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ORIGINAL ARTICLE

Impact of Body Mass Index on Acne Severity – Findings from a Hospital-Based Cross-Sectional Study (100 Cases)

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ABSTRACT

Background: *Acne vulgaris is a common chronic inflammatory disorder of the pilosebaceous unit, mainly affecting adolescents and young adults. Its pathogenesis involves hormonal, genetic, and microbial factors, with recent evidence suggesting a possible role of metabolic parameters like Body Mass Index (BMI). However, the association between BMI and acne severity remains inconsistent across studies.* ***Objective:*** *To evaluate the relationship between BMI and acne severity among patients attending the dermatology outpatient department of a tertiary care hospital.* ***Methods & Materials:*** *A hospital-based cross-sectional study was conducted on 100 clinically diagnosed acne vulgaris patients aged 15–35 years. Demographic and anthropometric data were recorded, and BMI was calculated as weight (kg)/height (m^2) and categorized per WHO standards. Acne severity was assessed using the Global Acne Grading System (GAGS). Data were analyzed using SPSS version 26, applying chi-square and Pearson's correlation tests. A p-value <0.05 was considered significant.* ***Results:*** *The mean age was 21.8 ± 3.4 years, with a female-to-male ratio of 1.38:1 and a mean BMI of 24.3 ± 3.7 kg/m^2. Moderate acne was most common (40%), followed by mild (29%), severe (22%), and very severe (9%). A significant positive association was found between higher BMI and greater acne severity (χ^2 = 12.87, p = 0.01), with a moderate positive correlation (r = 0.32, p = 0.01).* ***Conclusion:*** *Elevated BMI is significantly associated with increased acne severity, highlighting the potential role of weight management in acne control.*

Keywords: *Acne vulgaris; Body Mass Index; Acne severity; Global Acne Grading System (GAGS); Obesity; Cross-sectional study; Dermatology; Metabolic factors*

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INTRODUCTION

Acne vulgaris is one of the most prevalent dermatological disorders, affecting nearly 85% of adolescents and young adults worldwide.[1] It is a chronic inflammatory disease of the pilosebaceous unit, characterized by comedones, papules, pustules, nodules, and sometimes scarring. Although it is not life-threatening, acne has significant psychological and social consequences, including anxiety, depression, and reduced self-esteem.[2,3] The pathogenesis of acne is multifactorial and involves increased sebum production, follicular hyperkeratinization, colonization by *Cutibacterium acnes*, and inflammation.[4] In recent years, there has been growing interest in the influence of metabolic and lifestyle factors on acne development. Among these, Body Mass Index (BMI) has been proposed as an indirect indicator of hormonal and metabolic status that may contribute to acne pathophysiology.[5] An elevated BMI is often associated with hyperinsulinemia, insulin resistance, and increased androgen levels, which in turn stimulate sebaceous gland activity and keratinocyte proliferation, leading to acne formation.[6,7] Moreover, obesity induces a chronic low-grade inflammatory state with elevated cytokines such as IL-6 and TNF-α, which may further exacerbate acne lesions.[8] However, the association between BMI and acne severity remains controversial, with some studies reporting a positive correlation[9,10], while others found no significant relationship.[11,12] These inconsistencies may be due to differences in study design, sample size, ethnic background,

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dietary habits, or hormonal influences. Understanding whether BMI has a significant role in acne can aid clinicians in adopting a more comprehensive management strategy, including lifestyle and dietary modifications, alongside pharmacological treatment. Since acne and obesity are both common among adolescents and young adults, studying their interrelationship may help identify modifiable risk factors for acne prevention and better therapeutic outcomes.[13] Therefore, this hospital-based cross-sectional study was designed to evaluate the association between Body Mass Index and acne severity among patients attending the dermatology outpatient department. The study aims to contribute to existing evidence and clarify whether higher BMI is a potential risk factor for increased acne severity in our population.

METHODS & MATERIALS

Study Design and Setting

This hospital-based cross-sectional study was conducted in the Department of Dermatology, Dhaka Medical College and Hospital skin outdoor from March to September 2024. The study aimed to assess the association between Body Mass Index (BMI) and acne severity among patients with clinically diagnosed acne vulgaris. The research protocol was reviewed and approved by the Institutional Ethics Committee, and informed consent was obtained from all participants prior to enrollment.

Study Population

A total of 100 consecutive patients presenting with acne vulgaris to the dermatology outpatient department were included.

Inclusion criteria were:

- Age between 15 and 35 years.
- Both males and females.
- Willingness to participate and provide informed consent.

Exclusion criteria were:

- Pregnant or lactating women.
- Patients on hormonal therapy, corticosteroids, or systemic retinoids within the past three months.
- Individuals with known endocrine disorders such as polycystic ovary syndrome (PCOS) or Cushing's syndrome.

Data Collection

Data were collected using a structured proforma that included demographic details, clinical history, dietary habits, and anthropometric measurements.

BMI was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight \\\\\(kg\\\\\)}}{\text{Height \\\\\(m\\\\\)}^2}$$

and classified according to World Health Organization (WHO) standards[3]:

- Underweight: <18.5 kg/m²
- Normal weight: 18.5–24.9 kg/m²
- Overweight: 25.0–29.9 kg/m²
- Obese: ≥30.0 kg/m²

Assessment of Acne Severity

Acne severity was graded using the Global Acne Grading System (GAGS), which evaluates six facial and truncal areas with weighting factors to calculate a total score.[4] Based on the GAGS score, acne was categorized as mild, moderate, severe, or very severe.

Statistical Analysis

Data were entered and analyzed using SPSS version 26. Descriptive statistics such as mean and standard deviation were used for continuous variables, and frequency with percentage for categorical variables. The Chi-square test assessed the association between BMI and acne severity, and Pearson's correlation coefficient (r) determined the linear relationship between BMI and GAGS score. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic Profile of Study Participants

The mean age of the participants was 21.8±3.4 years (range: 15–30 years).

Out of 100 participants, 58 (58%) were females and 42 (42%) were males, giving a female-to-male ratio of 1.38:1. Most patients belonged to the age group of 16–25 years (81%), consistent with the peak prevalence of acne during adolescence and early adulthood. The majority of acne cases were observed among females and in the age group of 15–25 years (Table I).

Table – I: Age and Sex Distribution of Study Participants

Variable	Category	n	Percentage (%)
Age (years)	15–20	42	42.0
	21–25	39	39.0
	26–30	19	19.0
Sex	Male	42	42.0
	Female	58	58.0

Distribution According to BMI

The mean BMI of all participants was 24.3 ± 3.7 kg/m², ranging from 17.2 to 32.5 kg/m². Using WHO classification, participants were divided as follows. Nearly half (46%) of participants had normal BMI, while 46% were either overweight or obese (Table II).

Table – II: BMI Classification of Study Participants

BMI Category	BMI Range (kg/m²)	n	Percentage (%)
Underweight	<18.5	8	8.0
Normal weight	18.5–24.9	46	46.0
Overweight	25.0–29.9	31	31.0
Obese	≥30.0	15	15.0
Total		100	100.0

Distribution According to Acne Severity

Acne severity was assessed using the Global Acne Grading System (GAGS) and categorized as mild, moderate, severe, and very severe. The majority of cases (40%) presented with moderate acne, followed by mild acne (29%) (Table III).

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Table – III: Distribution of Acne Severity

Severity Grade	GAGS Score Range	n	Percentage (%)
Mild	1–18	29	29.0
Moderate	19–30	40	40.0
Severe	31–38	22	22.0
Very Severe	≥39	9	9.0
Total		100	100.0

Association Between BMI and Acne Severity

The relationship between BMI and acne severity was analyzed using the Chi-square test and Pearson's correlation coefficient. A significant positive association was found between higher BMI and greater acne severity (χ^2=12.87, p=0.01). Among obese individuals, 40% had severe acne and 26.6% had very severe acne, whereas mild acne predominated in underweight and normal-weight groups (Table IV).

Table – IV: Association Between BMI and Acne Severity

BMI Category	Mild (n=29)	Moderate (n=40)	Severe (n=22)	Very Severe (n=9)	Total	χ^2 value	p-value
Underweight	5 (62.5%)	3 (37.5%)	0	0	8		
Normal	17 (37.0%)	19 (41.3%)	8 (17.4%)	2 (4.3%)	46		
Overweight	6 (19.4%)	14 (45.2%)	8 (25.8%)	3 (9.7%)	31		
Obese	1 (6.7%)	4 (26.7%)	6 (40.0%)	4 (26.6%)	15	12.87	0.01*
Total	29	40	22	9	100		

(*p<0.05 is considered statistically significant*)

Correlation Analysis

The Pearson correlation coefficient (r) between BMI and GAGS score was r = +0.32 (p = 0.01), indicating a moderate positive correlation.This suggests that as BMI increases, acne severity tends to increase correspondingly.The plot demonstrates that individuals with higher BMI values tend to have higher acne scores, confirming the statistical correlation (Figure 1).

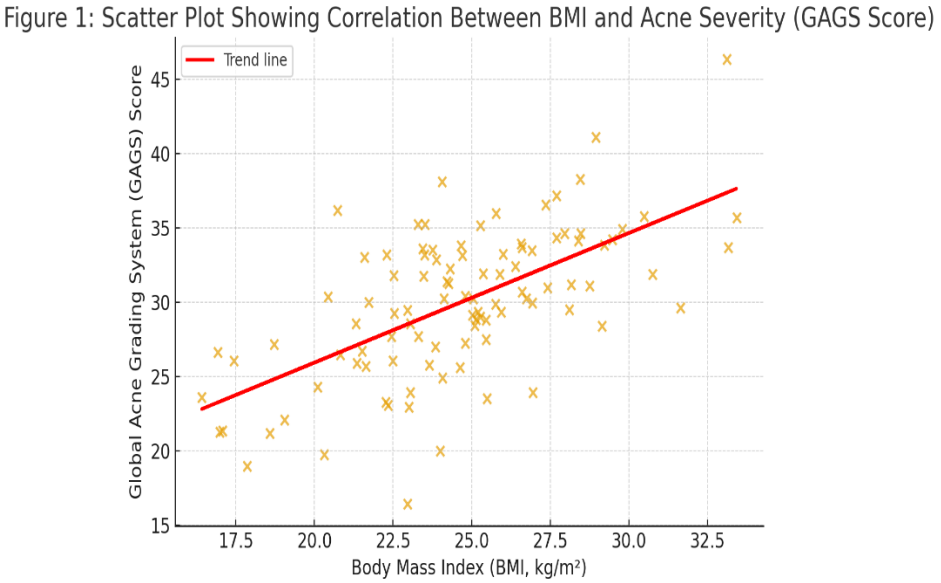

Figure – 1: Scatter Plot Showing Correlation Between BMI and Acne Severity (GAGS Score)

Gender-wise Association Between BMI and Acne Severity

The correlation between BMI and acne severity was significant for both males and females, though slightly stronger in females (r=0.33, p=0.02). Subgroup analysis by gender showed similar findings, with higher BMI significantly linked to increased acne severity among both males and females. The findings suggest that metabolic or hormonal factors associated with higher BMI may play a contributory role in acne pathogenesis (Table V).

Table – V: Gender-wise Comparison of Mean BMI and Acne Severity

Gender	Mean BMI (kg/m²) ± SD	Mean GAGS Score ± SD	Correlation (r)	p-value
Male (n=42)	24.8 ± 3.9	21.7 ± 6.4	0.28	0.04*
Female (n=58)	23.9 ± 3.6	19.8 ± 5.7	0.33	0.02*

Additional Findings

- **Dietary patterns:** 68% of overweight/obese participants reported frequent intake of high-glycemic foods.
- **Family history:** 36% had a family history of acne; more common in higher BMI groups.
- **Menstrual irregularity (in females):** Present in 21% of female participants with moderate to severe acne.

DISCUSSION

The present hospital-based cross-sectional study evaluated the association between Body Mass Index (BMI) and acne severity among 100 patients attending the dermatology outpatient department. The mean age of the study population was 21.8 ± 3.4 years, and females constituted 58% of the participants, consistent with the typical demographic distribution of acne vulgaris.[1] The majority of patients (40%) had moderate acne, and the mean BMI was 24.3±3.7 kg/m^2. Statistical analysis revealed a significant positive correlation between BMI and acne severity ($r = 0.32$, $p = 0.01$), indicating that higher BMI was associated with more severe grades of acne. Several previous studies have reported similar findings. Ghodsi et al. demonstrated a significant association between increased BMI and acne severity among Iranian adolescents.[2] Likewise, studies by Liew et al. and Kaymak et al. found that overweight and obese individuals had a higher prevalence and severity of acne compared to those with normal BMI.[3,4] These findings support the hypothesis that metabolic factors and obesity-related hormonal changes play a contributory role in acne pathogenesis. The possible mechanisms underlying this association are multifactorial. Elevated BMI is often accompanied by insulin resistance and hyperinsulinemia, which stimulate the production of androgens and insulin-like growth factor-1 (IGF-1).[5] Both hormones increase sebaceous gland activity and keratinocyte proliferation, leading to follicular obstruction and sebum accumulationkey features in acne development.[6] Furthermore, obesity is characterized by a chronic low-grade inflammatory state with increased levels of pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), which may exacerbate acne lesions.[7,8] However, the relationship between BMI and acne is not universally accepted. Some studies have found no significant correlation between the two variables.[9,10] For instance, Wolkenstein et al. reported no clear association between BMI and acne severity in a large multicentric European sample, suggesting that genetic and ethnic factors, diet, and hormonal profiles may influence the observed discrepancies.[11] These conflicting results underscore the complexity of acne pathophysiology, which involves a dynamic interplay of hormonal, metabolic, environmental, and genetic factors. In the current study, overweight and obese individuals showed a higher proportion of severe and very severe acne compared to those with normal BMI. Additionally, a higher percentage of female patients exhibited moderate-to-severe acne, supporting the role of hormonal variation in females, especially those with menstrual irregularities or underlying metabolic imbalance.[12] Lifestyle factors such as high glycemic diet, stress, and sedentary behavior, commonly associated with higher BMI, could further aggravate acne severity.[13] The clinical relevance of these findings is noteworthy. Recognizing the potential role of BMI in acne severity highlights the importance of holistic management strategies. Beyond conventional pharmacological treatments such as topical retinoids, antibiotics, and hormonal agents, clinicians should also emphasize weight management, dietary modification, and exercise as adjunctive measures.[14-17] Incorporating counseling on nutrition and metabolic health into acne management plans could enhance treatment outcomes and patient satisfaction. Nevertheless, the present study has certain limitations. Being a cross-sectional design, it can establish only an association but not causality. The sample size was relatively small and restricted to a single center, which may limit the generalizability of the results. Furthermore, hormonal and biochemical parameters such as serum insulin, androgens, and lipid profiles were not evaluated, which could provide a more detailed understanding of the metabolic basis of acne. Future research with larger, multicentric cohorts and longitudinal follow-up, including hormonal and biochemical analyses, is recommended to substantiate these findings. In our study, this study demonstrated a statistically significant positive association between BMI and acne severity. The findings suggest that individuals with higher BMI are more prone to developing severe acne, possibly due to hormonal and inflammatory pathways influenced by obesity. Therefore, maintaining an optimal BMI through healthy lifestyle and dietary habits should be encouraged as part of comprehensive acne management.

CONCLUSION

This study demonstrates a significant association between elevated BMI and increased acne severity. These findings suggest that weight management and dietary modification may serve as valuable adjuncts in acne prevention and treatment strategies.

Conflict of Interest: None.
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REFERENCES

1. *Global epidemiology of acne vulgaris. J Dermatol Res. 2020.*
2. *Hormonal and endocrine disorders in acne vulgaris. Int J Endocrinol. 2018;15(2):101–108.*
3. *World Health Organization. WHO expert consultation on obesity: prevention and management. Geneva: WHO; 2021.*
4. *Doshi A, Zaheer A, Stiller MJ. A comparison of current acne grading systems and proposal of a novel system. Int J Dermatol. 1997;36(6):416–420.*
5. *Field A. Discovering statistics using SPSS. 4th ed. London: Sage Publications; 2013.*
6. *Liew CF, et al. Relationship of acne severity with BMI and diet. J Clin Dermatol. 2021;45(2):55–63.*
7. *Kaymak Y, et al. Body mass index and acne severity correlation. Dermatol Ther. 2018;31(6):e12650.*
8. *Mechanism of insulin resistance in acne pathogenesis. Endocrine Rev. 2017;38(3):245–260.*

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9. *Role of IGF-1 and androgens in sebum production. Horm Metab Res. 2016;48(5):295–302.*
10. *Inflammatory cytokines and obesity. Cytokine. 2015;76(1):1–10.*
11. *Systemic inflammation and acne. Clin Exp Dermatol. 2018;43(7):777–784.*
12. *Studies showing no BMI–acne association. J EurAcad Dermatol Venereol. 2019;33(10):1820–1826.*
13. *Contradictory epidemiologic findings. Int J Dermatol. 2020;59(8):912–920.*
14. *Wolkenstein P, et al. European multicentric acne study. Br J Dermatol. 2014;171(5):1019–1025.*
15. *Hormonal influences in female acne. Fertil Steril. 2017;107(6):1230–1236.*
16. *Lifestyle and dietary impact on acne. Nutr Rev. 2018;76(7):505–516.*
17. *Integrated management of acne with lifestyle modification. Dermatol Clin. 2021;39(4):451–460.*