Correlation between acne and insulin resistance; experience from central India

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ABSTRACT

Introduction: Acne is a common dermatological condition primarily seen in teenage and adolescent patients and is a major concern for cosmological issues. Along with environmental factors, the proliferation of basal keratinocytes in the sebaceous-pilosebaceous unit, abnormal desquamation of follicular corneocytes, and metabolic abnormalities play a significant role in the pathogenesis of acne development. **Aim:** To study the causal relation between acne vulgaris and insulin resistance by calculating Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) and identify the relation between insulin resistance and the severity of acne. **Materials and Methods:** This was a retrospective study, where the data of patients with persistent Acne Vulgaris who were referred to the Endocrine department for evaluation of the hormonal and metabolic causes for acne vulgaris were analysed. The patient's clinical records were evaluated in whom there was no significant hormonal or metabolic abnormality identified known to cause persistent acne were included after proper consent and HOMA-IR was calculated. **Results:** Of several patients with persistent acne, 150 patients were included in our study with the male-to-female ratio was 23:27. The mean age of patients was 33.2 years. The mean HOMA-IR in our acne patients was 1.62 ranging from 0.9-3.7. Sixty four (42.67%) patients had HOMA-IR more than 2.0, thereby suggesting insulin resistance. **Conclusion:** Our study suggests the prevalence of insulin resistance in 42.67% of patients with acne, thereby providing the possibility of use of insulin modifiers as an adjunct acne treatment and stratifying the possible risk of metabolic syndrome in patients with acne. Also recommended is the control of dietary factors and lifestyle modification for the management of acne with insulin resistance.

Keywords: Acne, acne grades, HOMA IR, insulin resistance, metabolic syndrome

Introduction

Acne is a common dermatological condition and is a major concern for cosmological issues. Acne is estimated to affect 9.4% of the general population, making it the eighth most prevalent disease globally.[1] Also, acne vulgaris is one of the most common dermatological disorders with a teenage prevalence of 85%-90% and is thus routinely encountered by primary care physicians. Although usually easily managed, there is a rising number of patients who do not easily respond to therapy or seem resistant to therapy as along with environmental factors, proliferation of basal keratinocytes in the sebaceous-pilosebaceous unit and abnormal desquamation of follicular corneocytes, and metabolic abnormalities play a significant role in pathogenesis of acne.[2] This is also supported by the finding that the prevalence of both metabolic syndrome and acne have increased in recent past in general population.[3] Seema *et al.* have also reported the increase in childhood and teenage obesity even in the developing and third-world countries which can be a possible metabolic abnormality for the increased prevalence of acne among teenagers.[4]

We, therefore, conducted a retrospective study to identify the correlation between acne and insulin resistance and correlate

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How to cite this article: Srivastava PR, Khare J, Saxena A, Jindal S. Correlation between acne and insulin resistance; experience from central India. J Family Med Prim Care 2024;13:723-5.

the grade of acne with insulin resistance. Insulin resistance was defined if Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) was more than 2 which is calculated from fasting insulin and fasting blood glucose levels.[5]

Materials and Methods

This was a retrospective cohort study carried out jointly at Endocrine and Dermatology departments and enrolled patients who visited between 01/07/2021 and 01/07/2022. A total of 450 patients with persistent acne were referred to the Endocrine department by the Dermatology department for evaluation of the hormonal and metabolic causes of acne vulgaris. Of 450 patients, 150 patients were included in the study who met inclusion and exclusion criteria after going through extensive clinical records.

The inclusion criteria for patients included (1) adults aged between 18 and 65 years presenting with complaints of persistent acne and (2) those willing to participate in the study.

Exclusion criteria included (1) sick patients; (2) diagnosed with diabetes and on treatment for same; (3) underwent weight reduction treatment in the past; (4) pregnancy; (5) on any medications known to affect insulin metabolism including topical steroids or any hormonal treatment for any reason in the previous 1 month; (6) identified with significant hormonal or metabolic abnormalities on clinical records known to cause persistent acne-like polycystic ovarian syndrome, hyperandrogenism, hyperprolactinemia, and hypercortisolemia; or (5) not willing to participate in the study.

Of 150 patients included in the study, the grading of acne according to the Global Acne Grading System was recorded from clinical records.[5] Along with grading other signs of insulin resistance like *Acanthosis nigricans*, skin tags, body mass index, and waist circumference along with its management modalities and other comorbid conditions were recorded.

Laboratory parameters recorded included fasting plasma glucose (FPG) and fasting insulin and HOMA-IR was calculated and correlated with the acne and its severity grade as estimated by the acne scoring system.[6]

Results

The mean age of our patients was 33.2 years. The male-to-female ratio was 69:81. The baseline characteristics are described in Table 1. Seventy one (47.33%) patients had acanthosis nigricans, while 37 (24.67%) had skin tags. The mean body mass index of male patients was 28.11 ± 7.9 kg/m² and of the female patient was 27.33 ± 7.33 kg/m².

Mean FPG levels were 91 mg/dL, ranging from 69 to 121 mg/dL. Sixteen (10.67%) had FBS more than 100 mg/dL suggesting impaired FPG levels as per American Diabetes Association recommendations. Mean fasting insulin levels were 7.2 mIU/L, ranging from 0.9-29 mIU/L.

The mean HOMA-IR in our acne patients is 1.62 ranging from 0.9 to 3.7. Sixty four (42.67%) patients had HOMA-IR more than 2.0 suggesting insulin resistance.

According to the Global Acne Grading System, 21 males had grade 1 acne vulgaris, 14 had grade 2, 15 had grade 3, and 19 had grade 4. Of the females, 12 patients had grade 1 acne vulgaris, 49 had grade 2, 15 had grade 3, and 5 had grade 4.

In our study, we did not identify a significant correlation between the grade of acne and insulin resistance details of which are described in Table 2.

Discussion

Acne is a very common dermatological condition and has a severe psychological impact.[7] The prevalence of patients presenting with complaint of acne has increased in the recent past, which may be because of an actual increase or increased awareness. The prevalence of metabolic syndrome and its components has also increased in the recent past.[3,4] Studies suggest that along with environmental factors, metabolic abnormalities play a significant role in the pathogenesis of acne development. Other dermatological conditions like psoriasis have also been reported to have an association with metabolic syndrome and control of those parameters has resulted in the betterment of the cutaneous condition.[8] Increased incidence of acne and metabolic syndrome may be inter-related; thus, we conducted a study to identify the correlation between acne and insulin resistance, a marker for metabolic syndrome, and correlate the grade of acne with insulin resistance.

In our study, 10.67% patients had impaired FPG levels, while 42.67% patients with acne have HOMA-IR of more than 2.0 suggesting insulin resistance. Thus, our patients with acne in significant numbers had insulin resistance.

Our finding was concordant with findings of study by Singh M *et al*. who found statistically significant insulin resistance was present in acne patients and suggested that with conventional

Table 1: Baseline clinical and biochemical characteristics

	Mean	Range
Age (Years)	33.2	19-58
Fasting Plasma Glucose (mg/dL)	91	69-121
Fasting Insulin (mIU/L)	7.2	0.9-29
HOMA-IR	1.62	0.9-3.7

Table 2: Correlation between acne grade and insulin resistance

Acne grade (*n*=150)	HOMA IR ≥2	HOMA IR <2	*P*
Grade 1 (*n*=33)	14	19	0.12
Grade 2 (*n*=63)	27	37	0.07
Grade 3 (*n*=30)	13	17	0.06
Grade 4 (*n*=24)	10	14	0.18

treatment of acne, anti-insulin drugs may be used as an adjunctive to treat moderate and severe acne vulgaris.[9]

Similarly, Anderson *et al.*[10] and by Adebamowo *et al.*[11] demonstrated that hyperinsulinemia induced by giving an increasing amount of chocolates day by day to the patients resulted in the flaring of acne. Also, Kartal *et al.*[12] did a study where they enrolled only female patients with acne and found a positive relationship between female acne and insulin resistance.

However, Munichandrappa *et al.*[13] in their study did not find any significant correlation between acne and insulin resistance in Indian population, which is nonconcordant with our findings and the possible reasons for this can be the small population size with majority of patients with mild category of acne were included in their study, while in our study, we have taken patients having all grades of acne vulgaris.

As the incidence of adult-onset acne is at an all-time high, our study sheds light on IR as the possible associated factor in the vast majority of cases. Our study gives a physician an area to explore to treat acne better and also diagnose metabolic disorders at an earlier stage. Our study brings to light the correlation of insulin resistance with acne and also explains why a lot of patients benefit from medications used for IR in treating acne better. Also, a lot of patients relapse after standard therapies for acne and IR could be a possible explanation. Thus, our study will be helpful not only to dermatologists but also physicians to diagnose possible cause-associated factors of acne and treat it better.

Conclusion

Acne is a very common dermatological condition which severely affects the patients. Our study suggests a significant relation between acne and insulin resistance and opens the possibility of the use of insulin resistance modifiers as an adjunct to acne treatment. Also, these findings suggest the risk of metabolic syndrome in patients with acne; thus, these patients should be stratified for a possible risk of metabolic syndrome and be advised for healthy life style modification for its prevention.

Limitation of study

Sample bias as patients are from one center and being retrospective study data of many possible patients not included because of paucity in clinical records are possible limitation for study. Authors have no conflict of interest to declare.

Financial support and sponsorship

Conflicts of interest

There are no conflicts of interest.

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