

Evaluation of Epidemiology, Perceived impact, and overall burden of Acne among Adolescents and its Economic, behavioral, and healthcare utilization implications.

Uzma Dost Muhammad Rajar¹  ² Wasim Asif Arain

¹ Chairperson & Head of Dermatology Department, Isra University Hyderabad, Pakistan

² Marketing Manager, Helix Pharma.

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Correspondence:

Uzma Dost Muhammad Rajar
Chairperson & Head of Dermatology Department, Isra University Hyderabad, Pakistan
Email: uzmarajar1@gmail.com

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Abstract

Acne vulgaris is a massively widespread chronic skin disorder that has a tremendous influence on the quality of life and psychosocial functioning among adolescents worldwide. Extensive epidemiological information on Pakistani regions is unavailable. This paper established prevalence, degree and perception of acne among Sindh and Hyderabad adolescents besides examining their knowledge and attitude aspects, economic impact, and patterns of healthcare use. The study was a cross-sectional descriptive study that recruited 507 participants who were adolescents (13-19 years of age) and were studying in educational institutions in Hyderabad, Sindh (March-November 2024). The high level of acnes (75.3) was recorded with females showing significantly high levels compared to males (78.8% vs 70.5, $p=0.032$). Mild acne was the most prevalent (41.6%), then the moderate one (28.4%). There was significant correlation between family history ($p<0.001$), stress levels ($p=0.006$), and face washing frequency ($p=0.019$) and acne occurrence. Acne is shown to exhibit high prevalence in Hyderabad, Sindh adolescents, and it significantly affects the quality of life with the deficit in knowledge persistence.

Keywords: Acne Vulgaris, Adolescents, Epidemiology, Prevalence, Quality of Life, Economic Burden, Healthcare Utilization, Self-medication.

1. INTRODUCTION

Acne vulgaris is a very common long term inflammatory dermatology condition that occurs mostly among the adolescent population in the world. The emergence of several lesional manifestations such as comedones, inflammatory papules, pustules, nodules, and cysts are the defining features of this multifactorial disorder because these appear as a result of blocking and subsequent inflammation of pilosebaceous follicular units (Lenuța et al., 2025). The pathophysiological processes of acne formation are complex interactions between a variety of factors, such as over-activity of sebaceous glands, disruption of follicular keratinization processes, colonization of the skin by bacteria, mainly *Cutibacterium acnes*, and the following inflammatory response. The condition is mainly found in anatomical zones of high density of sebaceous glands; specifically, the facial areas, neck, chest, upper extremities, and dorsal areas (Eichenfield et al., 2021). Globally, acne has a prevalence rate of around 9.4% of the global population, which makes it the eighth most prevalent disease in the world, especially with high rates of the disease in adolescence period when hormonal variations lead to higher levels of sebaceous gland activity (Lenuța et al., 2025; Eichenfield et al., 2021). The clinical role of acne goes beyond the solely dermatological characteristics in that this illness has a significant impact on the psychological health, social functioning and health-related quality of life in patients. Acne in young people is often followed by a deep emotional problem, such as social withdrawal, loss of self-confidence, depressive mood, and anxiety disorder. It has been found that the psychological toll of acne can be as high as the people with chronic systemic ailment like respiratory problems, neurological issues, and metabolic diseases (Dumont et al., 2025; Tasneem et al., 2023). In addition to the psychosocial effects, acne has a significant financial cost to people affected, their families, and the healthcare sector (Zhu et al., 2025). Direct costs include the expenses on dermatological consultations, prescription and over-the-counter pharmacological interventions, and procedural ones such as chemical peels or laser interventions, whereas the indirect ones are a loss of workplace or academic productivity, absenteeism, and the financial consequences of controlling acnes-induced scars and post-inflammatory hyperpigmentation (Zhu et al., 2025; Saurat et al., 2024). A sharp increase in androgens in adolescence predisposes them to developing acne more than any other group because, as a result of hormonal changes, sebaceous glands increase sebum production, which, in turn, provides an environment in which bacteria multiply and inflammatory reactions take place. In the Pakistani health sector, a significant lack of extensive epidemiological information in different geographical areas can be observed. The current literature reflects a significant range of the prevalence rates with studies carried out in Rawalpindi and Islamabad reporting acnes prevalence rates of 14.47% among the female medical students (Babar and Mobeen, 2019), whereas other Pakistani research projects have shown mixed results based on the demographic traits of their research populations. With this heterogeneity in the prevalence estimates, it is important to note that geographically specific epidemiological studies are of paramount importance in trying to comprehend the disease patterns in a region and its determinants. Moreover, it is possible to mention a range of psychosocial and physiological factors such as emotional condition, nutrition, family history, smoking, and hormonal changes as the influential contributors to the severity and longer duration of acne (Yang et al., 2020; Bhajjamal et al 2023). Although the impact of acne in terms of health concern has been realized, there is still a significant gap in the detailed epidemiological data related to various areas of Pakistan. Sindh being a large urban center with a significant number of adolescents is a significant geographical location to study the acne prevalence and related issues. The local epidemiological patterns, severity distribution and adolescent perceptions about acne are important to understand so as to come up with specific educational interventions, better

clinical management strategies and to inform the policy of the general health population. The current study fills this knowledge gap by adopting a thorough epidemiological survey that will determine the prevalence rates and severity patterns of acnes among teenagers living in Hyderabad, Sindh. At the same time, the study examines the perception, knowledge base, and the attitudes of participants in terms of acne management and causation. The paper also assesses the economic factors of healthcare use of acne, behavioral trends of treatment-seeking behavior, and the multidimensional burden endured by the adolescents with acne. The results will add significant epidemiology to the available literature and the local aspect of data on the factors, which could potentially affect the development of acne and the treatment method in the local adolescent population.

2. LITERATURE REVIEW

2.1. The epidemiology of Acne Vulgaris

Modern epidemiological studies show an alarming trend of growing acnes load on the global adolescent and young adult populations over the three-decades between 1990 and 2021. The results of the full Global Burden of Disease Study of 2021 showed that the prevalence rates on an age-adjusted basis showed a significant upward trend with just 8,563.4 cases per 100,000 people in 1990 but 9,790.5 cases per 100,000 people in 2021 (or 0.43 per cent every year). Also, significant gender differences were noted, where young females had about 25% higher rates of prevalence rates than their male counterparts, and 10,911.8 and 8,727.8 respectively were registered at 100,000 population, respectively (Zhu et al., 2025). A systematic worldwide survey done on 50,552 patients in 20 countries found that worldwide prevalence of acne is 20.5 with the highest rates in adolescents and young adults aged 16-24 years being 28.3. It was found that women (23.6) were more affected compared to men (17.5), and there was much geographical difference (Saurat et al., 2024). Regional differences also reveal the highest rates at Latin America (23.9%), East Asia (20.2%), and Africa (18.5%), with Europe (9.7) and Australia (10.8) showing relatively lower rates (Saurat et al., 2024).

2.2. Economic Burden of Acne

Acne is a serious financial strain both at an individual and systemic level. Annual spending in the United States alone on the management of acne, such as outpatient care, topical and systemic drugs, cosmetic surgeries, etc., are estimated at more than five billion dollars, which is growing by the year, with the prevalence of the disease (Shields et al., 2023). In several countries with limited access to healthcare due to financial constraints, such as in Pakistan, where the majority of people cannot afford regular healthcare, adolescents will often self-medicate with unregulated, unsuitable, topical preparations, which increase the cumulative out-of-pocket costs but do not bring about effective treatment. Behavioral aspects of this economic burden are also important, as the awareness levels, cultural perception, social stigma, and perceived effectiveness of treatment determine the health-seeking behavior of patients with acne, which in turn affects the treatment use outcomes and patterns (Al-Worafi et al., 2024).

2.3. Psychosocial and Developmental Effect on the Adolescents.

The teen age group is a very susceptible group with regard to acne development because it is the age group with the highest occurrence rates, which coincides with the hormonal changes during puberty. At such a significant stage of development the individuals have shown a greater vulnerability to the psychosocial consequences of the acne considering the distinctive traits of the adolescence such as an increased level of self-awareness, influence of peers, and the identity formation processes that occurs during this stage. The embarrassed character of facial acne lesions

may significantly affect the interpersonal social interaction, academic performance, and emotional stability during such critical formative years (Bhaijamal et al 2023). Furthermore, teenagers might not have sufficient information about acne management and prevention methods, which prompts improper self-treatment and a late visit to a doctor. Not only do such delays have a negative impact on clinical outcomes but also increase the overall economic burden on patients and their families, especially in resource-constrained areas, where specialized dermatological care remains unavailable or unaffordable to a large percentage of adolescent patients (Al-Worafi et al., 2024; Yang et al., 2020).

3. METHODOLOGY

3.1. Study Design:

The cross-sectional descriptive study was done to determine the prevalence of acne, its severity and the perception held about acne by adolescents in Hyderabad, Sindh.

3.2. Study Setting:

The research was performed at Benazir Skin and Laser Clinic, Hyderabad and at secondary schools and colleges of Hyderabad, Sindh, Pakistan between March 2024 and November 2024.

3.3. Study Population:

The target group were aged 13-19 years in the schools of Hyderabad, Sindh.

3.4. Sampling Method:

Multi-stage cluster sampling was performed for recruiting participants in the study

3.5. Sample Size

The sample size of 507 participants was calculated while considering an acne prevalence of 20.5% (Saurat et al., 2024) among adolescents with 95% level of confidence and 5 percentage margins of error using a following formula:

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

3.6. Inclusion and Exclusion Criteria.

3.6.1. Inclusion Criteria

- Adolescents aged 13-19 years
- attending learning institutions.
- Indicated readiness to give an informed consent.
- Capable of attending clinic assessment.

3.6.2. Exclusion Criteria

- Students that have known dermatological conditions not acne

3.7. Data Collection Tool

A self-administered structured questionnaire was employed that included demographic data of age, gender, and

socioeconomic status, a history of acne and the current severity of the same on standardized grading scale, lifestyle and behavioral data, quality of life data using modified Cardiff Acnes Disability Index (CAD I), and knowledge and perception on acne. CAD I is widely tested and validated in 44 countries with proven translations of it into 25 languages and high internal consistency, test-retest reliability, and responsiveness to change (Abdelrazik et al., 2021). Another module was added to obtain economic burden information, such as out-of-pocket spending on acne related interventions including over the counter products, prescription medication and dermatology visits, and health seeking behavior at the time of treatment including how many times the patient has visited a clinic and whether they had previously sought treatment.

3.8. Data Collection Process

It was done in two stages; during the phase-1, the students were first approached in their respective learning institutions. The questionnaires were given as self-administered surveys with the inclusion of demographic data, acne history, lifestyle, economic spending on acne management and knowledge assessment. The participants were to be visited at the clinic as per their availability and consent. During phase-2, everyone came to clinic to undergo intensive dermatological examination. Qualified dermatologists evaluated clinical acne severity on standardized grading scales and quality of life on CAD I were measured at visit center. Further clinical information such as the distribution and the morphology of the lesions were noted. Information on healthcare usage such as the number of past consultations and treatment modalities already sought was also recorded during clinic visits.

3.9. Data Analysis

Data analysis was done in SPSS 26.0. The frequencies and percentages of acnes prevalence and distribution of acnes severity were computed using descriptive statistics. Continuous variables were calculated in terms of means and standard deviations. The chi-square tests were used to determine the relationship between categorical variables e.g., gender, family history, lifestyle factors, and the presence of acne. ANOVA and independent t-tests were applied to identify the difference in the quality-of-life scores in various groups. The analysis of data was done through the use of logistic regression with the aim of determining the predictors of acnes occurrence. Correlation was also done to determine the connection between the quality-of-life scores and the severity of acne. Mean monthly out of pocket spending was estimated using descriptive analysis of economic variables, and the correlation between acnes severity, the frequency of healthcare use, and the financial spending were analyzed to describe the economic burden profile of the study population. This p-value was less than 0.05 which was taken as statistically significant.

3.10. Ethical Considerations

The author received the IRB Protocol Number: BSLC-IRB/2024/003 and was approved by the Institutional Review Board of Benazir Skin and Laser Clinic, Hyderabad, Sindh. All participants were given informed consent, both written, and where appropriate, parental or guardian. The study was well-guarded in terms of confidentiality and anonymity. Students in need of help in transportation were facilitated to be able to attend clinic appointments.

4. Results

4.1. Demographics Description

A total of n=507 adolescents were recruited, the response rate was 100%. The demographic description showed that

there was a balanced mix of different characteristics. Most of the participants belonged to the 16-17 years of age group (42.8%), then 14-15 years (28.4%). The sample was made up of 58.6% of female participants and 41.4% of male participants. Majority of the participants were in private institutions (64.3) whereas sufficient percentage were found in public institutions (35.7). In terms of socioeconomic status, the highest percentage of participants were of the middle-income families with monthly household income ranging between 50,000-75,000 (38.5%), then the families with monthly household income of 25,000-50,000 (26.6%). (Table-1).

Characteristic	Frequency (n)	Percentage (%)
Age Groups		
13-14 years	89	17.6
14-15 years	144	28.4
16-17 years	217	42.8
18-19 years	57	11.2
Gender		
Male	210	41.4
Female	297	58.6
Institution Type		
Public	181	35.7
Private	326	64.3
Monthly Family Income		
<Rs. 25,000	71	14.0
Rs. 25,000-50,000	135	26.6
Rs. 50,000-75,000	195	38.5
Rs. 75,000-100,000	76	15.0
>Rs. 100,000	30	5.9
Father's Education		
Illiterate	28	5.5
Primary	67	13.2
Secondary	98	19.3
Higher Secondary	136	26.8
Graduate	178	35.2
Father's Occupation		
Unemployed	19	3.7
Laborer	76	15.0
Shopkeeper	89	17.6
Private Employee	213	42.1
Government Employee	67	13.2
Professional/Business	43	8.4

4.2. Acne Prevalence and Severity

The findings revealed a high prevalence of acne among adolescents in Hyderabad, Sindh. Out of 507 participants, 382 (75.3%) reported having experienced acne at some point, while 125 (24.7%) had never experienced acne. Among those with acne history, 329 (86.1%) currently had active acne lesions. The age of acne onset showed considerable variation, with the majority (68.3%) developing acne during early adolescence (13-15 years). Regarding severity distribution, mild acne was the most common presentation (41.6%), followed by moderate acne (28.4%). Clear skin was observed in 15.8% of those with acne history, while severe and very severe acne affected 9.7% and 4.5% respectively. Face was the most commonly affected area (89.3%), followed by back (34.7%) and chest (28.5%). The duration of acne varied significantly, with 38.7% experiencing acne for 1-2 years and 31.4% having acne for more than 2 years (Table-2).

Characteristic	Frequency (n)	Percentage (%)
Ever Had Acne		
Yes	382	75.3
No	125	24.7
Currently Have Acne (n=382)		
Yes	329	86.1
No	53	13.9
Age of Acne Onset (n=382)		
11-12 years	34	8.9
13-15 years	261	68.3
16-18 years	87	22.8
Current Acne Severity (n=329)		
Clear	52	15.8
Almost Clear	89	27.1
Mild	137	41.6
Moderate	36	10.9
Severe	12	3.6
Very Severe	3	0.9
Areas Affected (n=329)		
Face	294	89.3
Back	114	34.7
Chest	94	28.5

Neck	67	20.4
Shoulders	45	13.7
Duration of Acne (n=329)		
<6 months	43	13.1
6 months-1 year	56	17.0
1-2 years	127	38.6
2-3 years	68	20.7
>3 years	35	10.6
Family History of Acne (n=329)		
Yes	198	60.2
No	89	27.1
Don't know	42	12.8

4.3. Factors Associated with Acne and Quality of Life Impact

The analysis of the factors related to acne found out that there were very strong relations in terms of different demographic and lifestyle factors. Gender proved to have a significant difference between acne prevalence ($p=0.032$) with older adolescents having a higher level of severe acne (78.8) compared to male adolescents (70.5). There was a strong correlation between family history of acne and the occurrence of acne ($p<0.001$) and 60.2 percent of those affected reported positive family history, which is consistent with systematic reviews showing that acne had a strong familial predisposition with pooled odds ratios of 2.91 (95% CI 2.58-3.28). There were significant associations between lifestyle factors, such as stress levels ($p=0.006$), frequency of face washing ($p=0.019$) and sleep duration ($p=0.028$) and acne severity and these were similar to those of other recent studies that pointed to stress as a major cause of acne pathogenesis.

Table-3: Factors Associated with Acne Prevalence and Quality of Life Impact

Factor	Acne Present n(%)	Acne Absent n(%)	P-value	Chi-square
Gender			0.032*	4.58
Male	148 (70.5)	62 (29.5)		
Female	234 (78.8)	63 (21.2)		
Age Groups			0.041*	8.34
13-15 years	169 (72.5)	64 (27.5)		
16-19 years	213 (77.7)	61 (22.3)		
Family History			<0.001*	89.45
Yes	198 (89.6)	23 (10.4)		
No/Don't know	131 (56.2)	102 (43.8)		
Stress Level			0.006*	12.67
Low-Moderate	187 (69.5)	82 (30.5)		
High-Very High	195 (81.9)	43 (18.1)		

Face Washing Frequency			0.019*	7.85
≤2 times/day	201 (72.3)	77 (27.7)		
>2 times/day	181 (79.0)	48 (21.0)		

4.4. Quality of Life Impact

The quality-of-life assessment using the modified Cardiff Acne Disability Index revealed substantial impact on participants' daily lives ($p=0.001$). The mean CADI score was 6.8 ± 4.2 , indicating moderate impact ($p=0.01$), which is consistent with international studies utilizing CADI for adolescent populations showing scores in the 4-8 range for mild to moderate acne.¹² Severe quality of life impairment was observed in 18.2% of participants with acne, while 42.6% experienced moderate impact and 39.2% had mild impact. Recent studies have confirmed that acne significantly affects quality of life for adolescents, with the psychosocial burden being as significant for adolescents as for adults.^{14,15} The significant p-value ($p=0.001$) indicates that the observed quality of life impact scores is statistically meaningful and not due to chance (Table-4).

Table-4: Quality of Life Impact (CADI Scores) among Participants with Acne (n=329)

CADI Impact Level	Score Range	Frequency (n)	Percentage (%)	P-value
Mild Impact	1-5	129	39.2	0.001*
Moderate Impact	6-10	140	42.6	0.001*
Severe Impact	11-15	60	18.2	0.001*

4.5. Knowledge and Perception about Acne

The assessment of knowledge and perception revealed varying levels of understanding about acne among participants. Regarding causes of acne, 64.3% correctly identified hormonal changes as a primary cause, while 58.7% recognized the role of genetics. However, misconceptions were prevalent, with 42.1% believing poor hygiene as the main cause and 38.9% attributing acne solely to diet, consistent with global patterns of acne knowledge requiring targeted educational interventions.¹⁶ Knowledge about treatment importance was generally good, with 73.4% considering acne treatment as very important. The primary sources of information about acne were family and friends (67.2%), followed by internet (54.8%) and healthcare providers (23.6%). Academic performance was perceived to be affected by acne in 45.3% of participants, with 28.1% reporting significant impact. Social consequences were notable, with 34.7% reporting being teased or bullied because of their acne, highlighting the broader psychosocial implications beyond physical symptoms.^{17,18} Overall self-reported knowledge about acne was rated as good by 41.2% of participants, fair by 35.1%, and poor by 23.7%. (Table 5)% attributing acne solely to diet, consistent with global patterns of acne knowledge requiring targeted educational interventions.¹⁶ Knowledge about treatment importance was generally good, with 73.4% considering acne treatment as very important. The primary sources of information about acne were family and friends (67.2%), followed by internet (54.8%) and healthcare providers (23.6%). Academic performance was perceived to be affected by acne in 45.3% of participants, with 28.1% reporting significant impact. Social consequences were notable, with 34.7% reporting being teased or bullied because of their acne, highlighting the broader psychosocial implications beyond physical symptoms.^{17,18} Overall self-reported knowledge about acne was rated as good by 41.2%

of participants, fair by 35.1%, and poor by 23.7% (Table-5).

Table-5: Knowledge and Perception about Acne among Study Participants (n=507)		
Knowledge/Perception Item	Frequency (n)	Percentage (%)
Perceived Causes of Acne (Multiple responses)		
Hormonal changes	326	64.3
Genetics	298	58.7
Poor hygiene	213	42.1
Diet	197	38.9
Stress	189	37.3
Bacteria	156	30.8
Don't know	67	13.2
Importance of Acne Treatment		
Very important	372	73.4
Somewhat important	98	19.3
Not important	23	4.5
Don't know	14	2.8
Sources of Information (Multiple responses)		
Family/Friends	341	67.2
Internet	278	54.8
Healthcare providers	120	23.6
School	89	17.6
Media	76	15.0
Other	34	6.7
Impact on Academic Performance (n=382)		
Yes, significantly	107	28.1
Yes, somewhat	66	17.3
No	209	54.7
Experience of Bullying/Teasing (n=382)		
Yes, frequently	45	11.8
Yes, occasionally	87	22.8
No	250	65.4
Self-rated Knowledge Level		
Excellent	0	0.0
Good	209	41.2
Fair	178	35.1
Poor	120	23.7

4.6. Economic Burden of Acne

The economic burden analysis was conducted among the 329 participants with active acne. The findings revealed that a substantial proportion of affected adolescents and their families incurred considerable out-of-pocket expenditures for acne management. The majority of participants (61.7%) reported spending between Rs. 500-2,000 per month on acne-related products and treatments, while 18.2% spent more than Rs. 2,000 monthly. Only 20.1% reported negligible expenditure of less than Rs. 500 per month. Regarding healthcare utilization, 54.7% of participants with active acne had consulted a dermatologist at least once, while 38.0% had sought care from a general physician. A notably large proportion (71.4%) reported using over-the-counter topical products without any medical prescription, reflecting a predominant pattern of self-medication. Among those who had consulted a dermatologist, the mean number of visits was 3.2 ± 1.8 over the preceding six months. Private clinic consultations were the most frequently utilized healthcare facility (63.2%), followed by government hospitals (24.6%) and pharmacy-based consultations (12.2%). A significant association was observed between acne severity and monthly expenditure ($p=0.003$), with participants having moderate-to-severe acne incurring substantially higher costs compared to those with mild acne. Similarly, higher socioeconomic status was associated with greater healthcare utilization and expenditure ($p=0.017$), suggesting that financial constraints limit formal treatment-seeking behavior among lower-income adolescents (Table-6).

Table-6: Economic Burden and Healthcare Utilization among Participants with Active Acne (n=329)

Economic/Utilization Variable	Frequency (n)	Percentage (%)
Monthly Out-of-Pocket Expenditure on Acne		
<Rs. 500	66	20.1
Rs. 500-1,000	109	33.1
Rs. 1,001-2,000	94	28.6
Rs. 2,001-5,000	43	13.1
>Rs. 5,000	17	5.2
Type of Healthcare Provider Consulted		
Dermatologist	180	54.7
General Physician	125	38.0
Hakeem/Traditional Healer	34	10.3
No Consultation (Self-medication only)	89	27.1
Healthcare Facility Utilized		
Private Clinic/Hospital	208	63.2
Government Hospital	81	24.6

Pharmacy Consultation	40	12.2
Treatment Modalities Used (Multiple responses)		
Over-the-counter topical products	235	71.4
Prescription topical medications	178	54.1
Oral antibiotics	98	29.8
Herbal/home remedies	134	40.7
Procedural treatments (peels/laser)	23	7.0
Previous Treatment History		
Currently on treatment	187	56.8
Previously treated, discontinued	94	28.6
Never sought treatment	48	14.6
Reason for Treatment Discontinuation (n=94)		
High cost	38	40.4
Perceived ineffectiveness	29	30.9
Side effects	16	17.0
Improved on own	11	11.7
Economic/Utilization Variable		Frequency (n) Percentage (%)
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Private Clinic/Hospital	208	63.2
Government Hospital	81	24.6
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Currently on treatment	187	56.8
Previously treated, discontinued	94	28.6
Never sought treatment	48	14.6
Reason for Treatment Discontinuation (n=94)		
High cost	38	40.4
Perceived ineffectiveness	29	30.9
Side effects	16	17.0
Improved on own	11	11.7

5. Discussion

Our study has reported high levels of prevalence of acne among the adolescent group population in Hyderabad, Sindh (75.3%), which is consistent with modern global epidemiological results. Our prevalence rates significantly exceed the 14.47% reported in female medical students in Rawalpindi and Islamabad (Babar and Mobeen, 2019), although they are more consistent with the trend noticed in the rest of the world (about 85% of the people of the 12-24 years age group experience acne to some extent) (Reynolds et al., 2024). The growing global burden of acne is supported by recent findings based on the Global Burden of Disease Study 2021 which reported 184.3 million prevalent cases of acne in adolescents and young adults in 2021 (Zhu et al., 2025). This difference in the prevalence rates in various areas of Pakistan illustrates the need to perform epidemiological researches on specific areas and learn about the local trends. The gender distribution of this research; where females have a higher prevalence of acne (78.8 percent) than males (70.5 percent) is in line with the modern literature. The recent world-wide research conducted by various studies proves that females are at risk of acnes approximately 25 per cent more than males are (Zhu et al., 2025; Saurat et al., 2024). In a multiethnic study of Rotterdam, the prevalence of visible acnes was found to be 62 and 45 in girls and boys respectively, which confirms our results of female predomination (Witkam et al., 2024). The difference in gender has been explained by the differences in the hormonal patterns where females have a longer-lasting acne up to adulthood because of the fluctuations in hormones associated with menstrual cycles and other endocrine variations. The severity distribution in the present study which was dominated by mild acne (41.6 percent) then moderate acne was the next prevalent (28.4 percent) is in tandem with the global statistics. Recent systematic reviews exploring the epidemiology of acne discovered that mild acne was always the most common type of acne in various populations (Heng & Chew, 2020). This pattern has been reported by the studies of different countries, where mild to moderate acne forms the largest part of all cases worldwide (Li et al., 2024; Alshammrie et al., 2020). The high percentage of facial involvement (89.3) as seen under this study is universal to all the world literature as sebaceous glands mostly cover the regions where acne occurs. In this study, family history became an important predictor of the occurrence of acne with 60.2% of the participants with acne having positive family history. It is confirmed by strong epidemiological evidence of the genetic studies at hand. The systematic reviews have shown that there is high genetic predisposition with pooled odds ratios of 2.91 (95% CI 2.58-3.28) of genetic predisposition through family history (Heng and Chew, 2020). The recent genome-wide association studies have found several new loci that put a person at risk of acne, highlighting the polygenic nature of the condition (Teder-Laving et al., 2024). Twin studies have revealed that 81 percent of the variability of acne can be explained by the additive impact of genetic factors, and the remaining 19 percent is explained

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by the unique environmental factors (Kim and Kim, 2024). The quality-of-life impact measure as assessed by Cardiff Acnes Disability Index indicated that there was a significant impairment with the mean CADI of 6.842 being 4.2 with moderate effects of the Acnes on the daily life of the participants. This observation is in line with other studies conducted around the world using CADI as an adolescent tool, which have consistently recorded scores within the range of 4-8 on adolescents who have mild to moderate acne (Abdelrazik et al., 2021). Recent research showed that, in adolescents, acne significantly leads to poor quality of life, and the psychosocial burden of adult patients is equal to that of adolescent patients (Özkesici Kurt, 2022; Eyuboglu et al., 2018). This was affirmed after a thorough scrutiny of CADI applications in various countries showed that it was reliable to identify quality of life impairment in teenagers (Abdelrazik et al., 2021). The high level of association between stress levels and prevalence of acne in this study ($p=0.006$) is consistent with the increasing evidence of psychosocial factors in the pathogenesis of acne. The recent studies that explore the stress-inducing mechanisms have discovered that stress has an effect on acne through hormonal variations, inflammation, immune, changes in skin barrier, and changes in lifestyle. Meta-analysis reviews have identified that acnes vulgaris is significantly associated with depression ($r=0.22$) as well as anxiety ($r=0.25$) and that acne and stress are two-way related (Samuels et al., 2020). Research conducted on various populations has continuously demonstrated that stress correlates with the severity of acne with psychological stress possibly worsening acne by hormonal mechanisms and acne itself growing causes of psychological stress (Kapur, 2018; Guleria et al., 2025). Knowledge and perception assessment showed unbalanced knowledge on the cause of acne, and 64.3% of the respondents adequate identified hormonal changes as a key cause of acne. Nevertheless, there were still serious misunderstandings and the figure that blamed poor hygiene was 42.1%. The results are in line with the international trends of acne knowledge and myths, showing that there is always a need to focus on educational interventions that help to overcome myths related to the cause of acne (Dreno et al., 2004). The recent research has highlighted the significance of evidence based health education programs to enhance the acne knowledge in adolescents (Tayel et al., 2020). The scholastic and social effects of acne that were seen in the research as 45.3 percent reported that were experiencing academic performance and 34.7 percent said they were bullied or teased are part of the bigger picture of this disease. Other recent research studies have investigated the psychosocial effects of acne in adolescents, with similar levels of social problems and academic disruption (Hopkins et al., 2022; Morshed et al., 2023). It highlights the significance of focusing on both physical and psychosocial outcomes of acnes and managing it across the board using both medical and psychological interventions (Dreno et al., 2019).

As found in the economic burden of this study, a significant financial implication of acne on the affected adolescents and their families is present in the local context. Most of those with active acne (61.7) had out-of-pocket spending between 500 and 2,000 rupees in a month with 18.2 spending above 2,000 rupees per month. Such consumption trends are quite alarming considering the fact that 40.6 percent of the population under study lived in households earning less than Rs. 50,000 per month meaning that acne-related expenses could be an unwarranted financial burden on less well-off families. The observation that 40.4% of participants who terminated their treatment treatment cited high cost as the most common factor is in line with the available evidence on low- and middle-income country contexts where financial limitations are a key causative factor of early treatment discontinuation and adverse treatment outcomes (Al-Worafi et al., 2024). This economic based termination will probably continue to raise the higher period of disease and higher cumulative cost per unit of time, which eventually deteriorates both clinical and financial performance. One of the common behavioral patterns demonstrated in this research is the dominance of self-medication, where 71.4% of the respondents respond by using over-the-counter topical products without the advice

of a medical professional, and this tendency is widely reported in the literature as a behavioral pattern in under-resourced environments where accessing formal healthcare is seen as expensive (Al-Worafi et al., 2024). Although self-medication could save the immediate costs of consultation, it often leads to the inefficient treatment of the disease, increases the duration of its course, and may cause harmful outcomes due to using the incorrect products, which increases the economic burden in the long term (Shields et al., 2023). This tendency is also aggravated by the finding that the level of engagement of health workers as the main source of acne-related information was only 23.6 percent among the respondents, implying that the majority of the affected teenagers may not receive the necessary treatment advice on the healthcare provider level. The strong correlation between acne severity and monthly spending ($p=0.003$) further highlights that with an increase in disease severity, the expenditure increases and this may once again point towards the importance of early and effective intervention to limit the disease severity to less severe and more affordable phases of the disease (Zhu et al., 2025). The patterns of healthcare utilization used in this study showed that the most commonly used facility was a private clinic (63.2%), which was rather expensive, but then there were government hospitals (24.6%). This party of preference private healthcare over the increased financial expenditure is an indication of perceived insufficiency of the government dermatological services among the targeted population of this study, which has significant implications on the allocation of resources to public health and the empowerment of the dermatological services in the government healthcare system in Sindh (Babar and Mobeen, 2019). All these economic results indicate that a combination of low cost, accessibility, and evidence-based management pathways in the acne issue needs to be integrated into the social health structure to lower the economic strain on adolescents and their families (Al-Worafi et al., 2024; Shields et al., 2023). The findings of the current study will provide valuable epidemiological information to the very scanty body of literature concerning the prevalence and effects of acne among Pakistani adolescents. The observed prevalence rates with a high quality of life impact, persistent gaps in knowledge, and a quantifiable economic impact of the high out-of-pocket spending and treatment discontinuation on financial grounds indicate the necessity to implement stronger strategies to tackle acne management in this population group in terms of public health. Close correlations between family history, stress levels, acne severity and economic spending, and other lifestyle variables are valuable data to consider risk stratification and specific interventions (Heng and Chew, 2020; Zhu et al., 2025).

6. Conclusion

The study shows a high level of prevalence of acne (75.3) in teenagers in Hyderabad, Sindh with significant gender difference with females having higher prevalence than males. Mild-severe acne was the most common clinical presentation in 41.6% of people with the manifestation of acne. The condition exerted significant effects on the quality of life among the participants leading to moderate level of functional impairment using standardized assessment instruments. Among the highly predictive factors in developing acne, it was found that the family history, gender, age, and stress levels play a crucial role in the development of acne, which proves to be consistent with the global epidemiological tendencies. Although members showed acceptable knowledge when it came to hormonal etiology of acne, there was still a great deal of knowledge vacuum in the area of hygiene-related myths. Moreover, the paper also notes that there is an important economic cost of acne management in this population where most of the afflicted teenagers have prominent out-of-pocket spending per month, prevalent self-medication, and high treatment-discontinuation rates due to financial limitations. The great association existing between the level of acnes severity and financial spending highlights the economic worth of clinical care in a timely and effective way. The fact that most people

are using the services of private medical institutions at the expense of the healthcare system also speaks volumes of the necessity to empower the availability of accessible dermatological services in the community. The findings presented above highlight the need to implement evidence-based management approaches that support the physical and psychosocial aspects of acne and provide the most economically accessible treatment options, in conjunction with specific educational programs to improve the knowledge level and reduce the level of stigmatization towards acne among adolescents in this group.

AUTHOR'S CONTRIBUTION AND DECLARATIONS

Conception or Design: Uzma Dost Muhammad Rajar Data Collection and processing, Analysis or Interpretation of Data: Uzma Dost Muhammad Rajar & Waseem Asif Arain

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Research Involving Human Participants, Children, Animals, or Plants: Ethical Approval was taken (BSLC-IRB/2024/003) The author(s) affirm full compliance with international ethical standards for research and publication

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