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Original Research Article

Metabolic parameters in acne vulgaris: a case control study investigating fasting blood glucose and insulin levels in acne vulgaris

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ABSTRACT

Background: Influence of diet and lifestyle on acne among Indian population. Objectives were to identify the clinico-epidemiological profile of patients with Acne vulgaris and to assess the fasting plasma glucose and serum insulin levels in Acne vulgaris patients and the controls and correlate them.
Methods: This was a hospital-based case-control study conducted in the Department of Dermatology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore. Study included 60 cases of acne and 60 controls (age and sex matched), attending the outpatient department. After complete history, general physical, systemic and cutaneous examination, all cases were subjected to following investigation: fasting blood sugar and serum insulin levels.
Results: Acne was common in the age group 18-24 yrs (70%). In almost half the patients the age of onset was between 12-18 yrs. Commonly observed site for acne was cheeks (83.3%), forehead (66.7%), nose (55%) and chin (41.7%). The risk of developing acne was 3.5 times more among smokers than non-smokers. The mean fasting blood sugar values of cases and controls when compared showed a statistically significant difference ($p<0.05$). Our study did not find any statistically significant difference in fasting insulin levels between cases and controls.
Conclusions: There was only significant difference in the Mean fasting blood glucose in cases as compared to controls. Mean fasting serum insulin level though found to be raised in cases compared to controls, does not prove statistical significance. Fasting plasma glucose was significantly raised in grade III acne as compared to other grades.

Keywords: Acne vulgaris, Fasting blood sugar, Serum insulin, Insulin resistance

INTRODUCTION

Acne vulgaris (AV) is a chronic inflammatory disease of the skin affecting the pilosebaceous unit, clinically presenting as comedones, papules, pustules, nodules and occasionally scars, frequently over the face, back or chest.[1]It affects about 85% population at some stage of life. Females are affected at an earlier age and run a chronic course, but the more severe forms are seen in males.[2] Multiple factors have been established in the etio-pathogenesis of acne. They include genetic predisposition, hormonal abnormalities (key role by androgens), immunological factors, psychological, environmental, cosmetic and iatrogenic factors.[3] In addition, several factors have been implicated without much evidence. Chief among them is Diet. Diet rich in

sweets, oily foods, milk and chocolates are generally considered to increase the severity of acne by the patients.[4]

Acne occurring in the teen population, occurring in western population where high glycemic foods are consumed more, and introduction of westernized life style in non-western countries leading to increase in acne prevalence all pointed towards the role of diet as a causative factor in acne.[5] Studies conducted at the onset of this century revealed no correlation between the levels of glycemic factors and insulin in the pathogenesis of acne.[6,7] However several studies in the recent years have shown positive correlation between acne and high glycemic load.[8,9]

It is postulated that high glycemic diet results in increased insulin levels and insulin-like growth factor-1 (IGF-1) signaling, playing a significant role in the pathogenesis of acne during puberty.[10] While there is an increasing trend of obesity, metabolic syndrome and life style related issues among Indian population, there are very few studies reporting the association between glycemic factors and insulin levels among Indian patients with acne. This prompted us to do a case-control study on estimating fasting blood glucose and serum insulin levels in patients with acne; to correlate the same with BMI, other epidemiologic factors of acne vulgaris and severity of the disease among patients of Acne vulgaris.

METHODS

This was a case control, observational study conducted in the department of dermatology, Vydehi Institute of Medical Sciences and Research Centre, Bangalore between January 2018 to August 2019. The study included 60 clinically diagnosed cases of acne and a similar number of controls (age and sex matched) who had no acne, attending the outpatient department of Dermatology. A complete history followed by thorough general physical, systemic and cutaneous examination was carried out to rule out any other underlying associated factors and thus exclude them from the study. All the patients (of both groups) were subjected to following investigations: Fasting blood sugar and serum insulin levels. Data was analyzed using statistical software SPSS version 21.

Among cases, Females aged between 18-35 yrs. presenting with acne and willing to consent to participate in the study were included in the study. Patients with endocrine disorders, chronic systemic medical illnesses like tuberculosis, epilepsy, etc., women on any long-term medications, women with PCOS, pregnant women and women who gave history of using any anti-acne therapy or using any new cosmetics in the last 3 months were excluded from the study. Similarly, age and sex matched control group without acne, willing to give informed written consent were included in the control group.

RESULTS

In our study, 70% of the patients were in the age group of 18-24 years, with nearly half of them encountering initial episodes of acne before the age of 18. This observation clearly underscores acne as a teen age disorder. Cheeks were the commonest sites involved (83.3%) followed by forehead (66.7%), nose (55%) and chin (41.7%) (Figure 2). Notably, 45 cases (75%) had the disease duration exceeding 1 year emphasizing the chronic nature of the disease. Majority (68.3%) of our patients had grade II acne followed by grade III in 10 (16.7%) patients, and grade 1 in 8 (13.3%) patients.

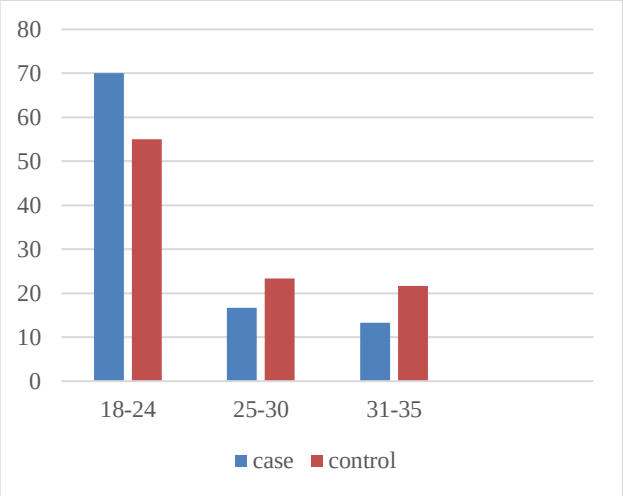

Figure 1: Distribution of cases and controls according to age.

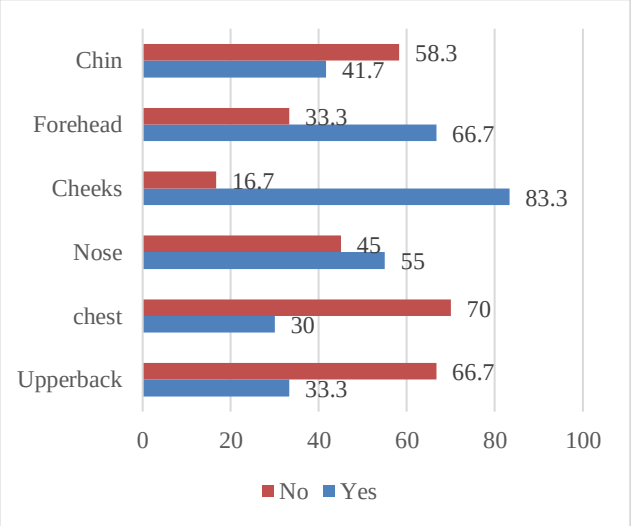

Figure 2: The various sites involved in acne.

Significantly, history of smoking was positive in 19 (31.7%) cases as compared to 7 (11.7%) among controls (Table 1). Thus, risk of developing acne was 3.5 times more among smokers than non-smokers. Smokers also had more severe grades of acne compared to non-

smokers. Prevalence of overweight in cases was found to be 43.3% whereas in controls it was 16.7% (Table 2). Totally, 26 patients in our study were overweight. But there was no statistically significant difference observed in the proportion of the BMI and Fasting plasma glucose ($p>0.05$). Proportion of overweight was 75%, 36.6% and 40% in grade I, II and III acne patients respectively. The potential impact of obesity or subsequent increase in the BMI on the acne grade cannot be addressed as it is not within the scope of our study. Mean fasting blood sugar level in cases was 96.63±18.29 whereas in controls it was 86.67±8.89. When we compared the mean values of cases and controls, it was observed that there is statistically significant difference in the mean values between the two groups ($p<0.05$) (Table 3).

Table 1: Relationship between acne severity and smoking.

Parameters		Grading of acne								Total
		I		II		III		IV		
		N	%	N	%	N	%	N	%	
History of smoking	Yes	4	50.0	14	34.1	0	0.0	1	100	19
	No	4	50.0	27	65.9	10	100.0	0	0	41
Total		8	100.0	41	100.0	10	100.0	1	100	60

Chi square-8.15, p=0.043 (<0.05), Significant.

Table 2: Relationship between acne grades and BMI.

Parameters		Grading of acne								Total
		I		II		III		IV		
		N	%	N	%	N	%	N	%	
BMI grade	Normal	2	25.0	26	63.4	6	60.0	0	0	34
	Overweight	6	75.0	15	36.6	4	40.0	1	100	26
Total		8	100.0	41	100.0	10	100.0	1	100	60

Chi square-6.33, p=0.097 (>0.05), Not significant, BMI-body mass index

Table 3: Comparison of fasting blood sugar and insulin levels between cases and controls.

Parameters		N	Mean	SD	T value	P value	Inference
FBS	Cases	60	96.63	18.29	3.80	0.00001 (<0.001)	Highly significant
	Controls	60	86.67	8.89			
Serum insulin	Cases	60	8.91	5.01	1.30	0.19 (>0.05)	Not significant
	Controls	60	7.84	3.95			

FBS-fasting blood sugar, SD-standard deviation

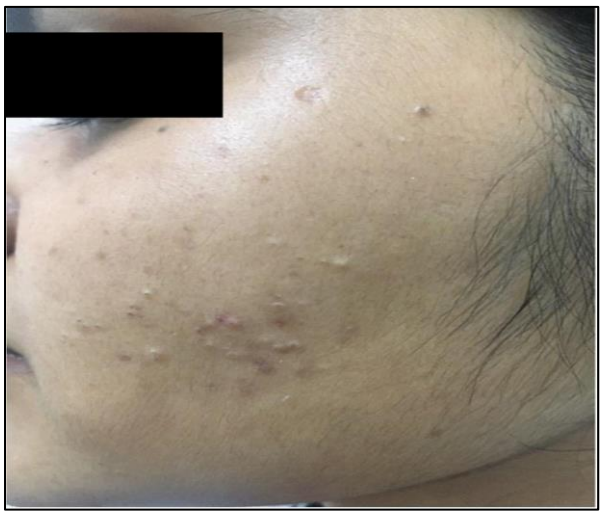

Figure 3: Mild acne (multiple open and closed comedones with few papules).

Figure 4: Moderate acne (multiple erythematous papules and few comedones with post inflammatory hyperpigmentation).

Even though sugar levels were within the normal range, it is noteworthy that Gade III acne (70%) patients exhibited higher FBS levels compared to 37.5% in grade I and 29.3% in grade II. The difference in proportion with respect to acne grades was found to be statistically significant ($p<0.05$). Mean serum insulin level in cases was 8.91±5.01 whereas in controls it was 7.84±3.95. When we compared the mean values of cases and controls, it was observed that there is no statistically significant difference in the mean values of both groups ($p>0.05$). Among patients with positive smoking history, five had increased FBS and two had increased insulin levels clearly pointing towards an interrelation of all life style factors.

DISCUSSION

In our study, out of 60 cases, 70% of patients were in the 18-24 years range, similar with the findings worldwide.[5,11-13] In our study 46.7% of patients noticed acne between 12 to 18 years. Adityan et al in their study reported the mean age of onset in females as 16.05±3.68 years, similar to our study findings.[5] Dreno et al from France reported the average age of onset among girls as 11 years and 12 years among boys, indicating the earlier age of onset among Caucasian population.[14] Our study showed more acne patients were smokers than controls (31.7%: 11.7%). Hosthota et al reported 28.57% cases and 15.87% of controls with history of smoking at least one cigarette per week.[15] Nonsmokers predominantly had grade I and grade II acne whereas smokers predominantly had grade 3 acne implying severity of acne goes positively with smoking. This is in contrast to our study wherein 50% of patients (smokers) had grade I acne followed by 34.1% with grade II acne. This variation might be ascribed to gender disparities within the study cohort and variations in the daily consumption of cigarettes between men and women. The risk of developing acne was 3.5 times more among smokers than non-smokers in our study. We establish a positive correlation between smoking and acne making smoking a risk factor for acne. Majority (68.3%) of our patients had grade II acne followed by grade III in 10 (16.7%) patients. These findings are similar to the findings reported by other studies.[11,16,17] The findings probably suggest the awareness and the anxiety among the females to take treatment for their acne, probably more for cosmetic and aesthetic reasons. About 43.3% of acne patients were overweight as compared to 16.7% in the control group, suggesting weight plays a significant role in acne patients. However, the mean BMI levels did not show much difference between the cases and controls (24.05±3.04 vs. 23.25±2.4). Nagpal has drawn similar conclusions in their studies.[18] However, Del et al have reported cases having a statistically significant BMI value compared to controls.[19] This may be due to the influence of western diet and life style among their cases. In our study, Overweight people had more severe grades of acne and also involved sites like back and arms. Whether overweight cases in our study would have probably evolved into having an increased BMI later is a matter of speculation. In our study, 22 cases (36.7%) were observed to have elevated plasma glucose levels. Mean fasting blood sugar level in cases was increased among cases (96.63±18.29 vs. 86.67±8.89) which was statistically significant. Prete et al, Nagpal et al have reported similar findings in their studies.[18,19] Fasting plasma glucose was more in grade III patients (70%) compared to 37.5% in grade I and 29.3% in grade II. The difference in proportion with respect to acne grades was found to be statistically significant ($p<0.05$). Eight of them had severe grade acne lesions over the back and arms. Seven of them had lesions lasting for more than one year. Three of them had elevated BMI levels. These findings suggest that high glycemic diet, various stages of evolution of metabolic syndrome could be playing a role in the pathogenesis of acne. The mean fasting plasma sugar levels were elevated among cases in all grades of acne. However, they were not significant to be termed diabetics. The mean fasting blood sugar values of cases and controls when compared showed a statistically significant difference ($p<0.05$). Our study did not find any statistically significant difference in fasting insulin levels between cases and controls. Fasting serum insulin level among our patients in cases and controls (8.91±5.01 vs. 7.84±3.95) was not statistically significant ($p>0.05$). Munichandrappa et al, Balta et al, Nagpal et al and Kaymak et al have all drawn similar conclusions in their studies.[9,11-17] However Verma et al and Prete et al have reported Elevated levels of serum insulin among cases compared to controls.[11,19]

Limitations

Current study is limited by smaller study group and the exclusion of other potential risk factors like PCOD, hypothyroidism, abnormal lipid levels. Perhaps a larger study might cover and establish the relationship between all these factors in the causation of acne.

CONCLUSION

To conclude our study shows significant association between chronicity, severity of acne, smoking, weight and the mean fasting plasma blood glucose levels in cases when compared to controls. Mean serum fasting insulin levels is not significant between cases and controls in our study. We conclude that smoking, overweight and abnormal blood glucose levels could be clear risk factors in the development of acne vulgaris and correction of such factors, by modification of lifestyle measures predominantly could play an important role in the management of acne. Though serum insulin levels are normal in our study, the abnormality could be in evolution which needs to be kept in mind. Therefore, diet though not the major risk factor in the onset of acne, it plays a crucial role in influencing the severity of acne.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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