, a notable percentage of patients with mild scar also reported a high impact on quality of life. This finding was observed in the study by Tan et al. which found that even patients with mild acne scars reported high levels of impairment in quality of life.[3] Most of these patients were young females. Females often place a high value on their appearance. Acne scars can lead to decreased self-esteem and body image issues especially during their teenage years when emotional development is a pivotal growth. This in return, causes further emotional distress and affects social interactions be it at home, school or work.

The impact of acne scars on anxiety and depression is largely unknown. Most data revolved around the impact of acne vulgaris on psychosocial health such as anxiety, depression and quality of life. A multi-centre study reported significant psychological burden of common skin diseases with higher prevalence of depression and anxiety as well as suicidal ideation in the acne vulgaris group compared to many other common skin conditions such as psoriasis, atopic dermatitis, leg ulcers.[15] These psychosocial effects can be attributed to both active acne lesions as well as post acne scarring. In a previous study evaluating psychosocial judgements and perceptions of acne vulgaris among adolescents, the authors observed that teenagers, especially females with acne are often misperceived as shy, stressed, lonely, introverted, boring and nerdy. Teenagers with acne also reported lower self-confidence, difficulty finding jobs and engaging in personal relationships.[16]

Greater impairment in quality of life suggests an increased risk for anxiety and depression as demonstrated by our results. The impact of acne on quality of life, anxiety and depression is well documented.[17-19] Most patients from these studies had moderate to severe acne and demonstrated a common and significant association between DLQI and anxiety as well as depression. Those who developed anxiety ranged from 26-32% while 9-29% of the patients developed depression. A significant risk factor for the development of anxiety and depression is poor quality of life. They did not find any correlation between acne severity and the development of anxiety and depression, suggesting that the patient's own perception towards acne plays an important role in the negative effects of acne on psychosocial health. Negative societal perception towards those with acne and scars have also largely influenced the way patients perceive of themselves. Coupled with the distinctive impact of social

media and peer pressure these days which seem to glorify models and celebrities with crystal clear skin, the negative influence on psychosocial health and quality of life in patients with acne and scars is amplified. Findings from this study reminds us to not overlook the psychosocial health impacts of not just acne but post acne scars as well in our patients, with prompt referral to the psychiatrist should the need arise.

Observations from our study showed that patients with moderate and severe acne that were left untreated or treated late were at risk for higher acne scar severity. These findings were consistent with the findings of Dreno et al.[5] Family history of acne, male gender, acne relapses and alcohol have been identified as risk factors for formation of acne scars in some studies.[6-8] This is contrary to our findings which may be due to other factors that were not documented in our study such as accessibility to dermatological services and treatment or skincare habits which may also influence scar formation. These may have masked the effects of the risk factors which were analysed in our study like family history.

Preventing acne requires a combination of skincare, lifestyle changes and public health efforts. Early intervention and education with public initiatives, including school programs, affordable and accessible dermatological care, timely institution of treatment and evidence-based skincare awareness can reduce acne prevalence and improve skin health.

LIMITATIONS

Recall bias is a limitation of this study as patients graded their past acne severity based on memory. However, as scar severity was determined by clinical examination and psychosocial assessments were performed when patients no longer have active acne, our results would reflect the psychosocial impact of scars.

The objective of the study was to determine the impact of scars on quality of life and its association with anxiety and depression. Thus, we included patients with acne scars only, without active acne. This is to try to eliminate the impact of active acne on psychosocial issues.

The DLQI and HADS assessed in this study are based upon patients' response towards their current acne scars, rather than their previous acne. As the patients did not have active acne during the study, therefore acne severity had to be determined retrospectively.

CONCLUSION

This study highlights the impact of facial acne scars on psychosocial health. Impairment in quality of life and the development of anxiety and depression are inter-related. Greater acne scar severity is strongly associated with increased impairment in quality of life and a higher risk of developing anxiety and depression. Severe acne and delay in seeking treatment are independent risk factors for acne scar severity. Acne prevention and early intervention are key strategies against scars. Physicians should approach patients holistically, providing not only prompt and effective treatment in acne and its scars but also in terms of mental health.

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CONFLICT OF INTEREST

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