

Clinical Correlates of PCOS in A Tertiary Health Care Centre

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Abstract

Aims: To study, analyse and find the correlation between different signs and symptoms of polycystic ovarian syndrome in a tertiary health care centre.

Settings and Design: (1) *Type of study:* Observational Study (2) *Sample size:* 150 (3) *Study participants:* All patients attending gynaecology OPD diagnosed with PCOS. *Study design:* It was a Questionnaire based observational study.

Methods and Material: This study was conducted on 150 patients of Polycystic Ovarian Syndrome. Diagnosis of Polycystic Ovarian Syndrome was done on the basis of 2003 Rotterdam diagnostic criteria. Ferriman Gallwey score was used for assessment of hirsutism and WHO cut-offs of Body Mass Index modified for Asian population was used for assessment of Body mass index, *Statistical analysis used:* Statistical Analysis: Data was compiled and analysed using site.

Results: Percentages of Chief complaints: Irregular menses (89%), Obesity (41%), Hirsutism (37%), Acne (32%), Infertility (10%). A Family History of Diabetes (45%), Hypertension(33%), Obesity (29%), Thyroid disorder (27%), PCOD (14%), Cardiac Disorder (13%) was also analysed. Polycystic changes in ultrasonographic findings were Present in 89% of the population and absent in 11% of the population. Only 33% participants were regular with the exercise routine rest. Hirsutism was graded according to mild (22%), moderate (62%), and severe (16%). 50% had Acne on examination. Body Mass Index was measured and graded into Underweight (11.3%), Normal (28.60%), Overweight (9.30%), Pre-obese (31.30%), Obese type 1 (19.30%). Acanthosis nigricans (AN) was present in 32% And absent in 68%. There was significant Correlation between: (p value <0.05) Irregular menses and infertility- 7%, Hirsutism and infertility- 3%, Ultrasonographic Findings and Acne- 48%, Obesity and Hirsutism- 45%, Irregular menses and acne - 48% Irregular menses and hirsutism- 33%, Ultrasonographic findings and acanthosis nigricans- 29.3%.

Conclusions: There is a diversity in the presentation of chief complaints of PCOS patients. PCOS patients show a variety in the presentation of the history of metabolic syndromes and of PCOS in their families. They show cutaneous manifestations in the form of Acne, Hirsutism and Acanthosis nigricans. PCOS patients mostly have moderate grades of hirsutism. Acne is present in almost half of PCOS patients even though most of them don't consider it as their chief complaint. Most of the participants who had increased BMI had Polycystic Ovarian Syndrome. Acanthosis is related to an increase in the BMI. Very few patients include exercise in their daily routine. There is a significant correlation in PCOS patients between: Irregular menses and infertility, Hirsutism and infertility, Ultrasonographic findings and Acne as chief complaint. Chief Complaints of Obesity and Chief Complaints of Hirsutism. Chief Complaints of irregular menses and Acne. Chief Complaints of Irregular menses and Hirsutism. Ultrasonographic findings and Acanthosis nigricans.

Keywords: Polycystic ovarian syndrome; Acne; Infertility; Hirsutism; Obesity; Family history; Chief complaints, acanthosis nigricans; Irregular menses.

Key Messages: This study has come up with the result of many statistically significant correlations between many common signs and symptoms like irregular menses, acne, hirsutism, infertility, Ultrasonographic findings, body mass index and acanthosis nigricans. Which will help in the further understanding of Polycystic ovarian syndrome. This study has also included various statistical analysis like having a family history of metabolic syndrome.

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Introduction

A Polycystic ovary syndrome, originally described by Stein and Leventhal in 1935 is the commonest endocrine disturbances affecting adolescent girls and women. It has long been recognized as the presence of enlarged ovaries with multiple small cysts (2-8 mm) and a hyper vascularized androgen secreting stroma associated with signs of androgen excess (hirsutism, acne, obesity and menstrual cycle

disturbance like oligomenorrhoea or amenorrhoea and also infertility. There is considerable heterogeneity of symptoms and signs amongst women with PCOS and may change overtime.

- Basic pathology seems to be an increased insulin resistance which in turn causes an increased LH/FSH ratio, SHBG (sex hormone binding globulin), resulting in anovulation and hyperandrogenism. Insulin resistance can lead to hyperinsulinemia which is also a precursor of type 2 diabetes and 75% of women suffer from insulin resistance.
- Women with PCOS have a higher prevalence of metabolic syndrome (MBS) which is a combination of cardiovascular disease, hyperandrogenemia, insulin resistance, glucose intolerance, dyslipidemia, hypertension and central obesity.
- Diagnosis of PCOS is now largely based on the Rotterdam criteria, which are inclusive of the original National Institutes of Health (NIH) criteria and require two of three key features: oligo or anovulation, clinical or biochemical androgenism and polycystic ovaries on ultrasound.
- To study, analyse and find the correlation between different signs and symptoms of PCOS in a tertiary health care centre.

Materials and Methods

Place of Study: This study was conducted at the Outpatient Department of Obstetrics and gynaecology, Dr. Vasantrao Pawar Medical College, Hospital and Research centre, Nashik from December 2018 to February 2020.

Type of study: Observational Study Sample size 150

Study participants: All patients attending gynaecology OPD diagnosed with PCOS. Study design. It was a Questionnaire based observational study.

Methods and Material

This study was conducted on 150 patients of Polycystic Ovarian Syndrome. Diagnosis of Polycystic Ovarian Syndrome was done on the basis of 2003 Rotterdam diagnostic criteria. Ferriman Gallwey score was used for assessment of hirsutism and WHO cut offs of Body Mass Index modified for Asian population was used for assessment of Body mass index.

The inclusion criteria

- Confirmed cases of PCOS.
- Females from Menarche till menopause, age range in the study group (minimum age 15 to maximum age of 40 years)
- Willing to participate.

The exclusion criteria

- The presence of any obvious co morbid conditions.
- No Thyroid Disorder and Hyperprolactenemia and Adrenal Hyperplasia.
- Not willing to participate.

Study design

Questionnaire based observational study.

- The study proposal was submitted to the Institutional Ethical Committee and research was carried after the approval.
- Present study was conducted among the patients satisfying the selection criteria.
- The study participants were recruited from a tertiary health care centre.
- Permission to conduct the study from appropriate authorities was obtained.
- Written informed consent was taken from all the study participants and the data was collected using a pre-designed questionnaire.

Statistical analysis used

Data was compiled and analysed using site: <https://www.openepi.com/TwoByTwo/TwoByTwo.htm>.

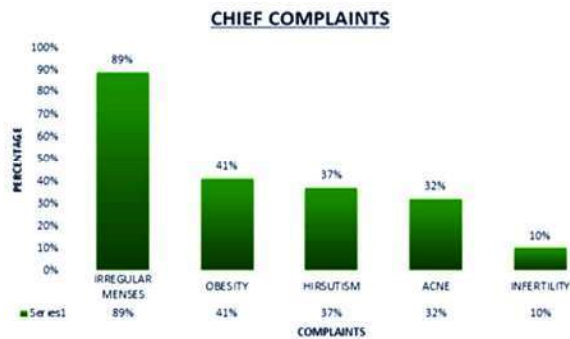
Results

Age Group

The main population of the patients belonged to the age group of 20-24 years i.e. 57%.

- Followed by the group of 15-19 years with 19%.
- 14% of the population in the study were from the group 25-29 years.
- 6% were in the group of 35-40 years.
- And the least belonged to the age group of 30-34 years with 4% of the population.

Chief Complaints

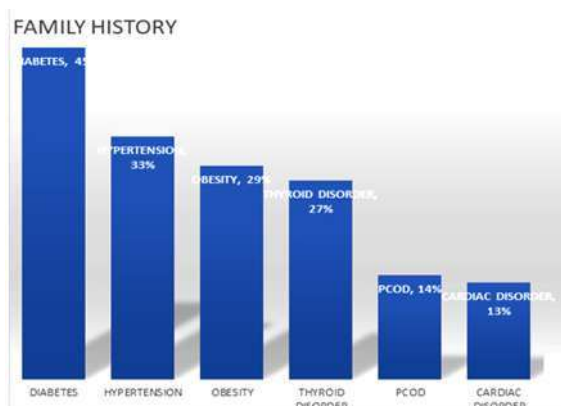


- When we asked for the chief complaints of each and every participant, the main chief complaints was irregular menses which was present in almost 89% of the participants.
- Then the main complaint was obesity which was present in 41% of the participants.
- Almost 37% had Hirsutism as their chief complaint and 32% had acne as their complaint.
- And lastly 10% of the participants came with infertility as their main complaint.
- As all these symptoms were subjective, many participants were having more than one symptom and there was a combination of 2 to 3 symptoms in one patient.

Menarche

- We gathered information about the actual age of Menarche in our study population; the mean age for menarche was found out to be 13.12 years.
- Most of the patients had their menarche between 11-13 years i.e. 59%. Around 35% of the patients got their menarche between 14-16 years.

Family History



- Diabetes was among the highest of them all; almost 45% had a positive family history of diabetes.
- It was followed by Hypertension which was present in 33% of the families of the PCOS patients.

Ultrasonographic findings

- When the USG reports were studied it was found that 89% of the participants had Polycystic changes in their ovaries.
- The remaining 11% were diagnosed as PCOS on the basis of their clinical profiles.
- According to the consensus definition, polycystic ovaries are present when (a) one or both ovaries demonstrate 10 or more follicles measuring 2–9 mm in diameter with an ovarian volume of more than 10 mm^{3,31}



Exercise Routine

- When asked about the exercise routine of the PCOS patients, almost 66% of them didn't do any kind of exercise in their day to day life. That made them more prone to having metabolic syndromes in their later life.
- And only 33% of the PCOS patients were doing some kind of exercise in their daily life like suryanamaskar, aerobic exercises, walking, running, cycling, etc.
- Clinical Examination results.

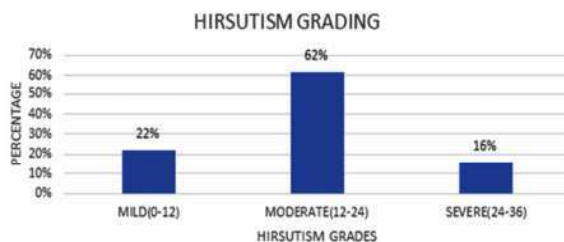
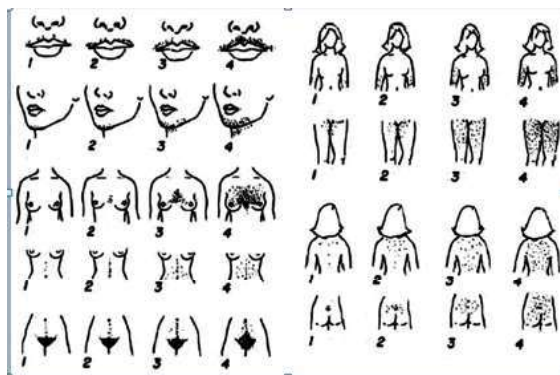
Signs which were clinically relevant according to PCOS were further assessed on the basis of their chief complaints.

Hirsutism Grading: Out of the 55 participants who had hirsutism as their chief complaints were further assessed and a hirsutism grading was done.

- Hirsutism was assessed according to Ferriman Gallwey (F-G) scoring according to

which a score of 1 to 4 was given for 9 areas of the body Upper lip, Chin, upper Arm, upper back, lower back, Chest, Thighs, Pubic region, lower forearm, abdomen.²⁸

- A score till 12 was mild hirsutism, a score between 12-24 was considered moderate and 24- 36 was severe hirsutism.
- Almost 16% of the patients had severe Hirsutism.
- 62% of patients had moderate hirsutism and 22% had mild hirsutism.

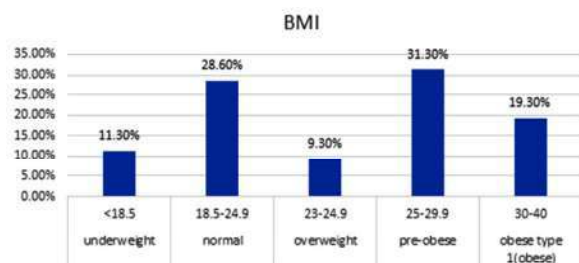


Acne On Examination

- Acne was present in 32% of the participants as their chief complaints, but when further asked in detail and clinically assessed it came out as 50% of them had Acne on their face, arm or back.

Body Mass Index of Patients

- BMI was calculated by Quelet's Formula i.e. dividing weight (kg) by height in metres squared (m²).
- We used the WHO cut offs of the Body Mass Index for our Asian population.



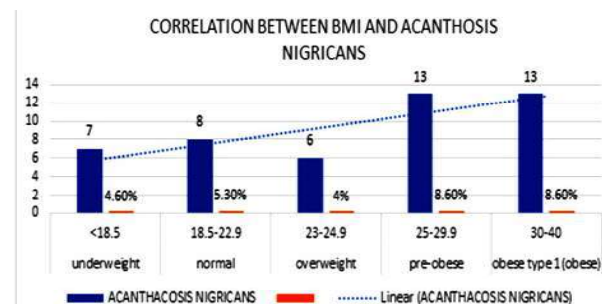
- It came out as around 60% of the participants had their BMI more than normal which means they belonged to the group of overweight.
- pre obese and obese type1 according to the WHO cut offs of the Asian Population.
- And in that 60%, almost 31.30% of the patients were belonging in the group of pre-obese that is BMI between 25-29.9 kg/m². 19.30% were in the group of obese type 1 i.e. BMI between 30-40 kg/m² and only 9.30% were in the group of overweight between 23-24.9 kg/m².
- If we compare the Ratio between the lean and normal population with those patients who were having BMI more than normal (overweight, pre obese, obese type 1) then it was around 6:4.
- That means 40% of the participants had their BMI in the category of normal or underweight.
- 28.60% of the participants were in a normal group between 18.5-22.9 kg/m².
- And 11.30% participants had their BMI less than 18.5 kg/m² which belonged to the underweight category.

Acanthosis Nigricans

- Insulin Resistance was also measured by looking at the blackening on the skin of the elbow, neck and around their groin region which is known as Acanthosis nigricans.
- 32% had Acanthosis Nigricans in their body suggesting Insulin Resistance.

Correlation between BMI and Acanthosis Nigricans

- When we saw the correlation between participants' BMI and the Acanthosis Nigricans there was a rising curve between them.



Clinical Correlation between Different Variables According to Chi Square test. Two by two tables are used to evaluate the association between a possible risk factor ('Exposure') and an outcome ('Disease'). Counts summarising the occurrence of the four possible combinations of events in the study population are entered into the appropriate cells. The table can be rotated or flipped so that either rows or columns represent Exposure, and the column headings (+) and (-) can be in either order to match common textbooks of epidemiology.

Statistics produced include the Fisher and mid-p exact tests, chi squares, odds ratio, maximum likelihood odds ratio estimate, risk/prevalence ratio (relative risk), risk difference, and etiologic fractions with confidence limits produced by several methods, with stratified analysis.

Between Irregular Menses and infertility

Table 1: Two by two table of irregular menses and infertility.

Irregular Menses	Infertility		
	Seen	Not Seen	Grand Total
Present	10	123	133
Absent	5	12	17
Grand Total	15	135	150

- When the patients came with the issue of infertility, it was found that 7% patients had irregular menses as their chief complaints. That means those patients who were having irregular menstrual cycles like amenorrhoea and oligomenorrhoea, there was statistically a significant chance of having infertility in about 7% of the patients ($p=0.002$).

Between Hirsutism and infertility

Table 2: Two by two table of Hirsutism and infertility.

Hirsutism	Infertility		
	Seen	Not Seen	Grand Total
Present	2	53	55
Absent	13	82	95
Grand Total	15	135	150

- When we analysed the chief complaint of infertility we saw that it had a significant correlation with their chief complaint of Hirsutism. ($P=0.02$)
- About 3% of participants who were having hirsutism also had infertility.

Between Their Ultrasonographic Findings and acne

Table 3: Two by two tables of Ultrasonographic findings and Acne as chief complaints.

Ultra Sonographic Findings	Acne		
	Present	Absent	Grand Total
Positive	64	69	133
Negative	12	5	17
Grand Total	76	74	150

- According to the Chi squares test a significant correlation was found between participant's USG reports (showing polycystic changes) and their Acne as the chief complaints. ($P=0.04$)
- Almost 48% of patients who showed polycystic changes in their USGs also had Acne as their chief complaints.

Between Obesity and Hirsutism

Table 4: Two by two table of Chief Complaints of Obesity and Chief Complaints of Hirsutism.

Obesity	Hirsutism		
	Present	Absent	Grand Total
Present	28	34	62
Absent	27	61	88
Grand Total	55	95	150

- About 45% of participants who came with obesity also had hirsutism. This correlation was statistically significant ($p=0.03$).
- And then 30% participants who weren't obese presented with hirsutism.
- If we compare both these values then hirsutism was present more in obese patients giving us a strong correlation between increased weight and hirsutism.

Between Irregular Menses and acne

Table 5: Two by two table of Chief Complaints of irregular menses and Acne.

Irregular Menses	Acne		
	Seen	Not seen	Grand Total
Present	64	69	133
Absent	12	5	17
Grand Total	76	74	150

- There was a significant correlation between chief complaints of irregular menses and acne ($p=0.04$).
- So for those who were having irregular menstrual cycles like amenorrhoea and

oligomenorrhea, about 48% came with acne as their chief complaints also.

Irregular Menses with Hirsutism

Table 6: Two by two table of Chief Complaints of Irregular menses and Hirsutism.

Chief Complaint Irregular Menses	Hirsutism		
	Present	Absent	Grand Total
Present	45	88	133
Absent	10	7	17
Grand Total	55	95	150

- There was significant correlation between the chief complaints of irregular menses and hirsutism.
- Almost 33% of the participants who had irregular menses as their chief complaints also had Hirsutism ($p=0.02$).

Correlation Between Ultrasonographic Findings of PCOS and Acanthosis Nigricans

Table 7: Two by two table of Ultrasonographic findings and Acanthosis nigricans.

Ultrasonographic Findings of PCOS	Acanthosis nigricans		
	Present	Absent	Grand Total
Present	39	94	133
Absent	9	8	17
Grand Total	48	102	150

- There was a Significant correlation between the Ultrasonographic findings of the participants and Acanthosis Nigricans ($p=0.02$).
- Around 29.3% of the participants who had polycystic changes in the ultrasonographic findings also had acanthosis nigricans.

Discussion

Age Group: The mean age in our study (22.91 years) was compared with the study which was done in Nagpur by Mugdha et. al.¹⁰ in PCOS where the mean age of the patients was 24.2 years, and in the study done by Sushma et.al.²¹ where the mean age was 21.6 years.

Menarche: The mean age for menarche in the present study (13.12 years) was compared with the study by Mugdha et. al.¹⁰ where the mean age came out to be 12.5 years and with Sunita et al.²⁰ where the mean age was 13.7±1.398

Table 8: Comparison of mean age of study participants and mean age of menarche with two studies.

	Present Study	Mugdha et.al. ¹⁰	Sushma et.al. ²¹
Mean age	22.91 years	24.2 years	21.6 years
Menarche	13.12 years	12.5 years	13.7 years

Chief Complaints

- Chief Complaints were comparable to the study on PCOS done in Nagpur by Mugdha et.al.¹⁰ where menstrual irregularities (92.3%), signs of hyperandrogenism (64%) and weight gain of >10% in last 6 months (38%) was present. And with Sushma et. al.²¹ where menstrual irregularities were there in 89% of patients, obesity in 42%, and infertility in 56% of patients. In the study done by Sunita et.al.²⁰, menstrual complaints were present in 65% and hirsutism in 44.16% of patients.

Table 9: Comparison of the chief complaints with three studies.

	Present Study	Mugdha et.al. ¹⁰	Sunita et.al. ²⁰	Sushma et.al. ²¹
Menstrual Complaints	89%	92.30%	65%	89%
Hirsutism	37%	43%	44.16%	--
Obesity	41%	38%	--	43%
Infertility	10%	--	--	56%

- Menstrual complaints in the present study were compared in Table No. 9 with the study done by Mugdha et.al.¹⁰ where it was 92.3%, Sushma et.al.²¹ where it was 89%.
- In the study done by Sushma et.al.²¹ where it was 65% it was not comparable with the present study.
- The chief complaints of obesity in the present study (41%) were compared with the other two studies in Table No. 9. In the study done by Mugdha et. al.¹⁰, it was 38% and in Sushma et. al.²¹ it was 42%.
- The chief complaints of Hirsutism in the present study (37%) were compared with the study done by Mugdha et al.¹⁰ where it was 43% and by Sunita et. al.²⁰ where it was 44.16%.
- Chief complaints of infertility in our present study (10%) were compared with the study done by Sushma et. al.²¹ where it was 56%.
- There was a difference in the results of both the studies. This difference was due to the study population which was 82 and in that almost 50 were married and 28 i.e (56%) were having infertility.

Family History: This study was comparable with the study done by Alaknanda et. al.²² where Diabetes was present in the families of 37% of the patients with PCOS, and Hypertension was there in 20% and the history of PCOS was present in 50% of the population. In the study done by Sangbhatula et.al.¹⁹, the prevalence of Diabetes, Hypertension and PCOS was present in 16%, 8%, 8% and Thyroid was present in 4% of the families of the patients.

Table 10: Comparison of Family History with other two studies.

Family History	Present study	Alaknanda et.al. ²²	Sangabathula et.al. ¹⁹
Diabetes	45%	37%	16%
Hypertension	33%	20%	8%
PCOS	14%	50%	8%
Thyroid	27%	--	4%

Further Clinical Examination

Acne on Examination: Presentation of Acne was compared with other studies like Mugdha. et.al.¹⁰ where the percentage of Acne was present in 63% of the patients. In the study done by Sunita et. al.²⁰ 20% of the participants had acne.

Acanthosis Nigricans: In the study by Sunita et.al.²⁰ 44.16% patients showed presence of acanthosis Nigricans, a surrogate marker of insulin resistance and in the study by Mugdha et.al.¹⁰ 26% showed presence of Acanthosis nigricans.

Ultrasonographic Findings Reports: Ultrasonographic findings were comparable with the study by Mugdha et.al.¹⁰ where 96.2% of the USG reports showed Polycystic changes.

Table 11: Comparison of acne on examination, acanthosisnigricans and ultrasonographic findings with two studies.

	Present Study	Mugdha et.al. ¹⁰	Sunita et.al. ²⁰
Acne on Examination	50%	63%	20%
Acanthosis Nigricans	32%	26%	44.16%
Ultrasonographic Findings	89%	96%	--

BMI: BMI of the patients was compared with other studies done by Sunita et.al.²⁰, Sushma et.al.²¹ and Mugdha et. al.¹⁰

Table 12: Comparison of BMI with other three studies.

	Present Study	Sunita et.al. ²⁰	Sushma et.al. ²¹	Mugdha et.al. ¹⁰
Underweight	11.30%	4.16%	20%	7.70%
Normal	28.60%	20.83%	27%	18.50%
Overweight	9.30%	12.50%	11%	24.60%
Pre obese	31.30%	28.83%	42%	49.20%
Obese Type 1	19.30%	34%		

Clinical Correlation

Correlation Between Irregular Menses and infertility

When we compared the present study p value which is 0.002 result with F Bazarganipour et.al.¹ which examined the extent of different clinical symptoms in PCOS patients on HRQOL.

Findings showed that the most common HRQOL concern was menstrual irregularities(menstruation (p=0.005) and infertility(infertility (p=0.02).

Correlation Between their Ultrasonographic Findings Andacne

The correlation between ultrasonographic findings was Comparable with the study done in Pakistan by Sadia et al.²⁵ where Out of 200 females with acne vulgaris, 92 (46%) had polycystic ovarian syndrome. Age of the patients ranged from 14-40 years in that study. While in the present study percentage of the participants having ultrasonographic changes present along with acne is 48%.

Correlation Between Obesity and hirsutism

The correlation between obesity and hirsutism was comparable with the study done by Besa et.al.⁶ Among 135 of the women with hirsutism, 9.6% were under weight, 60% were with normal weight, 20.7% were over weight and 9.6% were obese. That is, a total of 30.3% of the study population had BMI above normal and were having Hirsutism along with it. And in the present study it is 45%. Obesity was more frequent in PCOS and hyperandrogenism groups and the. Result came to be as Obesity was associated with increased hirsutism.

Correlation Irregular Menses and acne

We compared our results with the study done by Yu-Yang Wang et.al.²⁴ There were 121 participants (11.6%) who had oligomenorrhea, and the prevalence of oligomenorrhea in the acne group (17.6%) was higher than in the non acne group (8.6%; P<0.05). Whereas in the present study the p value for positive correlation between irregular

menses and acne is 0.04.

Correlation of Irregular Menses with Hirsutism

The correlation between irregular menses and hirsutism was compared with the study done by S. West et.al.²³ in that in a longitudinal study it was found that adolescent girls who had menstrual irregularities can have both menstrual irregularities and hirsutism later in their lives where the p value was - 0.034. In the present study the p value for the same comparison is 0.02.

Correlation of Ultrasonographic Findings with Acanthosis Nigricans:

It was comparable with the study done by Keen et.al.²⁶ where ultrasonography of 100 PCOS patients was done and around 30% of them had acanthosis nigricans. It was comparable with the present study where the percentage of positive correlation between ultrasonographic findings and acanthosisnigricans is 29.3%.

Conclusion

There is a diversity in the presentation of chief complaints of PCOS patients.

- PCOS patients show a variety in the presentation of the history of metabolic syndromes and PCOS in their families.
- They show cutaneous manifestations in the form of Acne, Hirsutism and Acanthosis nigricans.
- PCOS patients mostly have moderate grades of hirsutism.
- Acne is present in almost half of PCOS patients even though most of them didn't consider it as their chief complaint.
- Most of the participants who had increased BMI had Polycystic Ovarian Syndrome.
- Acanthosis Nigricans is related to an increase in the BMI.
- Very few patients include exercise in their daily routine.

There is a significant correlation in PCOS patients between:

1. Irregular menses and infertility.
2. Hirsutism and infertility.
3. Ultrasonographic findings and Acne as chief complaints.
4. Chief Complaints of Obesity and Chief Complaints of Hirsutism.

5. Chief Complaints of irregular menses and Acne.

Acknowledgment

I would like to thank my statistician and Professor Mr. Sunil Patil Sir for helping me in my statistical analysis. Dr. Pradeep Brade Sir and Dr. Muskaan Gaba Maam for their continuous motivation and guidance.

Conflict of Interest

- There is a conflict of interest between my study and the study done by Sangbathula et. al.¹⁹ in the family history of diabetes, hypertension, PCOS and Thyroid. Where the percentage was very less as compared to the present study. Further research in this topic will bring more understanding towards this topic. (Table no. 10)
- There is also a conflict of interest between the present study and the study done by Sunita et al.²⁰ where the percentage of acne on examination in the present study is very high as compared to Sunita et. al.²⁰ (Table no. 11)
- In the present study and the study done by Mugdha et. al.¹⁰ In the Comparison of Body Mass index has also been found a conflict of interest where the results in the present study are more as compared to the study done by Mugdha et al.¹⁰ (Table no. 12)

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