

A Cross Sectional Study of Metabolic Changes in Acanthosis Nigricans in Adolescents

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Abstract

In our study while assessing the incidence of Acanthosis Nigricans and its associated metabolic derangements on internal comparison the following significant conclusions were observed: Incidences of Acanthosis Nigricans were more in the male population of our study. Acanthosis Nigricans shows a strong correlation to an increased BMI. Increase in BMI suggests that obese individuals are more prone to develop Acanthosis Nigricans and also highlights the need for lifestyle modifications. Incidence of Acanthosis Nigricans is more in individuals who have a positive family history of insulin resistance. Majority of the family members of the study population had Acanthosis Nigricans also in addition to insulin resistance. Incidence of Acanthosis Nigricans with abnormal fasting blood sugar levels and insulin showed negative correlation among the study population. The Present study includes correlate the association of serum fasting and post prandial insulin levels, fasting and post prandial blood sugar levels and lipid profile in adolescent patients with Acanthosis Nigricans.

Keywords : Acanthosis Nigricans, lipid, malignancy, HOMA IR and fasting.

1. Introduction

Acanthosis Nigricans (AN) is characterized by dark, rough looking skin with a smooth texture that is symmetrically distributed. Varieties of Acanthosis Nigricans include benign, obesity associated, syndromic, malignant, acral, unilateral, drug-induced and mixed AN(1-4).

Diagnosis is usually clinical with the need for histopathology only for confirmation. Other investigations needed are lipid profile, fasting glucose, fasting and post prandial insulin levels,

hemoglobin and alanine aminotransferase for Acanthosis Nigricans with obesity and radiological investigations (plain radiography, ultrasonography, magnetic resonance imaging/computerized tomography) for malignancy associated AN(5-10)

2. MATERIALS AND METHODS

Study Design: Cross sectional study.

Study Area: Skin Outpatient Department Sree Balaji Medical College and Hospital

Study Population: All patients attending skin OPD, who are clinically diagnosed with Acanthosis Nigricans.

Study Method: Observational study.

Sample Size: 100

Inclusion criteria:

Consenting for the study.

The recruited patients were subjected to the following,

- A. Full History Taking
- B. Thorough General Dermatological Examination.
- C. Height and weight measurement for BMI calculation
- D. Blood tests for fasting and post prandial insulin levels
- E. Blood tests for fasting and post prandial blood sugars
- F. Blood tests for fasting lipid profile

Exclusion Criteria:

Not consenting for the study.

Data Analysis

Statistical Analysis was done by Statistical Package for Social Sciences (SPSS Version 16.0) statistical analysis software. The values were represented in number (%) and mean \pm standard deviation. Suitable statistical tests of comparison were done. Continuous variables were analyzed with the unpaired test. Categorical variables were analyzed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$.

3. Results

FIGURE 1: SEX RATIO OF STUDY POPULATION

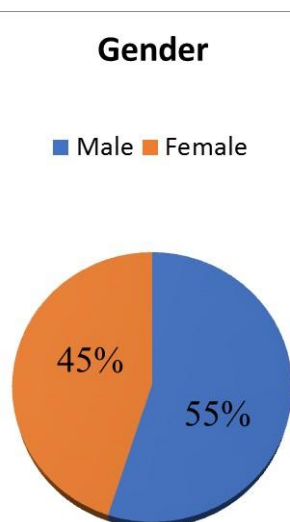


TABLE 1: BODY MASS INDEX (BMI)

Body Mass Index Category	Number	%
Under weight	7	7
Normal	41	41
Over weight	19	19
Obese	33	33

FIGURE 2: BODY MASS INDEX (BMI)

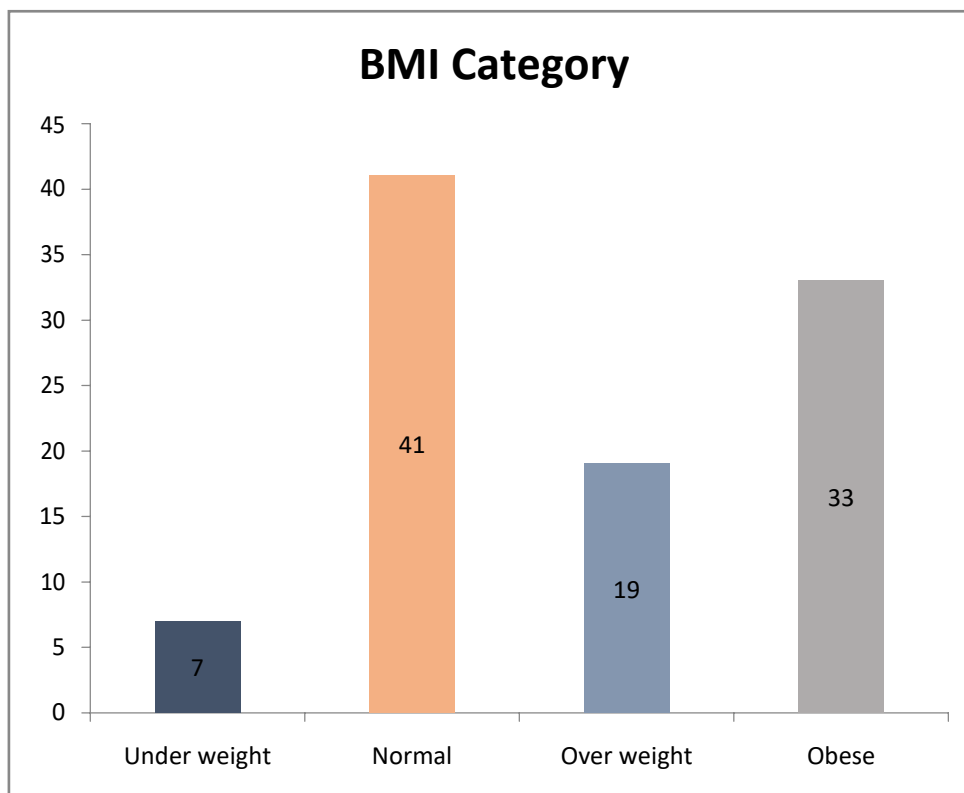


TABLE 2: FREQUENCY DISTRIBUTION OF QUALITATIVE VARIABLES

Variables	Sub group	Number (100)	Percentage
Gender	Male	55	55
	Female	45	45
Body Mass Index Category	Under weight	7	7
	Normal	41	41
	Over weight	19	19
	Obese	33	33
Fasting Blood Sugar	Normal	91	91
	Increased	9	9
Post Prandial Blood Sugar	Normal	83	83
	Increased	17	17
Fasting Insulin status	Normal	97	97
	Increased	3	3

Post Prandial Insulin status	Normal	99	99
	Increased	1	1
HOMAIR status	Normal	43	43
	Increased	57	57
Triglyceride status	Normal	93	93
	Increased	7	7
Total cholesterol status	Normal	93	93
	Increased	7	7
High Density Lipoproteins status	Normal	77	77
	Increased	23	23
Low Density Lipoproteins status	Normal	94	94
	Increased	6	6
Family History	Yes	54	54
	No	46	46

FIGURE 3: FASTING BLOOD SUGAR STATUS

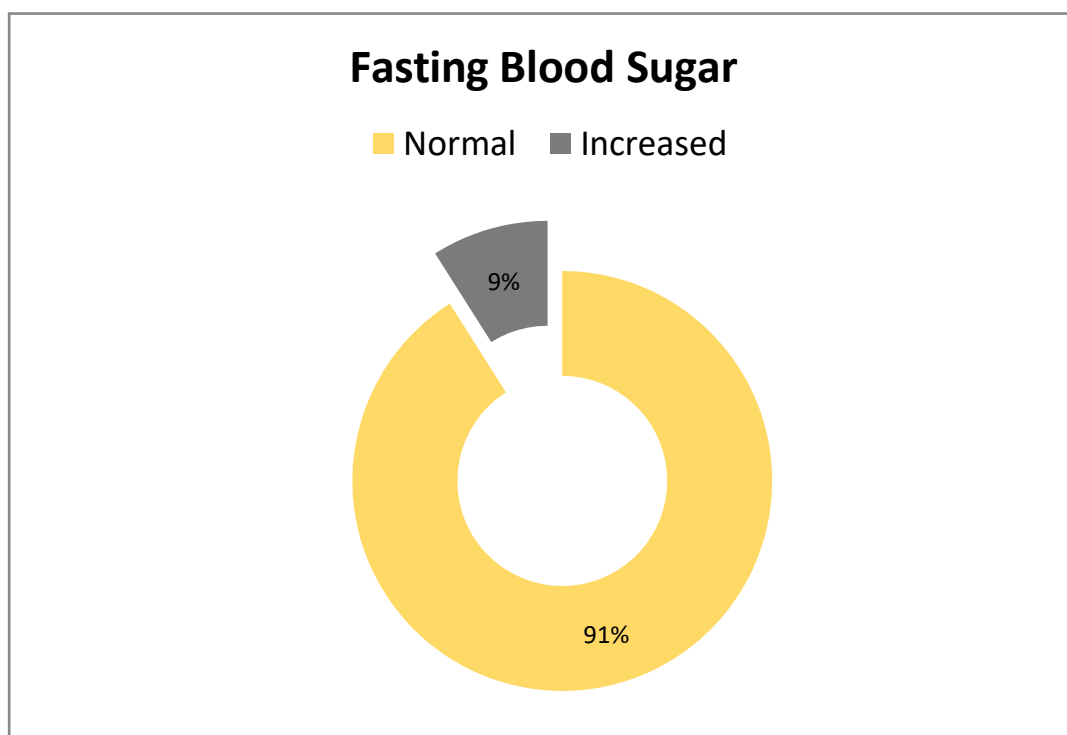


TABLE 3: DESCRIPTIVE STATISTICS

Variables	Mean	Standard Deviation	Median (Range)
Age#	15.33	2.04	16 (10,18)
Height*	162.11	9.86	162 (135,189)
Weight*	61.22	11.79	62.5 (26,90)
Body Mass Index*	23.12	3.50	23.35 (11.6,32)
Fasting Blood Sugar#	95.89	20.75	92 (66,168)
Post Prandial Blood Sugar#	116.10	21.26	110 (87,169)
Fasting Insulin#	11.01	6.85	9.26 (1.8,32)
Post Prandial Insulin#	49.37	36.26	33.8 (10.6,172)
HOMA IR#	2.67	1.99	2.2 (0.2,9.95)
Triglycerides#	108.56	26.58	104 (31,167)
Total Cholesterol*	157.74	29.17	160 (99,211)
High Density Lipoproteins#	46.77	10.17	45 (34,99)
Low Density Lipoproteins#	79.15	25.74	73.5 (39,171)

* Normally distributed

Non normally distributed

FIGURE 4: FASTING INSULIN STATUS

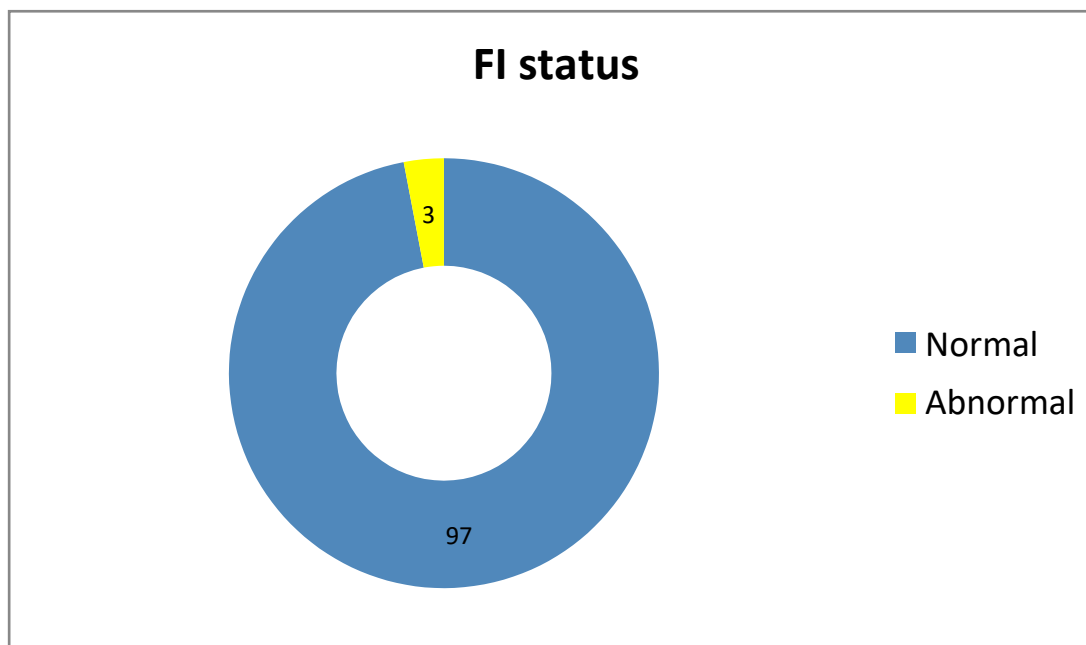


TABLE 4: ASSOCIATION OF GENDER WITH CATEGORICAL VALUES

Variable	Sub group	Gender		Statistical Significance
		Male	Female	
BMI category	Under weight	4 (7.3%)	3 (6.7%)	P<0.05
	Normal	24 (43.6%)	17 (37.8%)	
	Over weight	15 (27.3%)	4 (8.9%)	
	Obese	12 (21.8%)	21 (46.7%)	
FBS status	Normal	50 (90.9%)	41 (91.1%)	P>0.05
	Increased	5 (9.1%)	4 (8.9%)	
	Normal	42 (76.4%)	41 (91.1%)	

PPBS	Increased	13 (23.6%)	4 (8.9%)	P>0.05
FI status	Normal	54 (98.2%)	43 (95.6%)	P>0.05
	Increased	1 (1.8%)	2 (4.4%)	
PPI status	Normal	55 (100%)	44 (97.8%)	P>0.05
	Increased	0	1 (2.2%)	
HOMA IR status	Normal	25 (45.5%)	18 (40%)	P<0.05
	Increased	30	27 (60%)	
		(54.5%)		
Triglyceride status	Normal	49 (89.1%)	44 (97.8%)	P>0.05
	Increased	6 (10.9%)	1 (2.2%)	
Total cholesterol status	Normal	50 (90.9%)	43 (95.6%)	P>0.05
	Increased	5 (9.1%)	2 (4.4%)	
High Density Lipoproteins status	Normal	48 (87.3%)	29 (64.4%)	P<0.05
	Increased	7 (12.7%)	16 (35.6%)	
Low Density Lipoproteins status	Normal	51 (92.7%)	43 (95.6%)	P>0.05
	Increased	4 (7.3%)	2 (4.4%)	
	Yes	28 (50.9%)	26 (57.8%)	

Family History	No	27 (49.1%)	19 (42.2%)	P>0.05
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FIGURE 5: HOMA IR STATUS

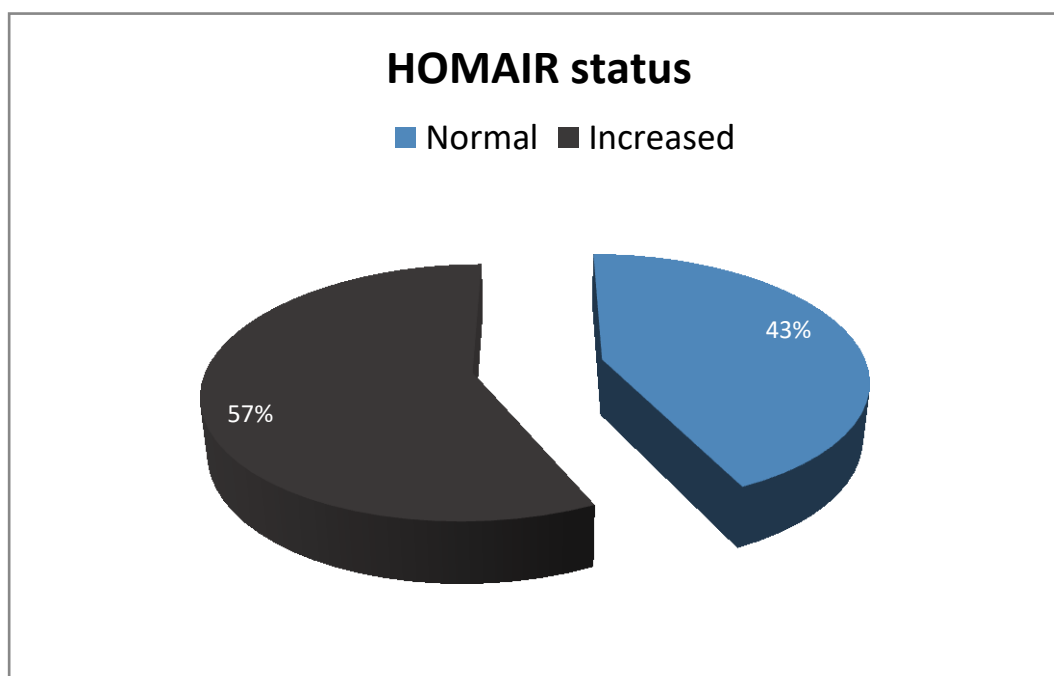


TABLE 5: CORRELATION OF HOMA IR WITH OTHER VARIABLES

Variables		Correlation coefficient	Statistical Significance
	Fasting Blood Sugar	0.695	P<0.01**
	Post Prandial Blood Sugar	0.625	P<0.01**
	Fasting Insulin	0.937	P<0.01**

HOMA IR	Post Prandial Insulin	0.749	P<0.01**
	Triglycerides	0.499	P<0.01**
	Total Cholesterol	0.430	P<0.01**
	High Density Lipoproteins	-0.156	P>0.05
	Low Density Lipoproteins	0.271	P<0.01**

Significant at 1% level of Significance

FIGURE 6: TRIGLYCERIDE STATUS

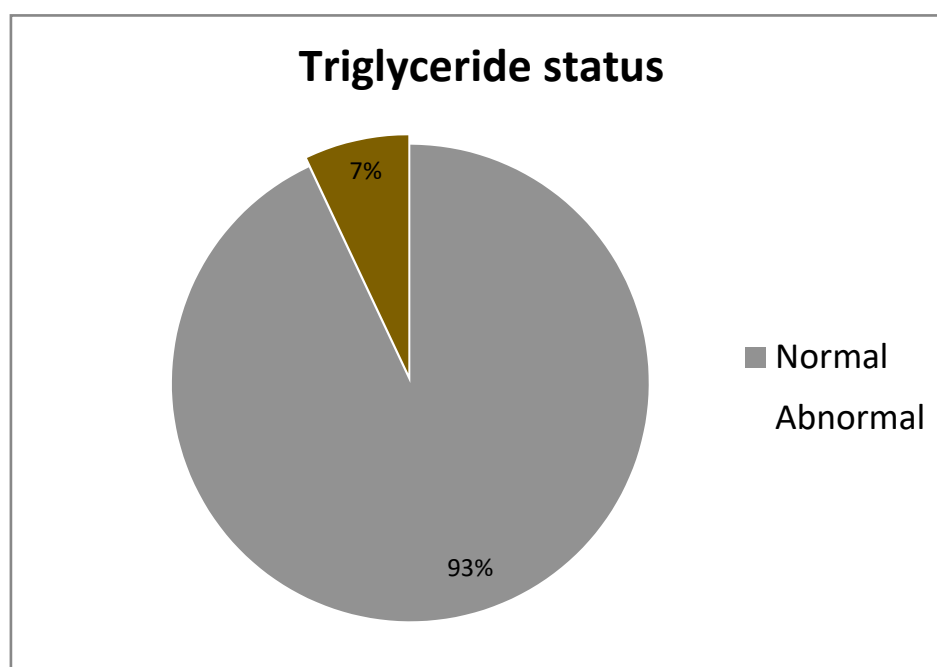


FIGURE 7: HDL STATUS

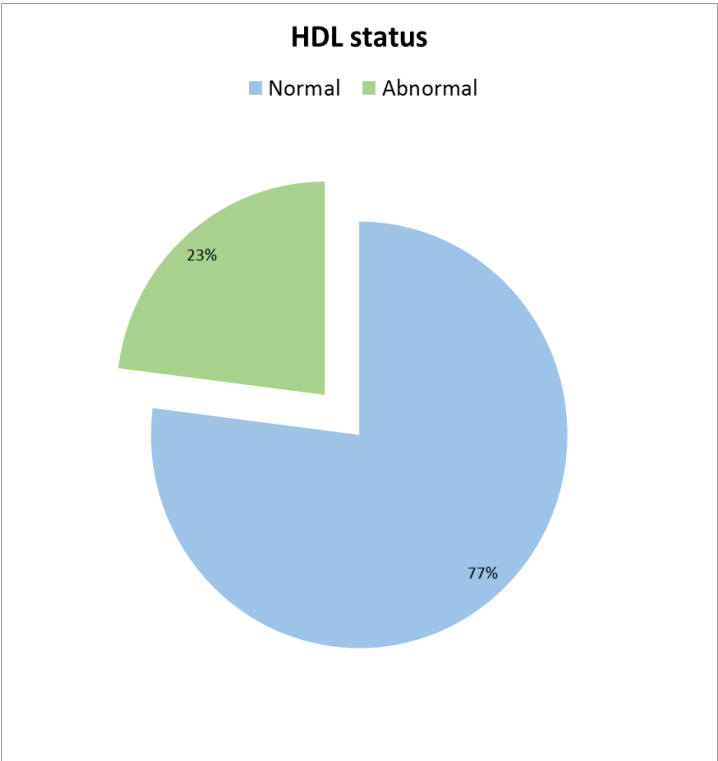


FIGURE 8: FAMILY HISTORY STATUS

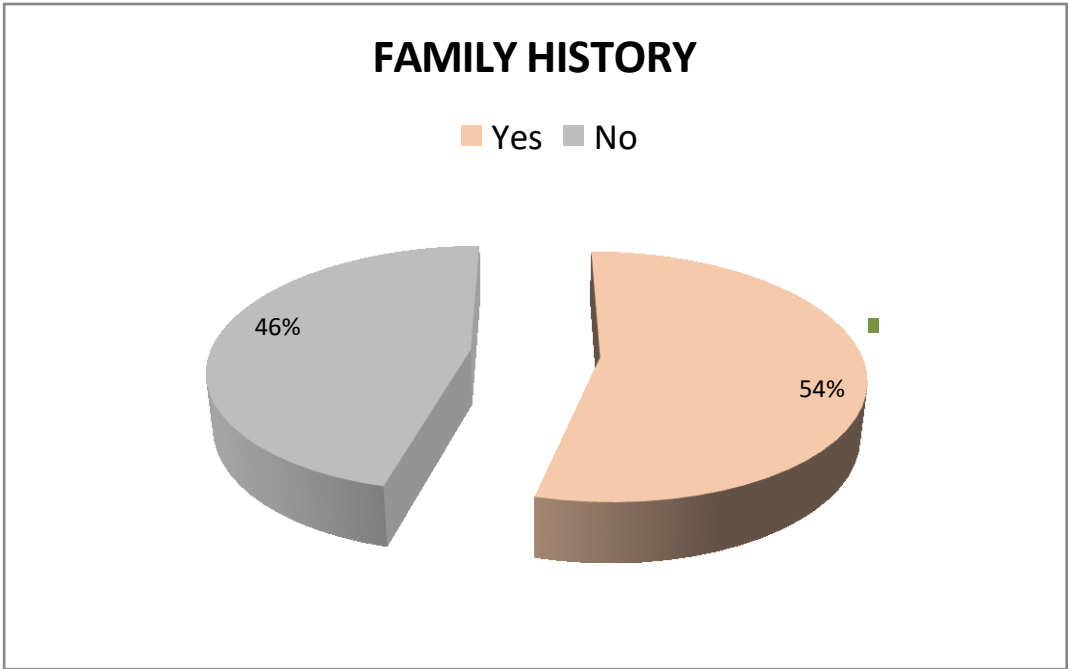


FIGURE 9: POST PRANDIAL BLOOD SUGAR

Discussion

STUDY GROUPS

In this cross sectional study, an analytical approach was adopted to assess the incidence of Acanthosis Nigricans with metabolic abnormalities among patients attending dermatology OPD at Sree Balaji Medical College and Hospital. Data collected from 100 selected subjects were internally compared, tabulated, analyzed and interpreted by using descriptive and inferential statistics based on the formulated objectives of the study.

ACANTHOSIS NIGRICANS AND GENDER

Out of the total of 100 patients diagnosed with Acanthosis Nigricans 55 were male (55%) and the rest 45 were female (45%) (Figure 1) (Table 2). The data subjected to chi squared test reveals the existence of statistically non - significant association between the gender status and study group ($p > 0.05$) (Table 4). Our study has shown that AN is more prevalent in the male population.

Results published in a similar study done by Alberta S Kong et al showed the opposite¹⁴. Also a similar study done by Fasunla James et al also showed more of female predominance (11-12).

ACANTHOSIS NIGRICANS AND BMI

In our study 7 out of 100 patients belonged to the underweight category (7%) (Table 2). Out of 100 patients 41 (41%) were in the normal category. 33 out of 100 patients were obese (33%) (Figure 2). This shows that the percentage of males in each category is significant different than females and this difference was found to be statistically significant ($P < 0.05$) (Table 4). BMI being a definitive indicator for obesity is useful to screen for insulin resistance. Our study showed that there is proportional association of AN with raised BMI. Results published in a similar study done by Nsiah- Kumi PA et al showed similar results with

increase in BMI have a positive correlation¹⁶. In a study done by Heloisa Marcelina Da Cuncha Palhares et al also showed similar results. (13-17)

ACANTHOSIS NIGRICANS AND FASTING BLOOD SUGAR

Out of the 100 patients included in the study only 9 (9%) had increased fasting blood sugar values (Table 2). The rest of the 99 patients had normal FBS values (91%) (Figure 3). The data subjected to chi squared test; results were that males had increased fasting blood sugar than the females but it was not found to be statistically significant ($p > 0.05$) (Table 4). In a study conducted by Sanjiv V Choudhary et al showed the opposite. Results from a study done by Koh KY Lee et al also showed positive correlation of fasting blood sugar values to the incidence of Acanthosis Nigricans¹⁸.

ACANTHOSIS NIGRICANS AND POST PRANDIAL BLOOD SUGAR

It is evident from the study that 83 out 100 patients selected had normal post prandial blood sugars (83%) (Table 2). The rest of the 17 patients in the study had elevated PPBS (17%) (Figure 9). This shows that the percentage of males had increased PPBS value is higher than the females but it was not found to be statistically significant ($P < 0.05$) (Table 4). Results published by Lisa Rafalson et al showed similar results of statistically in significant association of PPBS values with the incidence of Acanthosis Nigricans¹⁹.

ACANTHOSIS NIGRICANS AND FAMILY HISTORY OF SIMILAR LESIONS

It is evident from our study that 28 (50.9%) males had a positive family history of Acanthosis Nigricans in comparison to 26 (57.8%) females. 27 (49.1%) males in the study did not have family history of Acanthosis Nigricans in addition to 19 (42.2%) females (Figure 8) (Table 2). This shows that females have family history of Acanthosis Nigricans higher than the males. The data subjected to fishers' exact test reveals the existence of statistically

significant association between the family history of similar lesions status and study groups ($p < 0.05$) (Table 4). Majority of the cases with Acanthosis Nigricans also reported positive family histories of Acanthosis Nigricans. Also a positive history of diabetes mellitus was noted in the study population. Similar results were published in study by Alberta S Kong et al showing a positive correlation of family history in relation to the incidence of Acanthosis Nigricans¹⁰.

ACANTHOSIS NIGRICANS AND FASTING INSULIN

In our study out 100 patients 54 out 55 male patients (98.2%) had normal FI values than 43 out of 45 females (95.6%) (Table 2). 1 out of 55 male patients (1.8%) had increased FI values in comparison to 2 out of 45 females (4.4%) (Figure 4). This concludes that the percentage of females with increased FI value is higher than the males but it was not found to be statistically significant ($P > 0.05$) (Table 4). Results published in study done by P. P. Patidar showed positive correlation of raised fasting insulin levels in the incidence Acanthosis Nigricans¹¹.

ACANTHOSIS NIGRICANS AND POST PRANDIAL INSULIN

In our study 55 males (100%) had normal PPI values in comparison to 44 females (97.8%) females (Table 2). Only 1 female (2.2%) female had increased PPI values than others (Figure 12). This shows that the percentage of females having increased PPI value is higher than the males but it was not found to be statistically significant ($P > 0.05$) (Table 4). Out of the 57 cases with increased HOMA-IR, we also noticed that the value of post prandial insulin is four times or more than the fasting insulin levels in cases of insulin resistance calculated by the HOMA IR formulae in 47 cases (19-22).

ACANTHOSIS NIGRICANS AND HOMA IR

From our study of 100 cases of Acanthosis Nigricans 25 (45.5%) males had normal HOMA IR value when compared to 18 (40%) females (Table 2). 30 (54.5%) males had increased

HOMA IR than 27 (60%) females (Figure 5). This shows that the percentage of females having increased HOMA IR is higher than the males but it was found to be statistically significant ($P < 0.05$) (Table 4). HOMA IR can be definitely used a tool in identifying insulin resistance, even in cases where either of the values for FBS or insulin might be normal (24-25). Results of a similar study done by TM Nithun et al showed a positive correlation of HOMA IR values 12.

ACANTHOSIS NIGRICANS AND TRIGLYCERIDES

It is evident from our study that 49 (89.1%) males had normal triglyceride value than 44 (97.8%) females (Table 2). 6 (10.9%) males had increased triglyceride in comparison to 1 (2.2%) female (Figure 6). This shows that the percentage of males had increased triglyceride levels when compared to females but it was not found to be statistically significant ($P > 0.05$) (Table 4).

4. CONCLUSION

Acanthosis Nigricans patients tested for post prandial blood sugars and insulin levels also didn't show significant values pointing to a positive correlation. HOMA IR levels showed a positive correlation to the incidence of Acanthosis Nigricans. HOMA IR can be considered a useful tool in the diagnosis of insulin resistance. While calculating the HOMA IR values, it was noted that the patients with elevated HOMA IR had post prandial insulin values that were four times or more than the fasting insulin levels. The neck region was the most commonly affected site for the development of Acanthosis Nigricans. The incidence of facial Acanthosis Nigricans is the least of all the cases taken up in our study. Majority of the cases with Acanthosis Nigricans had come to the skin OPD for other complaints; of which majority of them presented with Acne. Hirsutism was also a major cause for the dermatology consult. Once diagnosed with insulin resistance a multidisciplinary approach involving the dietitian, endocrinologist, nutritionist and life style modifications are advised.

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

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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