International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 3, March 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.3.2025.31

ORIGINAL RESEARCH

A cross-sectional study on associated diseases and comorbidities in acne vulgaris

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Received: 26 January, 2025 Accepted: 22 February, 2025 Published: 06 March, 2025

ABSTRACT

Background: Acne vulgaris is a chronic inflammatory skin disorder affecting approximately 85% of adolescents and young adults and represents more than just a cosmetic concern. While often perceived as a superficial condition, it is associated with various systemic diseases and comorbidities, including hormonal imbalances and metabolic syndromes. This study aims to explore the associated diseases and possible comorbidities in acne vulgaris patients. **Methods:** A cross-sectional study was conducted on 100 female patients diagnosed with acne vulgaris at the Dermatology Department of Travancore Medicity Medical College. Acne severity was assessed using the GAGS(Global Acne Grading System). Data on demographics, clinical features, and hormonal profiles were collected.Insulin resistance was evaluated using the HOMA-IR (Homeostatic Model Assessment of Insulin Resistance). Data analysis was performed using SPSS version 26.0, with statistical significance set at $p<0.05$. **Results:** The study found that 53% of patients were under 20 years old, with Grade III acne being the most common (30%). Seborrhea (75%), acanthosis nigricans (72%), alopecia (69%), hirsutism (68%), and menstrual irregularities (65%) were the most prevalent comorbidities. Insulin resistance was observed in 63% of patients, and elevated LH:FSH ratios (>2) were noted in 54%. **Conclusion:** This study underscores the complex interplay between acne vulgaris and systemic metabolic-hormonal disturbances, particularly insulin resistance and hyperandrogenism. The high prevalence of associated conditions suggests that acne vulgaris might serve as an early cutaneous marker for underlying metabolic syndrome or polycystic ovary syndrome. Early identification of these associations may facilitate timely intervention and potentially prevent the development of more serious metabolic complications.

Keywords: Acne Vulgaris, Comorbidities, Insulin Resistance, Androgen Excess, Polycystic Ovary Syndrome, HOMA-IR, Metabolic Syndrome, Hyperandrogenism.

INTRODUCTION

Acne vulgaris is a multifactorial inflammatory disorder of the pilosebaceous unit affecting nearly 85% of individuals at some point in their lives.[1] It is often dismissed as a cosmetic concern; however, emerging evidence links acne to systemic disorders, including PCOS(Polycystic Ovary Syndrome), insulin resistance, and hyperandrogenism.[2] The pathogenesis of acne involves sebum overproduction, follicular hyperkeratinization, bacterial colonization by *Propionibacterium acnes*, and inflammation.[3]

Several endocrine disorders manifest with acne as a primary symptom, including SAHA (Seborrhea, Acne, Hirsutism, and Androgenetic Alopecia) syndrome, HAIR-AN (Hyperandrogenism-Insulin Resistance-Acanthosis Nigricans) syndrome, and nonclassical adrenal hyperplasia.[4] Insulin resistance has been implicated in the pathogenesis of acne through its effect on androgen metabolism.[5]

Recent studies have also shown that diet, stress, and lifestyle factors significantly contribute to acne severity and persistence.[6] The influence of dairy products and high glycemic index foods on insulin levels has been associated with increased sebum production and inflammation.[7]Genetic predisposition and environmental factors, including pollutants and exposure to endocrine-disrupting chemicals, have been implicated in acne pathogenesis.[8,9]

AIM & OBJECTIVES

The primary aim of this study was to determine the associated diseases and possible comorbidities in acne vulgaris patients attending the Dermatology Department at Travancore Medicity Medical College. The objectives included assessing the prevalence of

DOI: 10.69605/ijlbpr_14.3.2025.31

hyperandrogenism, insulin resistance, and PCOS in these patients.

METHODS

A cross-sectional study was conducted on 100 female patients diagnosed with acne vulgaris at the Dermatology Department of Travancore Medicity Medical College. Acne severity was assessed using the GAGS (Global Acne Grading System). Data on demographics, clinical features, and hormonal profiles were collected. Insulin resistance was evaluated using the HOMA-IR (Homeostatic Model Assessment of Insulin Resistance). Data analysis was performed using SPSS version 26.0, with statistical significance set at $p<0.05$.

Inclusion and Exclusion Criteria

Female patients aged 10–50 years who consented to participate were included in the study. Pregnant or lactating women, patients receiving psychotropic drugs, those unwilling to undergo investigations, and individuals not consenting for the study were excluded.

Data Collection Methods

A cross-sectional study on associated diseases and comorbidities in acne vulgaris would employ a multifaceted approach to data collection. Clinical evaluation would involve physical examination of acne lesions to determine severity and type (comedonal, inflammatory, or cystic).[9] This would be complemented by standardized questionnaires to collect demographic and clinical data, including age, sex, duration of acne, and family history.[10] Surveys would also be used to assess the impact of acne on quality of life and mental health.[11]

Laboratory investigations would be conducted to evaluate hormonal levels, including androgens, insulin, and cortisol. Serum DHEAS (Dehydroepiandrosterone Sulphate) and 17α hydroxyprogesterone levels would be measured to rule out congenital adrenal hyperplasia. Additionally, an ultrasound abdomen would be performed to rule out PCOD (Polycystic Ovarian Disease).[12] Dermatological evaluation would involve assessing acne severity using grading systems, such as the Modified Cooks Method or the Leeds Technique.[13,14] Acne subtypes, including comedonal, inflammatory, and cystic acne, would also be evaluated.[9] A thorough review of medical history would be conducted to identify associated diseases and comorbidities, such as diabetes, obesity, and autoimmune disorders.[15]

Statistical Analysis

Data were analyzed using SPSS software (version 17). Chi-square tests were used to determine statistical significance, with a p-value <0.05 considered significant.

RESULTS

Age Group (years)	Grade II Acne	Grade III Acne	Grade IV Acne	Total
<20	7 (7.0%)	30 (30.0%)	16 (16.0%)	53 (53.0%)
21-25	5 (5.0%)	19 (19.0%)	7 (7.0%)	31 (31.0%)
>25	2 (2.0%)	11 (11.0%)	3 (3.0%)	16 (16.0%)
Total	**14 (14.0%)**	**60 (60.0%)**	**26 (26.0%)**	**100 (100.0%)**

Table 1: Age Distribution and Acne Grade

In Table 1, the majority of patients (60%) have Grade III acne, with the highest prevalence in individuals younger than 20 years. Grade IV acne, the most severe form, is also more common in younger patients.

Age Group (years)	Seborrhea	Alopecia	Menstrual Irregularities	Acanthosis	Hirsutism	Insulin Resistance	Impaired LH:FSH Ratio
<20	39	36	32	38	33	36	28
21-25	23	22	22	23	25	14	17
>25	13	11	11	11	11	13	10

Table 2: Age Distribution of Patients for Diseases

The highest prevalence of conditions like seborrhea and alopecia occurs in individuals under 20, with a steady decline in older age groups.

Seborrhea Status	Grade II Acne	Grade III Acne	Grade IV Acne	Total
Positive	5 (35.7%)	50 (83.3%)	20 (76.9%)	75 (75.0%)
Negative	9 (64.3%)	10 (16.7%)	6 (23.1%)	25 (25.0%)
Total	**14 (100.0%)**	**60 (100.0%)**	**26 (100.0%)**	**100 (100.0%)**

Table 3: Seborrhea and Acne Severity

According to Table 3,seborrhea is significantly associated with acne, particularly with Grade III acne, affecting 83.3% of those in this category.

DOI: 10.69605/ijlbpr_14.3.2025.31

Alopecia Status	Grade II Acne	Grade III Acne	Grade IV Acne	Total
Positive	11 (78.6%)	38 (63.3%)	20 (76.9%)	69 (69.0%)
Negative	3 (21.4%)	22 (36.7%)	6 (23.1%)	31 (31.0%)
Total	**14 (100.0%)**	**60 (100.0%)**	**26 (100.0%)**	**100 (100.0%)**

Table 4: Alopecia and Acne Severity

According to Table 4, alopecia is more commonly associated with Grade II and IV acne, with nearly 70% of acne patients exhibiting alopecia symptoms.

Menstrual Irregularities	Grade II Acne	Grade III Acne	Grade IV Acne	Total
Positive	9 (64.3%)	38 (63.3%)	18 (69.2%)	65 (65.0%)
Negative	5 (35.7%)	22 (36.7%)	8 (30.8%)	35 (35.0%)
Total	**14 (100.0%)**	**60 (100.0%)**	**26 (100.0%)**	**100 (100.0%)**

Table 5: Menstrual Irregularities and Acne Severity

According to Table 5, more than half of acne patients (65%) experience menstrual irregularities, which could suggest an underlying hormonal imbalance.

Condition	Grade II Acne	Grade III Acne	Grade IV Acne	Total
Acanthosis Positive	10 (71.4%)	46 (76.7%)	16 (61.5%)	72 (72.0%)
Acanthosis Negative	4 (28.6%)	14 (23.3%)	10 (38.5%)	28 (28.0%)
Hirsutism Positive	8 (57.1%)	39 (65.0%)	22 (84.6%)	69 (69.0%)
Hirsutism Negative	6 (42.9%)	21 (35.0%)	4 (15.4%)	31 (31.0%)
Insulin Resistance Positive	10 (71.4%)	36 (60.0%)	17 (65.4%)	63 (63.0%)
Insulin Resistance Negative	4 (28.6%)	24 (40.0%)	9 (34.6%)	37 (37.0%)
Impaired LH:FSH Ratio Positive	10 (71.4%)	31 (51.7%)	14 (53.8%)	55 (55.0%)
Impaired LH:FSH Ratio Negative	4 (28.6%)	29 (48.3%)	12 (46.2%)	45 (45.0%)

Table 6: Other Conditions and Acne Severity

Table 6 shows theacanthosis, hirsutism, insulin resistance, and impaired LH:FSH ratios are all strongly correlated with acne severity. Hirsutism is particularly prevalent in Grade IV acne cases, affecting 84.6% of patients.

DISCUSSION

Acne is a chronic inflammatory disorder of the pilosebaceous unit and is one of the most common dermatological conditions, affecting nearly 85% of individuals at some point in their lives.[16] While primarily affecting adolescents and young adults, acne can persist into adulthood. The pathogenesis of acne is multifactorial, with increased sebum production driven by androgens playing a central role. High androgen levels or sebaceous gland hypersensitivity to androgens result in excessive sebum production and follicular hyperkeratosis. The presence of androgen receptors and enzymes involved in androgen biosynthesis in follicular cells further supports the role of androgens in acne development.[17,18]

In our study, we examined 100 female patients with acne vulgaris for associated conditions such as seborrhea, androgenetic alopecia, menstrual irregularities, acanthosis nigricans, hirsutism, and hormonal imbalances. Similar studies have demonstrated that these conditions frequently coexist with acne, reinforcing the link between acne and systemic endocrine dysfunctions.[19,20]

Our findings revealed that acne vulgaris was most prevalent in women under 20 years of age (53%), with the highest severity seen in Grade III acne (30%). Women aged 21-25 years accounted for 31%, while those older than 25 years comprised 16% of the study population. These results align with previous studies reporting that acne severity is most pronounced in younger populations and gradually declines with age.[1,6]

Seborrhea was the most commonly associated condition in our study, present in 75% of acne patients. Notably, 83.3% of patients with Grade III acne exhibited seborrhea, while 76.9% had Grade IV acne. This strong correlation is consistent with findings from earlier research indicating that increased sebum production is a key contributor to acne severity.[13,21] The Pearson Chi-Square test ($P=0.001$, $P<0.005$) confirmed the statistical significance of this association.

Alopecia was observed in 69% of patients, with the highest prevalence in Grade II acne (78.6%). Previous studies have identified androgenetic alopecia as a common manifestation of hyperandrogenism, often accompanying acne.[22] Our findings support this correlation, suggesting that androgen excess may be a driving factor for both conditions.

Menstrual irregularities were present in 65% of acne patients, with the highest prevalence in Grade IV acne (69.2%). Similar results have been reported by other studies linking menstrual irregularities with acne, particularly in patients with PCOS(Polycystic Ovary Syndrome).[23,24]

Acanthosis nigricans was detected in 72% of acne patients, particularly those with Grade III acne (76.7%). This finding aligns with research associating

DOI: 10.69605/ijlbpr_14.3.2025.31

acanthosis nigricans with hyperinsulinemia, a condition often linked to acne pathogenesis.[25,26]

Hirsutism was found in 68% of patients, with Grade IV acne showing the highest association (84.6%). This supports prior research suggesting that acne and hirsutism are both cutaneous markers of hyperandrogenism.[27,28]

Our study found that 63% of acne patients exhibited insulin resistance, with the highest prevalence in Grade II acne (71.4%). Previous studies.[5,29] have shown that hyperinsulinemia contributes to increased androgen production, exacerbating acne severity. The role of insulin resistance in acne development is an emerging area of research, highlighting the importance of metabolic factors in acne pathophysiology.

An elevated LH:FSH ratio (>2) was observed in 54% of patients, particularly in those with Grade II acne (71.4%). Elevated LH levels, often seen in PCOS, contribute to increased ovarian androgen production, which in turn exacerbates acne.[30,31] The role of hormonal imbalance in acne has been well-documented, reinforcing the need for hormonal assessments in patients with persistent acne.

Limitations of the Study

The sample size was limited to 100 female patients, which may not be representative of the broader population. The study focused only on female patients, and thus the findings may not be generalizable to males. Additionally, hormonal assays were conducted only in a subset of patients, and external factors such as diet, stress, and genetic predisposition were not considered in detail. Future studies with larger sample sizes, inclusion of male patients, and a comprehensive assessment of lifestyle and environmental influences on acne are needed to further validate these findings.

CONCLUSION

The findings support the association between acne vulgaris and androgen and insulin disorders. Given the strong correlation between acne and hormonal imbalances, particularly in women, screening for conditions such as PCOS should be considered in acne patients. Hormonal assessments and pelvic ultrasound can aid in the early diagnosis of underlying endocrine disorders.

REFERENCES

1. Kaymak Y, Adisen E, Ilter N, Bideci A, Gurler D, Celik B. Dietary glycemic index and glucose, insulin, insulin-like growth factor-I, insulin-like growth factor binding protein 3, and leptin levels in patients with acne. J Am Acad Dermatol 2007;57(5):819-23.
2. Cappel M, Mauger D, Thiboutot D. Correlation between dairy intake and acne severity. Arch Dermatol2005;141(5):599-606.
3. Melnik BC. Endocrine-disrupting chemicals and acne vulgaris: The link between environmental exposure and skin pathology. Exp Dermatol 2018;27(10):1086-90.
4. Lee YB, Byun EJ, Kim HS. Potential role of the gut microbiome in acne: a review of current evidence. J Clin Med 2020;9(3):752.
5. George R, Clarke S, Thiboutot D. Hormonal therapy for acne. Semin Cutan Med Surg 2008;27(3):188–96.
6. Zouboulis CC, Seltmann H, Hiroi N, Chen W, Young M, Oeff M, et al. Corticotropin-releasing hormone: an autocrine hormone that promotes lipogenesis in human sebocytes. Proc Natl Acad Sci USA 2002;99(10):7148-53.
7. Thiboutot D, Harris G, Cimis G, Gilliland K. Activity of type 1 5α-reductase in sebaceous glands and its relation to acne. J Invest Dermatol 1995;105(2):209-14.
8. Mills OH, Punte M, Kligman AM. Exacerbation of acne by UV radiation. Br J Dermatol 1978;98:145-8.
9. Williams HC, Dellavalle RP, Garner S. Acne vulgaris. Lancet2012;379(9813):361-72.
10. Tan JK, Bhate K. A global perspective on the epidemiology of acne. Br J Dermatol 2015;172 Suppl 1:3-12.
11. Zaenglein AL, Pathy AL, Schlosser BJ, Alikhan A, Baldwin HE, Berson DS, et al. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol 2016;74(5):945-73.
12. Dumesic DA, Oberfield SE, Stener-Victorin E, Marshall JC, Laven JS, Legro RS. Scientific statement on the diagnostic criteria, epidemiology, pathophysiology, and molecular genetics of polycystic ovary syndrome. Endocr Rev 2015;36(5):487-525.
13. Lucky AW, Biro FM, Huster GA, Leach AD, Morrison JA, Ratterman J. Acne vulgaris in early adolescence: a pilot study of clinical, biochemical, and hormonal parameters. J Pediatr 1994;124(6):884-8.
14. Lookingbill DP, Chalker DK, Lindholm JS, Marks JG, Webb RR, Delaney TA, et al. Treatment of acne with a combination clindamycin/benzoyl peroxide gel compared with clindamycin gel, benzoyl peroxide gel and vehicle gel: combined results of two double-blind investigations. J Am Acad Dermatol 1997;37(5 Pt 1):590-5.
15. Bhate K, Williams HC, Andrew Smith R. Epidemiology of acne vulgaris. Br J Dermatol 2013;169(3):474-85.
16. Schata J, Nienhans A, Vielut D,Berger J, Ring J. Epidemiology of acne in the general population the NSK of smoking B-J Dermatal 2001;45(1):100-4.
17. Kenyon FE. Psychosomatic aspect of Acne. Br J Dermatal 1966;76:344-51.
18. Jebraile R, Kaur S, Kanwar AJ, Kataria S, Dush RJ. Hormone profile and polycystic ovaries in acne vulgaris, Indian Journal of Medicine Res 1994;100:73-6.
19. Bhambri S, Del Rosso JQ, Bhambri A. Pathogenesis of acne vulgaris: recent advances.J Drugs Dermatol 2009;8(7):615-8.
20. Held BL, Nader S, Rodriguez-Rigau LJ, Smith KD, Steinberger E. Acne and hyperandrogenism. J Am Acad Dermatol1984;10(2 Pt 1):223-6.
21. McLaughlin B, Barrett P, Finch T, Devlin JG. Late onset adrenal hyperplasia in a group of Irish females who presented with hirsutism, irregular menses and/or cystic acne. Clin Endocrinol (Oxf.)1990;32(1):57-64.
22. Emans SJ, Grace E, Fleischnick E, Mansfield MJ, Crigler JF. Detection of late-onset 21-hydroxylase deficiency congenital adrenal hyperplasia in adolescents. Pediatrics1983;72(5):690-5.

DOI: 10.69605/ijlbpr_14.3.2025.31

23. Elmer KB, George RM. HAIR-AN syndrome: a multisystem challenge. Am Fam Physician 2001;63(12):2385-90.
24. Bunker CB, Newton JA, Kilborn J, Patel A, Conway GS, Jacobs HS, et al. Most women with acne have polycystic ovaries. Br J Dermatol 1989;121(6):675-80.
25. Betti R, Bencini PL, Lodi A, Urbani CE, Chiarelli G, Crosti C. Incidence of polycystic ovaries in patients with late-onset or persistent acne: hormonal reports. Dermatologica 1990;181(2):109-11.
26. Orfanos CE, Adler YD, Zouboulis CC. The SAHA syndrome. Horm Res 2000;54(5-6):251-8.
27. Demidowich AP, Freeman AF, Kuhns DB, Aksentijevich I, Gallin JI, Turner ML, et al. Brief report: genotype, phenotype, and clinical course in five patients with PAPA syndrome (pyogenic sterile arthritis, pyoderma gangrenosum, and acne). Arthritis Rheum 2012;64(6):2022-7.
28. Williams C, Layton AM. Persistent acne in women: implications for the patient and for therapy. Am J Clin Dermatol 2006;7(5):281-90.
29. Edmondson SR, Thumiger SP, Werther GA, Wraight CJ. Epidermal homeostasis: the role of growth hormone and insulin-like growth factor systems. Endocr Rev 2003;24(6):737-64.
30. Deplewski D, Rosenfield RL. Role of hormones in pilosebaceous unit development. Endocr Rev 2000;21(4):363-92.
31. Deplewski D, Rosenfield RL. Growth hormone and insulin-like growth factors have different effects on sebaceous cell growth and differentiation. Endocrinology 1999;140(9):4089-94.