ANNQUEST NOV 2023

www.stannsannquest.com

ISSN: 2321-3043

A STUDY ON PREVALENCE OF PCOS IN ADOLESCENT GIRLS (13 YEARS & ABOVE) RESIDING IN GOVERNMENT RESIDENTIAL SCHOOLS OF TELANGANA

Zehra Meher*, Mrs.Y.V. PhaniKumari

Department of Nutrition, St. Ann's College for Women-Mehdipatnam, Hyderabad-500028, TS, India.

**Corresponding author: meherzehra@gmail.com*

Abstract:
Polycystic ovarian syndrome (PCOS) is one of the leading causes of infertility among women worldwide. PCOS is an endocrine disorder that manifests as polycystic ovaries, anovulation, and/or hyperandrogenemia. There is no concrete evidence of the true cause of PCOS.However, PCOS may be inherited and linked to anomalies like obesity and a high body mass index (BMI), among other things.Aim of this paper was to study the prevalence of PCOS in adolescents of Telangana Social Welfare Residential Educational Institutions Society ,to determine the prevalence of PCOS among adolescent girls (13 years & above) of lower socioeconomic backgrounds , to observe the dietary habits of the gets affected by PCOS& to educate and spread awareness on PCOS among adolescent girls (13 years & above) residing in Government residential schools of Telangana.

A semi-structured questionnaire was administered among adolescents identified with PCOS under the Telangana Social Welfare Residential Educational Institutions Society(TSWREIS). Anthropometric measurements as well as data on amenorrhea, oligomenorrhea&hirsutism (assessed by the FerrimanGallwey score) was collected.The prevalence of PCOS was found to be 35.5% with 84.42% of girls having abnormal ovulation, 36.365 of girls having menorrhagia & 83% of girls having dysmenorrhea.
KEYWORDS: PCOS, Hirsutism, Oligomenorrhea, Anovulation, Ultrasonography, Infertility

Introduction:

Introduction to TSWREIS

Under the sponsorship of the Ministry of Welfare, the Telangana Social Welfare Residential Educational Institutions Society (TSWREIS) has been fervently and impeccably providing its services for the past 35 years in an effort to raise the living standards of Scheduled Caste students by offering them a quality and enduring education in English up to graduation.

The Society, which has 268 institutions and 1,50,000 students, embraces seamless experimentation and keeps up with new developments in the field of education. With consideration for the objectives and aspirations of its clients, the Society also began foraying into specialised schools. Over a period of past three decades, the Society has transformed thousands of common boys and girls into exceptional individuals because to its attentive,

meticulous, and carefully planned operation.

TSWREIS continues to draw educators from all over the world and India each year because of its unbeatable reputation in the field of public residential education. TSWREIS enrolls 1,45,485 pupils, or around 10% of the cohorts in Telangana's Schedule Casts. It operates secondary schools, community colleges, and universities with degree programmes in the arts and sciences. With 175 of these institutions educating 1,04,360 girls, they are more focused on serving girls. This includes 17,185 young women who choose to seek higher education instead of getting married off young.

Along with providing the crucial basic education, TSWREIS also began branching out into specialty schools to get students ready for a variety of jobs in the twenty-first century. The TSWREIS team has the benefit of more than three decades of expertise in the residential education system, as well as highly qualified and experienced teachers who are important in shaping students into civically engaged individuals. To free marginalised children from all types of poverty, hopelessness, and inferiority complexes and finally to place them in the sphere of higher education and self-respect, TSWREIS also brought a number of initiatives into the history of the government education sector in India.[1]

PCOS & Symptoms:

PCOS was first defined by Stein and Leventhal more comprehensively in 1935. [2]

Poly cystic ovary syndrome (PCOS) is a disease condition commonly characterized by elevated androgen levels (hyperandrogenism), absent or irregular menstrual cycle and/or cysts on one or both ovaries. PCOS is a hormonal disorder which can potentially lead to various other health problems in women of childbearing age. The hormonal imbalance leads to cyst formation on ovaries and menstrual irregularity. This condition may further lead to infertility or other complications like ovarian cancer, diabetes, hypertension etc[3]

Major symptoms of PCOS are hyperandrogenism, menstrual irregularity & polycystic ovaries seen commonly via ultrasonography. Hyperandrogenism can be identified upon clinical examination for acne, hirsutism, alopecia and acanthosisnigricans. It can also be determined by biochemical tests for elevated levels of androgens (testosterone and androstenedione. Menstrual irregularity can be determined upon clinical examination and biochemical tests both. Upon clinical examination oligomenorrhea and amenorrhea can be identified. Biochemical tests reveal high levels of luteinizing hormone. Poly cystic ovary can be observed through ultrasonography.[4]

Hyperandrogenism:

Clinical hyperandrogenism:

The greatest clinical indicator of hyperandrogenism is hirsutism. Based on ethnicity, hirsutism levels should be anticipated. Hirsutism is characterized as the presence of undesirable terminal (coarse) hairs in a pattern that is more frequently found in adult males. Contrast this with hypertrichosis, which is unaffected by androgen impact and is characterized by the uniform, excessive growth of non-terminal (vellus) hair all over the body, especially in non-sexual areas [5]. The Ferriman-Gallwey scale can be used to visually assess the amount of extra terminal hair [6]. At 11 androgen-sensitive areas (upper lip, chin, chest, upper back, lower back, upper abdomen, lower abdomen, arm, forearm, thigh, and lower leg) the original scale measured hair density on a scale of 1-4.

A more erratic indicator of hyperandrogenism is acne. Acne alone was considered to be a potential indicator of hyperandrogenism, despite research on the precise incidence of androgen excess in

these people is rather contradictory [7]. Less research has been done on the single occurrence of androgenic alopecia as a marker of hyperandrogenism. It doesn't seem to be a very good indicator of androgen excess, unless the patient is oligo-ovulatory, nonetheless.

Biochemical Hyperandrogenism

With or without clinical symptoms, excessive androgen production is a reliable, but not always predictable general PCOS characteristic. The patient must have either clinical or biochemical symptoms of hyperandrogenism to meet the current PCOS diagnosis criteria. The requirements are met if hirsutism is unequivocally evident, however other hyperandrogenism symptoms including acne, hair loss, or mild hirsutism may be harder to spot.

The three main androgens that circulate in the body are testosterone, androstenedione, and dehydroepiandrosterone sulphate of (DHEA) and (DHEA) (DHEAS). The most clinically significant circulating androgen in adult females is testosterone, which is produced mostly via peripheral conversion from circulating androstenedione and also contributes from the ovary (25%) and adrenals (25%) tissues. The best androgen to measure and the higher cut-off consistent with PCOS are not currently agreed upon, however it is generally agreed that testosterone is the measurement of choice for the analysis of female hyperandrogenism.

Polycystic Ovary:

The criteria meeting enough specificity and sensitivity to define PCO are as follows, according to the literature that is currently available: "presence of 12 or more follicles in each ovary measuring 2–9 mm in diameter, and/or increased ovarian volume (>10 mL)" [8]. The rise in stromal echogenicity and volume, as well as the follicular distribution, should be disregarded. Although increased stromal volume is a characteristic of PCO, it has been demonstrated that in clinical practice, measuring ovarian volume is a good substitute for quantifying stromal volume [9].

To define PCO, only one ovary needs to match this definition. The scan needs to be performed the following cycle if there is a corpus luteum or a dominant follicle (>10 mm). Until more is known about the clinical presentation, a woman with PCO who does not also have an ovulatory problem or hyperandrogenism ("asymptomatic" PCO) should not be considered to have PCOS.

Insulin Resistance:

When complex dynamic studies of insulin action are conducted, it is frequently discovered that the greater population (10–25%) has insulin resistance, which is characterised as impaired insulin-mediated glucose consumption [10].

Along with insulin resistance and hyperinsulinism, polycystic ovarian syndrome is frequently found in female patients (PCOS). The selection of a dominant follicle may be prevented by hyperinsulinemia altering the FSH-to-LH transition.

Furthermore, it appears that insulin improves the granulosa cells' receptivity to LH and boosts androgen synthesis from the ovary through activating cytochrome P450c17.

There is strong evidence to support the increased (3–7 times) risk of type 2 diabetes in women with PCOS [11].

Diagnosis Criteria:

To categorise this condition, three distinct diagnostic classifications have been suggested.

Since the NIH-sponsored conference in 1990

It has been recognised that PCOS comprises a wider range of ovarian dysfunction signs and symptoms than those identified by the original diagnostic criteria. They came to the conclusion that the three most important criteria for PCOS

should be the absence of other recognised illnesses, oligo-ovulation, and hyperandrogenism and/or hyperandrogenemia .

From May 1–3, 2003, a second expert meeting was held in Rotterdam, The Netherlands, partly funded by the European Society for The American Society for Reproductive Medicine and Human Reproduction and Embryology. During the meeting, it was recommended that PCOS be classified as present when two out of the following three characteristics were present: oligo- or anovulation, clinical or biochemical evidence of hyperandrogenism, and polycystic ovaries are the first three symptoms.

Last but not least, the Androgen Excess Society published revised diagnostic criteria in 2006 that demanded the presence of: Menstrual and ovulatory dysfunction are listed first, followed by hyperandrogenemia, clinical signs of hyperandrogenism, and polycystic ovaries [12].

Materials:

Questionnaires were administered to record hirsutism, menstrual irregularities if any, family history & dietary habits of girls affected with PCOS. Questionnaires were only given to PCOS patients who had a legible medical diagnosis of the condition.

Methodology:

It is a community based cross sectional study conducted among adolescent girls living in 29 different residential schools across Telangana state under the Telangana Social Welfare Residential Educational Institutions Society **(TSWREIS)**. These residential schools provide shelters to underprivileged students in Telangana. The study was conducted by taking prior permission from the directors and health supervisors via telephone calls.

Through purposive sampling, 217 adolescent girls ages 13-18 years and above were selected from 29 different residential schools of Telangana Social Welfare Residential Educational Institutions Society (TSWREIS).

A consent from HS of the subjects was obtained as the subjects were minor. This study was undertaken with the permission of authorities of Synergy India Foundation, who are involved in assessing the health status of children residing in the Government Residential Homes of Telangana. This was possible due to the collaboration of Department of Nutrition at St. Ann's with Synergy India Foundation.

The study was presented before the Institutional Ethical Committee, St. Anns College For Women ,Mehdipatnam. The jury approved the sample size selected for the study and data collection methods.

The data obtained from different residential schools was compiled. Use of mean and SPSS package was done to obtain statistical analysis of the data procured.

Results:
Ultrasonography for PCO
Out of 217 girls sampled from TSWREIS for menstrual irregularities and dysfunction, out of which 77 girls were found to have PCO. This was confirmed via ultrasonography.
35.5% girls from 217 subjects were found to have PCO.

Age of Respondents

Table 1 Age of Respondents

Age group	Frequency	Percentage
13-15	0	0
16-18	19	24.7
18 & above	58	75.3
Total	77	100.0

Upon interviewing via questionnaires it was found that out of 77 respondents, 24.7% were girls of the age group 16-18 years & 75.3% of girls were 18 & above.

Health Parameters

Table 2 Health Parameters

Health Parameters			Mean	
	Minimum Statistic	Maximum Statistic	Statistic	Standard Error
Height (feet & inches)	4.10	5.5	5.1205	0.04031
Weight (kg)	37.00	68.0	52.7792	0.90503
BMI (kg/m²)	15.4	34.7	22.2252	0.43575

The mean height of the total respondents is found to be 5 feet 1 inch, maximum height being 5 feet 5 inches and minimum height being 4 feet 1 inch.
The mean weight of total respondents is found to be 52.7 kgs while minimum weight being 37 kgs and the maximum weight is 68 kgs.
The mean BMI of total respondents is 22.2 kg/m², maximum BMI is 34.7 kg/m² and minimum BMI is 15.4 kg/m².
The latest WHO Asian BMI categories for Asians are: 18.5-22.9 kg/m² is normal , 23-27.5 kg/m² is overweight and ≥27.5 kg/m² is obese.
The average BMI is 22.2 kg/m² for 77 PCOS affected girls and it is normal as it is within the normal range ie 18.5-22.9 kg/m².(https://www.who.int/)

Menstrual Characteristics:
Age of Menarche:
Table 3 Age of Menarche

Age of Menarche	Frequency	Percentage
13-15 years	51	66.2
16-18 years	26	33.8
18 years & above	0	0

Out of 77 respondents, 66.2% of subjects attained menarche between the ages of 13-15 years and about 33.8% of subjects attained menarche between 16-18 years of age.
According to (Sadrzadeh et al, 2003) diagnosis of PCOS and attaining menarche after turning 14 have been proven to be strongly correlated.

Dysmenorrhea
Table 4Dysmenorrhea

	Frequency	Percentage
Yes	64	83.1
No	13	16.9

Of all respondents, 83.1% of girls experienced dysmenorrhea ie painful periods and 16.9% of girls did not suffer from dysmenorrhea.
Majority of PCOS affected girls suffer with painful periods.
A research study suggests that PCOS and the severity of primary dysmenorrhea may be related (Jeong et al, 2019).

Number of pads used per day
Table 5 Number of pads used per day

No of pads used per day	Percentage
2-4	85.5
5-7	10.5
8 or more	3.9

Out of 77 respondents, 85.5% of girls used about 2-4 pads per day of their menstrual period, 10.5% of girls used 5-7 pads per day and 3.9% used 8 or more pads per day. Here usage of 2-4 pads indicate normal to moderate flow, usage of 5-7 pads indicate moderate to heavy flow & usage of 8 or more pads indicate excessive flow. Here 14.48% of girls with PCOS experienced heavy to excessive menstrual bleeding (menorrhagia).

Number of days of bleeding experienced

Table 6 Number of days of bleeding

Number of days	Percentage
2-4	16.9
5-7	46.8
8 or more	36.4

Out of 77 girls, 46.75% of girls reported to have 5-7 bleeeding days per menstrual period, 36.36% of girls had 8 or more days of bleeding and about 16.88% of girls had 2-4 days of bleeding per menstrual period.
36.36% of PCOS affected girls experienced excessive bleeding (menorrhagia).

Length of menstrual cycle
Table 7 Length of menstrual cycle

Number of days	Percentage
<21 days	23.4
21-35 days	15.6
>35 days	20.8
Amenorrhea (absence of menses)	7.8
Randomly, no fixed date	32.5

Out of total respondents, about 32.47% of subjects had no fixed length of cycle and it varied, about 23.38% of subjects had less than 21 days of menstrual cycle, about 20.78% of subjects had more than 35 days of menstrual cycle, about 15.58% of subjects had 21-35 days of menstrual cycle and only 7.79% of subjects had an absence of menstrual period ie amenorrhea.
Only 15.58% of the girls had a normal length of menstrual cycle. 84.42% of PCOS affected girls had abnormal menstrual bleeding ie either polymenorrhea, oligomenorrhea or amenorrhea. 20.78% of girls had oligomenorrhea, 23.38% of girls had polymenorrhea
& 7.79% of girls had amenorrhea.

Areas of abnormal hair growth

Table 8 Areas of Abnormal Growth

Areas of Hair growth	Percentage
Upper lip	31.2
Beard area	3.9
Breasts	13.0
Inner thighs	16.9
Lower back	10.4
Upper lip, Inner thighs	1.3
Upper lip, Lower back	2.6
Inner thighs, Lower back	3.9
Upper lip, Beard area, Breasts	2.6
Upper lip, Beard area, Inner thighs	5.2
Upper lip, Beard area, Lower back	7.8
Upper lip, Beard area, Breasts, Lower back	1.3

From the above table the following was found;
31.2% of total subjects had hair growth on Upper lip
3.9% of total subjects had hair growth on Beard area
13.0% of total subjects had hair growth on Breasts
16.9% of total subjects had hair growth on Inner thighs
10.4% of total subjects had hair growth on Lower back
1.3% of total subjects had hair growth on Upper lip and Inner thighs
2.6% of total subjects had hair growth on Upper lip and Lower back
3.9% of total subjects had hair growth on Inner thighs and Lower back
2.6% of total subjects had hair growth on Upper lip, Beard area and Breasts
5.2% of total subjects had hair growth on Upper lip, Beard area and Inner thighs
7.8% of total subjects had hair growth on Upper lip, Beard area and Lower back ,
1.3% of total subjects had hair growth on Upper lip, Beard area, Breasts and Lower back
These results indicate that abnormal hair growth alone or hirsutism can be indicative of hyperandrogenism but cannot be an indicator of PCOS alone since it is a complex disorder.

Abnormal Body Hair growth scores
Table 9 FerrimanGallwey Score mFG

mFg	Percentage
1	30.3
2	27.6
3	1.3
4	13.2
6	7.9
8	3.9
10	7.9
12	3.9
16	2.6
18	1.3

From the above table, the following was found;
30.3% of girls had scored 1 on the mFG scale of abnormal hair growth
27.6% of girls had scored 2 on the mFG scale of abnormal hair growth
1.3% of girls had scored 3 on the mFG scale of abnormal hair growth
13.2% of girls had scored 4 on the mFG scale of abnormal hair growth
7.9% of girls had scored 6 on the mFG scale of abnormal hair growth
3.9% of girls had scored 8 on the mFG scale of abnormal hair growth
7.9% of girls had scored 10 on the mFG scale of abnormal hair growth
3.9% of girls had scored 12 on the mFG scale of abnormal hair growth
2.6% of girls had scored 16 on the mFG scale of abnormal hair growth
1.3% of girls had scored 18 on the mFG scale of abnormal hair growth

These results indicate that abnormal hair growth alone or hirsutism can be indicative of hyperandrogenism but cannot be an indicator of PCOS alone since it is a complex disorder.

The multifactorial pathophysiology of hirsutism, which is primarily influenced by androgen levels, also involves the susceptibility of hair follicles to androgens. In reality, it was discovered that the relationship between biochemical hyperandrogenism and the severity of hirsutism was not as strong as anticipated, indicating that there may be additional factors influencing the above-described mechanism. Insulin and insulin-like growth factor-1 may both influence hair follicle growth in a dose-dependent manner, according to in vitro research
The primary foundation for the idea of hyperandrogenism should be clinical data. Androgen measures are not a replacement for clinical judgement, and biochemical examination is

crucial in patients who don't exhibit overt hyperandrogenism, in particular. However, after ruling out the previously stated linked conditions, an abnormal scale of hirsutism accompanied with ovulatory failure or ovarian morphological abnormalities is sufficient for the diagnosis of PCOS.
(Spritzer et al, 2022).

Family History of PCOS
Table 10 Family History

Family History of PCOS	Percentage
Yes	14.29
No	85.7

From the above table, only 14.29% of girls had close female family members affected by PCOS & 85.7% of girls did not have a family history of PCOS.

It was found in a study that the incidence and expression of the illness were strongly correlated with family history (Bharathi et al, 2017).

Food Frequency
Table 11 Food frequency

Food Item	Daily (%)	Three or more times a week (%)	Twice a week (%)	Once a week (%)	Never (%)
Cereals and millets (rice, wheat, ragi, jowaretc)	96.1	3.9	0	0	0
Refined: Ready to eat foods	72.7	2.6	1.3	23.4	0
Milk and milk products (curd, paneer)	90.9	2.6	1.3	5.2	0
Green leafy vegetables	42.9	0	50.6	6.5	0
Roots and tubers	19.5	0	74	6.5	0
Other vegetables	76.6	11.7	11.7	0	0
Fruits	72.7	27.3	0	0	0
Non-veg (meat, fish, chicken)	26	0	0	44.2	29.9

Egg	36.4	48.1	1.3	2.6	11.7
Butter, cream, cheese	3.9	11.7	0	14.3	70.1
Nuts and seeds	7.8	0	42.9	37.7	11.7
Restaurant food/ Street food	0	1.3	1.3	24.7	72.7
Junk Food (chips, biscuits) and fried foods	62.3	0	0	11.7	26
Tea/ coffee	19.5	0	0	14.3	66.2
Carbonated Beverages	0	3.9	3.9	0	80.5
Desserts and bakery items	0	0	3.9	11.7	84.4

Cereals and millets (rice, wheat, ragi, jowaretc)

Majority of PCOS affected girls ie about 96.1% of them consume cereals and millets daily in their diet.

Refined: Ready to eat foods

72.73% of PCOS affected girls regularly consumed refined foods or ready to eat foods. This indicates that majority of PCOS affected girls consume a diet that is rich in simple sugars and less fibres on a daily basis.

Milk and milk products (curd, paneer)

From the above pie chart, 90.91% of girls consumed milk and milk products regularly. 5.19% of girls consumed milk and milk products once a week and 2.60% of girls consumed milk and milk products thrice a week.

Green leafy vegetables

Only 42.86% of girls consumed GLVs regularly and 60.655 of girls consumed GLVs only twice a week & 6.49% of girls consumed GLVs once a week.

Roots and tubers

Roots & Tubers were consumed twice a week by 74.03% of girls, consumed daily by 19.48% of girls & 6.49% girls consumed it only once a week.

Other vegetables

76.62% of girls consumed other vegetables daily, 11.69% consumed it three or more times a week & 11.69% of girls consumed it twice a week.

Fruits72.73% of girls reported to consume fruits daily and 27.27% of them consumed it thrice a week.

Non-veg (meat, fish, chicken)

44.16% of girls consumed non vegetarian foods once a week, 29.87% never consume this food group & 25.97% of girls consumed it twice a week.

Egg

11.69% of total respondents never consume egg,2.6% of tem consumed it once a week, 36.36% consumed it daily while 48.05% of them consumed it thrice a week

Butter, cream, cheese

70.13% of girls never consume butter, cream or cheese, 14.29% of them consume it once a week, 11.69% consume it thrice a week and only 3.9% of girls consumed it daily.

Nuts and seeds

42.86% of girls consumed nuts and oil seeds twice a week, 37.66% of girls consumed nuts and oil seeds once a week, 11.69% of girls never consumed nuts and oil seeds & 7.79% of girls consumed nuts and oil seeds daily.

Restaurant food/ Street food

72.73% of girls never consume street food and restaurant foods, 24.68% of girls consume street food and restaurant foods once a week & 1.30% of girls never consume street food and restaurant foods thrice a week.

Junk Food (chips, biscuits) and fried foods

62.34% of girls consume junk food daily, 25.97% of girls never consume junk food & 11.69% of girls consume junk food obly once a week.

Tea/ coffee

66.23% of girls don't consume tea & coffee, 19.48% consumed tea & coffee daily & 14.29% consume it once a week.

Carbonated Beverages

80.5% of girls never consume carbonated beverages, 11.69% consume it once a week, 3.9% consume it thrice a week & 3.9% consume it twice a week.

Desserts and bakery items

84.42% of girls never consume desserts & bakery items, 11.69% of girls consumed it once a week & 3.9% of girls consumed desserts twice a week.

Discussion:

The first objective was to determine the prevalence of PCOS was found to be 35.5%; out of 217 girls of ages 13 & above from under TSWREIS with menstrual problems, 77 were diagnosed with PCO via US. It was found that age of menarche for 33.8% of the girls was between the ages of 16-18 years which could have been an early indicator of PCOS. 83% of PCOS affected girls had dysmenorrhea (painful menses) and about 363% of them had menorrhagia (excessive bleeding). 84.42% of girls had abnormal ovulation issues; 20.78% of girls had oligomenorrhea, 23.38% of girls had polymenorrhea& 7.79% of girls had amenorrhea. The mFg scores indicated that abnormal hair growth alone or hirsutism can be indicative of hyperandrogenism but cannot be an indicator of PCOS alone since it is a complex disorder.

The second objective was to observe the dietary intake of PCOS affected adolescent girls, it was found that they consumed refined & junk foods regularly. This

indicates that their diets may be high in processed foods, fats & simple sugars. The third objective was to raise awareness on PCOS its complications, risk factor and dietary management, it was all done via PPT presentation.

Suggestions

Awareness should be raised in institution and communities on PCOS and other menstrual issues as it can greatly impact the quality of life in these individuals.

Emphasis should be made on taking a proper balanced diet, high in antioxidants, phytochemicals and fibre.

Seed cycling should be encouraged as a practise to maintain and stabilize hormone levels.

Proper assessment and diagnosis must be made in case of suspicion of PCOS as it a complex and multifactorial disorder that requires medical, nutritional and psychological attention.

Limitations:

The data obtained was via self reporting questionnaires, hence we cannot determine the accuracy of answers obtained in certain areas such as intensity of hair growth and frequency of food group intake. Due to distance and other factors the interviewing process could not be done for each and every respondent. The awareness programs could not be conducted in person due to long distances and time constraint.

References:

1. www.tswreis.ac.in
2. Stein IF, Leventhal ML. Amenorrhea associated with bilateral polycystic ovaries. *Am J Obstet Gynecol*. 1935;29:181–91.
3. Ajmal, N., Khan, S. Z., & Shaikh, R. (2019). Polycystic ovary syndrome (PCOS) and genetic predisposition: A review article. European journal of obstetrics &gynecology and reproductive biology: X, 3, 100060.
4. El Hayek, S., Bitar, L., Hamdar, L. H., Mirza, F. G., &Daoud, G. (2016). Poly cystic ovarian syndrome: an updated overview. Frontiers in physiology, 7, 124.
5. Dawber RP. Guidance for the management of hirsutism. Curr Med Res Opin 2005;21:1227-34.
6. Ferriman D, Gallwey JD. Clinical assessment of body hair growth in women. J ClinEndocrinolMetab 1961;21:1440-7.
7. Slayden SM, Moran C, Sams WM Jr, Boots LR, Azziz R Hyperandrogenemia in patients presenting with acne FertilSteril 2001;75:889-92.
8. Balen AH, Laven JS, Tan SL, Dewailly D. Ultrasound assessment of the polycystic ovary: international consensus definitions. Hum Reprod Update 2003;9:505-14.
9. Bucket WM, Bouzayen R, Watkin KL, Tulandi T, Tan SL Ovarian stromal echogenicity in women with normal and polycystic ovaries. Hum Reprod 2003;18:598-603.
10. Ferrannini E, Natali A, Bell P, Cavallo-Perin P, Lalic N, Mingrone G. Insulin resistance and hypersecretion in obesity. J Clin Invest 1997;30:1166-73.
11. Wild S, Pierpoint T, McKeigue P, Jacobs HS Cardiovascular disease in women with polycystic ovary syndrome at long-term follow-up: a retrospective cohort study. ClinEndocrinol 2000;2:595-600.
12. Artini, P. G., Di Berardino, O. M., Simi, G., Papini, F., Ruggiero, M., Monteleone, P., &Cela, V. (2010). Best methods for identification and treatment of PCOS. Minerva ginecologica, 62(1), 33.