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**EVALUATING THE ULTRASONOGRAPHIC, ENDOCRINAL, AND CLINICAL
PROFILE OF CASES WITH PCOS IN MARRIED FEMALES AT INDIAN
TERTIARY CARE CENTER**

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ABSTRACT

Background: PCOS (polycystic ovarian syndrome) is a clinical condition arising from the interaction of various endocrinal, biochemical, and pathological events and usually results in complaints as signs of metabolic disturbances such as impaired glucose tolerance, amenorrhea, HA (hyperandrogenemia), and/or infertility.

Aim: The present study was aimed at evaluating the ultrasonographic, endocrinal, and clinical profile of cases with PCOS married females at an Indian tertiary care center.

Methods: The study assessed 200 married females who had confirmed diagnosis of PCOS (polycystic ovarian syndrome) using the criteria by Rotterdam. In all the 200 studies females' ultrasonographic, endocrinal, and clinical profiles were assessed. The data was statistically analyzed for results formulation.

Results: The majority of the study females were in the age range of 20-24 years with 47% (n=94) females. The mean age of the females was 23.67±4.46 years. 48% (n=96) study females were obese. Nearly 86% of females had oligomenorrhea and 50% of females presented with features of hyperandrogenism. In 54% of females, serum testosterone levels were high. Concerning three Rotterdam criteria, 46% had hyperandrogenism, 83% had USG suggesting PCOS and the majority had irregular cycles (chronic anovulation). The association between obesity, acanthosis nigricans, and hyperandrogenism was statistically significant with $p < 0.005$.

Conclusions: The present study concludes that features and complaints of PCOS (polycystic ovarian syndrome) in females should be given high importance as timely intervention can delay the development and progression of PCOS (polycystic ovarian syndrome). As PCOS is a complex entity that is not clearly defined, it requires proper monitoring. There is a need to spread the vital role of weight reduction and symptom identification in the management of PCOS (polycystic ovarian syndrome).

Keywords: Acanthosis nigricans, hirsutism, infertility, oligomenorrhea, PCOS (polycystic ovarian syndrome)

INTRODUCTION

PCOS (polycystic ovarian syndrome) is one of the most commonly encountered hormonal disorders reported in females from the reproductive age group. In females presenting with infertility to various healthcare centers, PCOS (polycystic ovarian syndrome) contributes to be the leading cause of infertility.¹ The exact prevalence of PCOS (polycystic ovarian syndrome) remains highly unknown as the features of PCOS (polycystic ovarian syndrome) are not clearly defined and identified. The global prevalence of PCOS (polycystic ovarian syndrome) shows high variations with the reported prevalence being in the range of 2% to 26%. Previous literature data assessing females from South India and Maharashtra utilizing the Rotterdam criteria is reported to be 22.5% and 9.13% respectively.^{2,3}

Valisnere in 1721 was the first to describe PCOS (polycystic ovarian syndrome). This was followed by Stein and Leventhal in 1935 which explained PCOS (polycystic ovarian syndrome). In May 2003, at the ESHER conference in Rotterdam, Netherlands, the definition of PCOS was revised with emphasis on fulfilling a minimum of two criteria among three in diagnosing PCOS (polycystic ovarian syndrome). The criteria comprised of presence of polycystic ovaries on

ultrasonography, biochemical and/or clinical signs of hyperandrogenism, and anovulation or oligo-ovulation.^{4,5}

PCOS (polycystic ovarian syndrome) presents a complex interaction of endocrinal, biochemical, or pathological events that usually present with complaints as signs of metabolic disturbances such as impaired glucose tolerance, amenorrhea, HA (hyperandrogenemia), and/or infertility. Also, it is associated with features of hyperandrogenism such as baldness, acne, and hirsutism that affect the quality of life and mental health in affected females.⁶

As PCOS is a multifactorial, heterogeneous, and complex clinical entity, it is vital to early recognize and timely manage the disease to prevent its ill effects and complications. Hence, the present study aimed to evaluate the ultrasonographic, endocrinal, and clinical profile of cases with PCOS at Indian tertiary care centers.

MATERIALS AND METHODS

The present cross-sectional descriptive observational clinical study was aimed to evaluate the ultrasonographic, endocrinal, and clinical profile of cases with PCOS at an Indian tertiary care center. The study subjects were from the Department of Obstetrics and Gynecology of the Institute. Verbal and written informed consent was taken from all the study subjects before participation and after explaining the detailed study design.

The present study included 200 females with inclusion criteria as follows: females from the reproductive age group that fulfilled a minimum 2 criteria from the 3 Rotterdam criteria⁷ and were willing to participate in the study. To diagnose PCOS, the operational definition used was from a combined ESHRE (European Society for Human Reproductive Embryology) and ASRM (American Society for Reproductive Medicine) that assess 2 out of 3 criteria as polycystic ovarian morphology on ultrasonography (USG), biochemical or clinical features of hyperandrogenism, and oligo and/or anovulation. The exclusion criteria for the study were pregnant females, androgen-secreting tumors, Cushing's syndrome, and/or congenital adrenal hyperplasia (CAH).

The final sample size for the study was 200 married females with PCOS fulfilling the inclusion criteria for the study. After the initial inclusion of the study subjects, detailed history was recorded for all the subjects on preformed structure proforma including the complaint about illness, infertility, age of onset of puberty, family history, history, pain, amount of bleeding, menstrual cycle duration and history, marital status, age, and other relevant data. This was followed by a thorough general and systemic clinical examination to detect and assess the signs of PCOS (polycystic ovarian syndrome). The signs of hyperandrogenism were also assessed. To calculate the BMI (Body mass index) of the study subjects, anthropometric measurements were taken for all the subjects.

All the subjects underwent ultrasonography to assess the ovarian volume and polycystic ovarian morphology. On ultrasonographic assessment, criteria considered were increased ovarian volume by more than 10 ml or 12 or more follicles present in each ovary (one ovary being enough to diagnose) of dimension 2-9 mm in diameter.⁸ A TVS (transvaginal scan) ultrasound was done in all married females.

The features of hyperandrogenism were considered biochemical for androstenedione or FTC or T levels >95% confidence interval for 97.5 percentile or clinical when FG scores were more than 8 or the subject had moderate to severe acne assessed by inflammatory lesion and their extension presence.⁹ Glucose tolerance tests and TFT (Thyroid function test) were done in all the study females. Standard operating protocols and standard operating definitions were made before the commencement of the study and were adapted till the completion of the study.

The data gathered were analyzed statistically using the SPSS software version 21.0 (IBM Corp., Armonk, NY, USA) and the chi-square test. The data were expressed as mean and standard deviation and frequency and percentage. Statistical significance was kept at a p-value of <0.05.

RESULTS

The present cross-sectional descriptive observational clinical study was aimed to evaluate the ultrasonographic, endocrinal, and clinical profile of cases with PCOS at an Indian tertiary care center. The present study included 200 females with PCOS. The mean age of study subjects was 23.67 ± 4.46 years. The majority of the study females were in the age range of 21-24 years with 47% (n=94) females followed by 34% (n=68) subjects from 25-29 years of age range, 11% (n=22) females from <20 years, 7% (n=14) from 30-34 years, and 1% (n=2) subjects from >34 years of age. There were 68% (n=136) married participants and 32% (n=64) single participants in the study. The BMI of the majority of study females was in an obese category with 48% (n=96) females followed by pre-obese in 35% (n=70) females, 16% (n=32) from normal weight, and 1% (n=2) females were underweight as shown in Table 1.

On assessing the signs and symptoms of PCOS in study subjects, acanthosis nigricans was present in 34% (n=68) subjects, baldness was seen in 4% (n=8) study females, acne in 24% (n=48) study participants, hirsutism in 41% (n=82) study subjects, and infertility was seen in 48% (n=64) study subjects. For the irregularities in the menstrual cycle, menorrhagia, amenorrhea, oligomenorrhea, dysmenorrhea, and anovulation/irregular menstrual cycles were seen in 4% (n=8), 1% (n=2), 86% (n=172), 29% (n=58), and 96% (n=192) study subjects respectively as summarized in Table 2.

The study results showed that concerning the assessment of biochemical and hormonal parameters in study subjects with PCOS, GTT (glucose tolerance test) was impaired in 9% (n=18) study subjects and was normal in 91% (n=182) study subjects respectively. For the total testosterone levels, the values were increased in 54% (n=108) study subjects, and the total testosterone levels were normal or low in 46% (n=92) study females as depicted in Table 3.

It was also seen that for the ultrasonography findings that was assessed in 166 females in the study subjects, only polycystic ovarian morphology was seen in 6.02% (n=10) study subjects, only increased ovarian volume was seen in 14.46% (n=24) study subjects, and both polycystic ovarian morphology and increased ovarian volume was seen in 79.52% (n=132) study females respectively as shown in Table 4.

Concerning the diagnostic methods of PCOS utilized in study subjects, in PCOS criteria, hyperandrogenism with USG assessed PCOS in 13% (n=26) study subjects, chronic anovulation with hyperandrogenism in 17% (n=34) study subjects, chronic anovulation with USG in 54%

(n=108) study subjects, and all three diagnostic criteria were seen in 16% (n=32) study females respectively. For the Rotterdam criteria, USG suggesting PCOS was seen in 83% (n=166) study subjects, hyperandrogenism in 46% (n=92) study subjects, and chronic anovulation (irregular cycles) in 87% (n=174) study subjects (Table 5).

DISCUSSION

The present study assessed 200 females with PCOS. The mean age of study subjects was 23.67 ± 4.46 years. The majority of the study females were in the age range of 21-24 years with 47% (n=94) females followed by 34% (n=68) subjects from 25-29 years of age range, 11% (n=22) females from <20 years, 7% (n=14) from 30-34 years, and 1% (n=2) subjects from >34 years of age. There were 68% (n=136) married participants and 32% (n=64) single participants in the study. The BMI of the majority of study females was in the obese category with 48% (n=96) females followed by pre-obese in 35% (n=70) females, 16% (n=32) from normal weight, and 1% (n=2) females were underweight. These data were similar to the studies of Blank SK et al¹⁰ in 2008 and Majumdar A et al¹¹ in 2009 where authors assessed subjects with PCOS and demographic data comparable to the present study.

It was seen that on assessing the signs and symptoms of PCOS in study subjects, acanthosis nigricans was present in 34% (n=68) subjects, baldness was seen in 4% (n=8) study females, acne in 24% (n=48) study participants, hirsutism in 41% (n=82) study subjects, and infertility was seen in 48% (n=64) study subjects. For the irregularities in the menstrual cycle, menorrhagia, amenorrhea, oligomenorrhea, dysmenorrhea, and anovulation/irregular menstrual cycles were seen in 4% (n=8), 1% (n=2), 86% (n=172), 29% (n=58), and 96% (n=192) study subjects respectively. These results were comparable to the findings of Moghetti P et al¹² in 2013 and Kar S et al¹³ in 2013 where similar signs and symptoms to the present study were reported by the authors in their studies.

Concerning the assessment of biochemical and hormonal parameters in study subjects with PCOS, GTT (glucose tolerance test) was impaired in 9% (n=18) of study subjects and was normal in 91% (n=182) of study subjects respectively. For the total testosterone levels, the values were increased in 54% (n=108) study subjects, and the total testosterone levels were normal or low in 46% (n=92) study females. These results were consistent with the findings of Ozdemir D et al¹⁴ in 2011 and Falsetti L et al¹⁵ in 2002 where biochemical and hormonal parameters similar to the present study were also quoted by the authors.

The study results showed that for the ultrasonography findings that were assessed in 166 females in the study subjects, only polycystic ovarian morphology was seen in 6.02% (n=10) study subjects, only increased ovarian volume was seen in 14.46% (n=24) study subjects, and both polycystic ovarian morphology and increased ovarian volume was seen in 79.52% (n=132) study females respectively. These findings were in agreement with the studies of Pfeifer SM et al¹⁶ in 2009 and Alaknanda et al¹⁷ in 2017 where ultrasonography findings reported by the authors were comparable to the results of the present study.

For the diagnostic methods of PCOS utilized in study subjects, in PCOS criteria, hyperandrogenism with USG assessed PCOS in 13% (n=26) study subjects, chronic anovulation

with hyperandrogenism in 17% (n=34) study subjects, chronic anovulation with USG in 54% (n=108) study subjects, and all three diagnostic criteria were seen in 16% (n=32) study females respectively. For the Rotterdam criteria, USG suggesting PCOS was seen in 83% (n=166) study subjects, hyperandrogenism in 46% (n=92) study subjects, and chronic anovulation (irregular cycles) in 87% (n=174) study subjects. These results were in line with Mandrelle K et al¹⁸ in 2012 and Kalra A et al¹⁹ in 2006 where the diagnostic criteria utilized by authors were PCOS criteria and Rotterdam criteria used in the present study.

CONCLUSIONS

Within its limitations, the present study concludes that features and complaints of PCOS (polycystic ovarian syndrome) in females should be given high importance as timely intervention can delay the development and progression of PCOS (polycystic ovarian syndrome). As PCOS is a complex entity that is not clearly defined, it requires proper monitoring. There is a need to spread the vital role of weight reduction and symptom identification in the management of PCOS (polycystic ovarian syndrome).

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TABLES

| Characteristics | Number (n=200) | Percentage (%) |
|-------------------------------|----------------|----------------|
| Mean age (years) | 23.67±4.46 | |
| <20 | 22 | 11 |
| 21-24 | 94 | 47 |
| 25-29 | 68 | 34 |
| 30-34 | 14 | 7 |
| >34 | 2 | 1 |
| Marital status | | |
| Married | 136 | 68 |
| Single | 64 | 32 |
| BMI (kg/m²) | | |
| Underweight | 2 | 1 |
| Normal | 32 | 16 |
| Pre-obese | 70 | 35 |

| | | |
|-------|----|----|
| Obese | 96 | 48 |
|-------|----|----|

Table 1: Demographic data of study participants

| Characteristics | Number (n=200) | Percentage (%) |
|---------------------------------------|----------------|----------------|
| Acanthosis nigricans | | |
| Present | 68 | 34 |
| Absent | 132 | 66 |
| Baldness | | |
| Present | 8 | 4 |
| Absent | 192 | 96 |
| Acne | | |
| Present | 48 | 24 |
| Absent | 152 | 76 |
| Infertility (n=136) | | |
| Present | 64 | 48 |
| Absent | 72 | 52 |
| Hirsutism | | |
| Present | 82 | 41 |
| Absent | 118 | 59 |
| Menstrual cycle irregularities | | |
| Menorrhagia | 8 | 4 |
| Amenorrhea | 2 | 1 |
| Oligomenorrhea | 172 | 86 |
| Dysmenorrhea | 58 | 29 |
| Irregular cycles | 192 | 96 |

Table 2: Symptoms and signs of PCOS in the study subjects

| Parameter | Number (n=200) | Percentage (%) |
|-------------------------------------|----------------|----------------|
| GTT (glucose tolerance test) | | |
| Impaired | 18 | 9 |
| Normal | 182 | 91 |
| Total testosterone | | |
| Increased | 108 | 54 |
| Normal/low | 92 | 46 |

Table 3: Biochemical and hormonal parameters in study subjects with PCOS

| Factors | Number (n=166) | Percentage (%) |
|--|----------------|----------------|
| Only polycystic ovarian morphology | 10 | 6.02 |
| Only increased ovarian volume | 24 | 14.46 |
| Both polycystic ovarian morphology and increased ovarian volume | 132 | 79.52 |
| Total | 166 | 100 |

Table 4: Ultrasonography results in the study subjects

| Features | Number (n=166) | Percentage (%) |
|----------------------|----------------|----------------|
| PCOS criteria | | |

| | | |
|---|-----|-----|
| Hyperandrogenism with USG | 26 | 13 |
| Chronic anovulation with hyperandrogenism | 34 | 17 |
| Chronic anovulation with USG | 108 | 54 |
| All three | 32 | 16 |
| Total | 200 | 100 |
| Rotterdam criteria | | |
| USG suggesting PCOS | 166 | 83 |
| Hyperandrogenism | 92 | 46 |
| Chronic anovulation (irregular cycles) | 174 | 87 |

Table 5: Diagnostic methods of PCOS utilized in study subjects