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Thyroid Disorders in Women with Polycystic Ovary Syndrome

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Abstract

Background: Polycystic ovary syndrome (PCOS) is one of the common endocrinopathies of women in the reproductive age group. Thyroid hormones have various effects on the reproductive system of female. PCOS and thyroid dysfunction are linked to each other since several years. **Objective:** To evaluate and detect the thyroid dysfunction in patients with PCOS attending in a tertiary care hospital in Bangladesh. **Methodology:** This was a prospective cross sectional study conducted from November 2018 to October 2019 at Department of Obstetrics and Gynecology in Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh on one hundred and fifty (150) PCOS women of reproductive age (15 - 45 years). All data of the study subjects regarding socio-demographic, anthropometric and clinical manifestations were recorded accordingly. Their thyroid function tests (serum level of FT_3, FT_4, TSH) were done at the hospital laboratory and results were recorded. **Result:** Mean (±SD) age of the study subjects was 24.57 ± 4.27 years. The maximum numbers [108 (72.0%)] of PCOS women were between 18 - 25 years age group. Among total (150) study population, 51 (34.0%) were overweight, 36 (24.0%) were obese and 63 (42.0%) were within normal weight level. Hirsutism was found in 87 (58%) study subjects while 24 (16%) subjects had acne in their face, 54 (36%) subjects had oligomenorrhea and 45 (30%) subjects had irregular periods. Among 150 PCOS women, 120 (80%) were married and 30 (20%) were single; of them primary infertility was detected in 58 (48.33%) women followed by the normal fertility status [51 (42.5%)] and 11 (9.17%) had secondary infertility. Among total (150) study subjects, 105

(70%) were in euthyroid state, hypothyroidism was found in 33 (22.0%) subjects and hyperthyroidism was detected in 12 (8%) subjects. **Conclusions:** Present study demonstrated that, thyroid disorders are prevalent in 30.0% of PCOS patients. Hypothyroidism is almost three-fold more prevalent than hyperthyroidism.

Keywords

Polycystic Ovary Syndrome (PCOS), Reproductive Age, Thyroid Disorder

1. Introduction

Polycystic ovary syndrome (PCOS), the most common endocrinopathy of women is a complex disorder affecting approximately 5% - 10% of women in their reproductive age and contributes to a major share of anovulatory infertility [1] [2]. PCOS is associated with 75% of anovulatory infertility. Even if they conceive, they can have very high pregnancy loss rates [2]. It can present in women of any ethnicity but more prevalent in South Asian women than in Caucasians [3]. PCOS is a multifactor disorder characterized by chronic anovulation with biochemical and/or clinical evidence of androgen excess and without other specific diseases of adrenal, thyroid or pituitary glands that can produce similar manifestation. PCOS could be diagnosed by three criteria: oligo/anovulation, hyperandrogenism or polycystic ovaries on ultrasound [4]. There is no specific cause for PCOS as there are numerous genetic, variants and environmental factors that interact and contribute to the pathophysiological processes of PCOS [1] [5] [6]. Genetic factors may have some role, but the exact mechanisms for developing PCOS are still unclear. Little evidence shows familial aggregation of hyperandrogenaemia with or without oligomenorrhoea in the first degree relatives of women with PCOS [5]. The diagnosis should exclude all the secondary causes such as androgen producing neoplasm, hyperprolactinemia and adult onset congenital adrenal hyperplasia [5]. PCOS is often associated with increased metabolic and cardiovascular risk factors due to increased insulin resistance compounded by the common occurrence of obesity, while insulin resistance is also evident in non-obese women with PCOS [7]. A recent meta-analysis demonstrated a two-fold increased risk of coronary heart disease and stroke in women with PCOS. Although there is an increased risk of cardiovascular disorders, there is no apparent risk of increase mortality for PCOS [7] [8]. Therefore PCOS is not only a reproductive disorder but also an endocrinopathy one with long-term effects on women's health.

Thyroid gland, located at base of the neck is a butterfly-shaped gland weighing only about 20 grams, but the hormones it secrets are essential to the growth and metabolism. The gland is a prime regulator of all body functions. There are different forms of thyroid disorders; these may occur with thyroid hormone deficiency (hypothyroidism), thyroid hormone excess (hyperthyroidism) or with

thyroid hormones within the normal range (euthyroidism). Thyroid disorders are found in 0.8% - 5% of adult population and are 4 - 7 times more common in women of child bearing age. Dysfunction and anatomic abnormalities of the thyroid hormone are among the most common disease of the endocrine gland. Thyroid disorders are often insidious in their presentations and it has long been recognized that thyroid dysfunction has a profound effect on the female reproductive system. Although the reason is not understood, the high prevalence of thyroid disorder in women is possibly due to the autoimmune nature of the thyroid disorders. The abnormalities of the thyroid hormone supply to the peripheral tissues are associated with a number of metabolic processes [9] [10] [11] [12].

Primary hypothyroidism is the most common pathological hormone deficiency, the prevalence of overt and subclinical disease being 0.3% and 4.3%, respectively [13]. Thyroid hormones abnormalities have several effects on different organs, including reproductive system of the female. Long-standing hypothyroidism can interfere with gonadotropin secretion by increasing serum prolactin levels [14]. Clinical manifestations including menstrual irregularities and impaired fertility are the results of anovulation and/or luteal phase defect [15].

It has been reported that PCOS and thyroid disorders have profound effect on fertility and reproductive biology. More interestingly hypothyroidism can initiate, maintain or worsen the syndrome [16]. During recent years different studies from various parts of the world regarding thyroid disorders in PCOS have tried to explore the PCOS-thyroid interface [15] [16] [17] [18]. Most of the results showed higher incidence of elevated TSH levels and four times higher prevalence of autoimmune thyroiditis in PCOS subjects [18]. But there is scarce evidence addressing the thyroid dysfunction among patients with polycystic ovary syndrome in Bangladesh. Therefore the purpose of the current study was to evaluate and detect the thyroid dysfunction among polycystic ovary syndrome (PCOS) patients attending a tertiary care hospital (BSMMU) in Bangladesh.

2. Material and Methods

This prospective cross sectional study was conducted at Department of obstetrics and gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from November 2018 to October 2019. The study was approved by the Ethical Review Committee, BSMMU, Dhaka, Bangladesh. According to the statistical calculation a total of one hundred and fifty (150) PCOS patients were selected as study population following selection criteria. Women who were diagnosed as polycystic ovary syndrome (PCOS) in reproductive age (15 - 45) group attended at the obstetrics and gynecology department of BSMMU were enrolled in this study. Sample was selected by consecutive, convenient sampling technique. The diagnosis was made by 2 of 3 Rotterdam criteria (oligo and/or anovulation, biochemical and/or clinical sign of hyperandrogenism, plycystic ovaries) [4]. Normal females without PCOS, pregnant, preme-

narche and menopause were excluded from the study. Informed written consent was taken from each participant prior to enrollment in the study. All study participants were evaluated by history, clinical examination and investigations. Each study participant was asked about age, marital status, history of infertility (primary or secondary), menstrual history including any history of oligomenorrhea, irregular periods or amenorrhea and any previous sonographic studies documented PCOS. Then they were examined for presence and distribution of hirsutism and acne. Their anthropometric measurements were done with a calculation of body mass index (BMI). At the same time, thyroid function tests (serum TSH, serum FT_3, serum FT_4) were done for each study participant. The outcome variables were-age, body mass index (BMI), clinical manifestations and thyroid function tests (serum level of TSH, FT_3, FT_4).

In this study, obesity and overweight were defined according to WHO criteria as a body mass index (BMI) ≥ 30 kg/m^2 and ≥ 25 kg/m^2 respectively. Amenorrhea was defined as absence of menstrual cycles in the last 6 months and oligomenorrhea as interval of menstrual cycle > 35 days. Menstrual bleeding was considered irregular when it occurs more frequently than every 21 days or lasts longer than 8 days. Infertility was assessed only in married study patients and was defined as failure of spontaneous pregnancy after one year of marriage and having sex without using birth control methods in the absence of male infertility. Primary infertility was defined as, couples who have not become pregnant after at least 1 year and having sex without using any birth control methods. Secondary infertility was defined as; couples who have been able to get pregnant at least once, but now are unable to conceive.

2.1. The Reference Values of Thyroid Hormones

The reference normal values of FT_3, FT_4 and TSH used in this study were according to Biochemistry and Molecular Biology Laboratory, Department of Biochemistry and Molecular Biology, Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka, Bangladesh.

- Free triiodothyronine (FT_3): 3.5 - 8.5 pmol/L.
- Free thyroxine (FT_4): 8.5 - 25.6 pmol/L.
- Thyroid-stimulating hormone (TSH): 0.3 - 5.0 pmol/L.

2.2. Rotterdam Diagnostic Criteria of Polycystic Ovarian Syndrome [4]

Diagnosis of PCOS is dependent on identifying at least two of the following three features.

- **Oligo/anovulation**

Oligo/anovulation is usually seen in women with menstrual cycles greater than 35 days apart or, conversely, with short cycles of less than 21 days. It is important to remember that even women with regular cycles may be anovulatory. For these women a measure of luteal progesterone (day 21 in a 28 day cycle) will

determine ovulatory status.

- **Hyperandrogenism**
- **Clinical** (Hirsutism or less commonly male pattern alopecia) or
- **Biochemical** [Raised free androgen index (FAI) or free testosterone]

Hirsutism is difficult to assess as most women treat this so it is not obvious on examination. Hyperandrogenaemia is best measured with free testosterone; either calculated free testosterone, FAI or bioavailable testosterone. If free testosterone is significantly raised or there is evidence of rapid virilisation, further investigations are required to exclude late onset congenital adrenal hyperplasia and virilising tumours [4].

- **Polycystic ovaries on ultrasound**

Polycystic ovaries on ultrasound are diagnosed when at least 12 follicles are seen in each ovary, follicular diameter between 2 mm to 9 mm, and increased ovarian volume more than 10 mm^3. Other aetiologies must be excluded such as congenital adrenal hyperplasia, androgen secreting tumours, cushing syndrome, thyroid dysfunction and hyperprolactinaemia

2.3. Collection, Preservation and Analysis of Blood Samples

After selection of the subjects the objectives, nature, purpose and potential risk of all procedures used for the study were explained in detail and informed written consent was taken from each participant. Participant's particulars, detailed history and findings of clinical examination were recorded in a pre-tested data collection sheet. Then 6 ml of venous blood was collected from median cubital vein of each study participant by disposable syringe following standard procedure. The needle was detached from the nozzle and blood from the syringe was transferred into a dry, clean and plain test tube with a gentle push to avoid hemolysis. Test tubes containing blood sample were labeled and coded for identification and kept in slanting position till formation of clot, then centrifuged at 3000 rpm for 5 minutes at 24˚C temperature and the separated serum was kept in labeled eppendorf after proper labeling. From each eppendorf; about 200 µL of serum was used for serum TSH, 200 µL for FT_3 and 200 µL for FT_4. Serum TSH, serum FT_3 and FT_4 were measured by Chemiluminescence immunoassay method. All the biochemical tests were carried out as early as possible. Whenever there was a delay, the sample was stored at −20˚C, to avoid loss of bioactivity and contamination. Biochemical tests were performed at the Biochemistry and Molecular Biology Laboratory, Department of Biochemistry and Molecular Biology, BSMMU, Dhaka, Bangladesh.

2.4. Interpretation of Thyroid Function Test Results [2]

Depending on the serum free T_3 (FT_3), free T_4 (FT_4) and TSH level the results of thyroid function test can be classified as follows:

- **Euthyroid:** When FT_3, FT_4, TSH are within normal range.
- **Primary hypothyroidism:** When FT_4, FT_3 are less than normal value and

TSH is elevated, that is more than normal upper limit (>5.0 pmol/L).

- **Primary hyperthyroidism:** When FT_3, FT_4 more than normal value and TSH is undetectable or less than normal lower limit (<0.3 pmol/L).
- **Subclinical hypothyroidism:** When TSH is mildly elevated and FT_3, FT_4 are within normal range.
- **Subclinical hyperthyroidism:** When TSH is undetectable or decreased and FT_3, FT_4 are within normal range.

2.5. Clinical Manifestations of PCOS

Irregular periods: Usually normal menstrual cycle of a woman lasts 28 days (±7 days). When it occurs more frequently such as less than 21 days or continues more than 8 days then it is considered as irregular period.

Oligomenorhea: Oligomenorhea is an abnormal condition of female menstrual cycle. If menstrual cycle occurs at interval of more than 35 days then it is considered as oligomenorrhoea.

Acne: Acne is a chronic inflammatory condition of the skin. It occurs due to blockage of the hair follicles by the oil and dead cells from the skin which causes pimples and spots. Main sites of the acne are the face, shoulders, chest, neck, back and upper arms.

Hirsutism: Hirsutism is a male pattern of excessive hair growth in women. It mainly occurs on face, chest and back in women. Hirsutism grades from 0 (no hair) to 4 (frankly virile) by the modified Ferriman-Gallwey (mFG) score which includes 9 body areas such as upper lip, chin, chest, upper abdomen, lower abdomen, thighs, back, arms and buttocks [19].

2.6. Estimation of Sample Size

Sample size (n) was determined by the formula used in cross sectional studies ($n = Z^2pq/d^2$) with 95% confidence interval [value of standard normal distribution (Z) = 1.96] and 05% margin of error (d). The prevalence (p) of thyroid disorders in PCOS women was taken to be 0.269 [18]. Taking 05% error, sample size was calculated to be 302. Because it was a single centre study and time constraints, a total of 150 patients were studied.

2.7. Data Analysis

Data cleaning validation and analysis was performed using the Statistical Package for Social Science (SPSS) software for Windows version-22. Categorical data were presented as frequency/percentage and continuous variable was expressed as mean ± SD (standard deviation).

3. Results

A total of 150 women in reproductive age (15 - 45 years) who were diagnosed as PCOS (2 of the 3 Rotterdam criteria) had been evaluated in this study. The majority of the study subjects (78%) were living in urban areas and only 22% of

them were living in rural areas. Most of them (85%) were housewife and only 15% were employee. Nearly half (48%) of them had a primary school level of education and 32% had the secondary level of education, while the illiterate and university level of education was 15% and 5% respectively. According to their monthly family income majority (68.0%) of the study patients came from lower-middle income family. In all age groups majority (90%) of the study subjects had no knowledge about PCOS. Among total study subjects 120 (80%) were married and 30 (20%) were single.

In this study among total 150 study population, the maximum participants [108 (72.0%)] were between 18 - 25 years age group next [42 (28.0%)] were 26 - 35 years age group. Mean (±SD) age of the study subjects was 24.57 ± 4.27 years [Table 1].

Among 150 PCOS women 51 (34.0%) were overweight (BMI 25 - 29.9 kg/m^2), 36 (24.0%) were detected as obese (BMI ≥30 kg/m^2) and 63 (42.0%) were within normal weight (BMI 18.5 - 24.9 kg/m^2) level [Table 2]. Of them 105 (70%) had

Table 1. Age distribution of the study subjects (n = 150).

Age (years)	Frequency (n)	Percentage (%)	Mean ± SD
18 - 25	108	72.0	
26 - 35	42	28.0	24.57 ± 4.27
>35	0	0	

Table 2. Distribution of study subjects according to weight categories and thyroid hormone parameters (n = 150).

Variable	Number of patients (n = 150)	Percentage (%)
Weight (BMI kg/m^2)		
Normal weight (18.5 - 24.9)	63	42.0
Overweight (25 - 29.9)	51	34.0
Obese (≥30)	36	24. 0
TSH level (pmol/L)		
Normal (0.3 - 5.0)	105	70. 0
Elevated (>5.0)	33	22. 0
Decreased (<0.3)	12	8. 0
FT3 level (pmol/L)		
Normal (3.5 - 8.5)	111	74.0
Decreased (<3.0)	24	16.0
Elevated (>8.5)	15	10. 0
FT4 level (pmol/L)		
Normal (8.5 - 25.5)	114	76. 0%
Deceased (<8.5)	24	16. 0%
Elevated (>25.5)	12	8. 0%

normal TSH level (TSH 0.3 - 5.0 pmol/L), 12 (8%) had decreased (TSH <0.3 pmol/L) level of TSH and 33 (22.0%) had elevated TSH level (TSH >5.0 pmol/L). Regarding FT_3 it was observed that 111 (74.0%) patients were in normal level of FT_3 (FT_3 3.5 - 8.5 pmol/L), 24 (16%) patients had low level of FT_3 (FT_3 < 3.0 pmol/L) and 15 (10%) patients had elevated level of FT_3 (FT_3 > 8.5 pmol/L). In this series we found that serum thyroxine (FT_4) level was decreased in 24 (16.0%) study subjects (FT_4 < 8.5 pmol/L), 114 (76.0%) subjects were within normal range of FT_4 (FT_4 8.5 - 25.5 pmol/L) and 12 (8%) subjects had raised serum thyroxine (FT_4) level (FT_4 > 25.5 pmol/L) [Table 2].

In this study an analysis of clinical manifestations revealed that; clinical hirsuitism was found in 87 (58%) study subjects, 54 (36%) subjects had oligomenorrhea, 45 (30%) subjects had irregular periods and 24 (16%) subjects had acne in their face [Table 3].

It was observed that among total 120 married study subjects; primary infertility was detected in 58 PCOS women as the highest percentage (48.33%) followed by the normal fertility status 51 (42.5%) and 11 (9.17%) subjects had secondary infertility [Table 4].

Regarding thyroid dysfunction, 24 (16.0%) study subjects were detected as primary hypothyroidism and it was the predominant thyroid abnormality in this current study. The subclinical hypothyroidism was found in 9 (6.0%) study subjects and primary hyperthyroidism was found in 12 (8.0%) study subjects. None of the case was detected as subclinical hyperthyroidism [Table 5].

Present study demonstrated that among total (150) study population; 105 (70%) patients of polycystic ovary syndrome (PCOS) were in euthyroid state, hypothyroidism was found in 33 (22.0%) study subjects and hyperthyroidism was found in 12 (8%) study subjects. Therefore thyroid disorders were prevalent in 30.0% of PCOS patients, among them hypothyroidism was almost three-fold (22% versus 8%) more prevalent than hyperthyroidism [Table 6].

Table 3. Distribution of the patients according to clinical manifestations (n = 150).

Clinical manifestations*	Frequency (n)	Percentage (%)
Hirsutism	87	58
Oligomenorrhea	54	36
Irregular periods	45	30
Acne	24	16

*Some participants had more than one finding.

Table 4. Distribution of the study subjects according to fertility status (n = 120).

Fertility status	Frequency (n)	Percentage (%)
Normal fertility	51	42.50
Primary infertility	58	48.33
Secondary infertility	11	9.17

Table 5. Frequency and pattern of thyroid abnormality in the study population (n = 150).

Thyroid status	Number of patients (n)	Percentage (%)
Euthyroidism	105	70.0
Primary hypothyroidism	24	16.0
Subclinical hypothyroidism	9	6.0
Primary hyperthyroidism	12	8.0
Subclinical hyperthyroidism	0	0

Table 6. Status of thyroid function tests among study subjects (n = 150).

Thyroid status	Number of patients (n)	Percentage (%)
Euthyroidism	105	70.0
Hypothyroidism	33	22.0
Hyperthyroidism	12	8.0

Figure 1 shows the overall prevalence of thyroid dysfunction among total 150 polycystic ovary syndrome (PCOS) women, displaying that hypothyroidism is 73% and hyperthyroidism is 27%.

4. Discussion

Polycystic ovary syndrome (PCOS) is a common disorder among young women and an important cause of infertility in this age group. PCOS and thyroid dysfunction are two of the most common endocrine disorders in women, although the features of these conditions are very different [18]. Hyperthyriodism is more common in women with PCOS than in the general population [18]. The pathogenesis of hypothyroidism and PCOS is completely different. But these two entities have many features in common [20] [21]. PCOS and thyroid dysfunction are linked to each other for several years. Thyroid hormones have various effects on the reproductive system of female. Thyroid abnormality mainly hypothyroidism is related to polycystic ovary syndrome (PCOS), ovarian enlargement and cyst formation. Both hyperthyroidism and hypothyroidism may result in menstrual disturbances and impair fertility, although the hormonal and other biochemical aberrations are not the same in these two disorders [21]. We have evaluated 150 women with polycystic ovary syndrome (PCOS) in reproductive age (15 - 45) group attended at the obstetrics and gynecology department of BSMMU, Dhaka, Bangladesh to detect their thyroid dysfunctions.

In the present study mean (±SD) age of the study population was 24.57 ± 4.27 years. Maximum numbers of cases [108 (72.0%)] were between 18 - 25 years age group, next [42 (28.0%)] were 26 - 35 years age group. This finding was consistent with previous study as showed that, nearly half of the study patients were in the age group 26 - 35 years (48%) with PCOS followed by less than 25 years old patients [21].

In present study it was found that, 51 (34.0%) patients were overweight, 36 (24.0%) patients were detected as obese and 63 (42.0%) patients were within

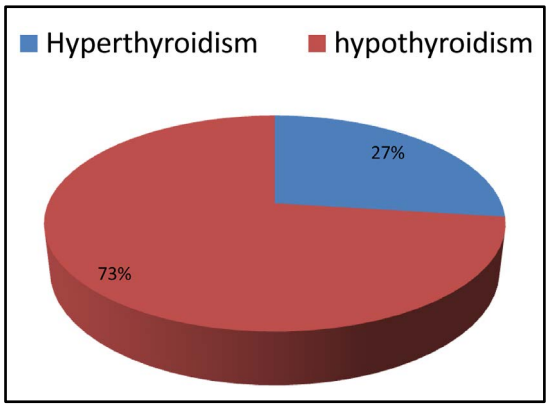

Figure 1. Overall prevalence of thyroid dysfunction in polycystic ovary syndrome (PCOS) women (n = 150).

normal weight level. These findings accorded with previous studies as reported that prevalence of obesity was approximately 50% among PCOS women [20] [21] [22]. A study regarding demographical feature of the study subjects showed that, 64% of cases were overweight, 32% were normal weight and 4% were obese among PCOS patients [20]. In a Delhi based study with 33 PCOS subjects, obesity was observed in 46% [21]. Najem *et al.* observed prevalence of obesity and overweight 57% and 54% respectively among 318 PCOS patients and documented that obesity was 2.5 times more common in PCOS women than in the general Libyan female population [20]. Sinha U *et al.* reported obesity was in 55% among total 80 PCOS patients [22]. Obesity is a common finding in PCOS that aggravates many of its reproductive abnormalities and features. The relationship between them is complex and not well understood, but most likely involves interaction of genetic and environmental factors [21]. However obesity varies significantly with country of origin [22].

In this study about clinical manifestations: hirsutism as detected by modified F.G. score [19] was present in 58% of the patient, menstrual disturbance such as irregular periods and oligomenorrhea was present 30% and 36% of the patients respectively, while 24 (16%) patients had acne in their face. These findings also correlate with other studies as stated that hirsutism affects 65% - 75% of white, black and south-east Asian women of PCOS [5] [22] [23]. Najem *et al.* in their study among 318 PCOS patients found that hirsutism was in 91% patients and 12% patients had acne [20]. A study on 130 PCOS patients reported that, hirsutism was detected among 57% patients and 61% of the patients had elevated free testosterone [24]. In another similar study it was observed that patient having symptoms of menstrual disturbance in form of oligomenorrhoea or amenorrhea was 92.5% [22]. This was also reflected in another study which reported 60% - 85% PCOS patient suffering from gross menstrual dysfunction and 93% PCOS patients had oligomenorrhea or amenorrhea [20].

In this current study among total 120 married PCOS women, 51 were fertile without medical intervention, while primary infertility was detected in 58 pa-

tients and secondary infertility was detected in 11 patients. Therefore the overall prevalence of infertility in PCOS women was 57.5%, among which 48.33% of them had primary infertility and 9.17% had secondary infertility, while 42.50% of them were fertile. These findings were consistent with previous study as showed that the overall prevalence of infertility was 46% in which 32% of them had primary infertility and 14% of cases had secondary infertility [21].

Regarding thyroid dysfunction, 24 (16.0%) patients detected as primary hypothyroidism and it was the predominant thyroid abnormality in this current study. The subclinical hypothyroidism was found in 9 (6.0%) study subjects and primary hyperthyroidism was found in 12 (8.0%) study subjects. None of the case was detected as subclinical hyperthyroidism. Present study demonstrated that among total (150) study population; 105 (70%) patients were in euthyroid state, hypothyroidism was found in 33 (22%) study subjects and hyperthyroidism was found in 12 (8%) study subjects as assessed by the findings of their thyroid function tests. Therefore thyroid disorders were prevalent in 30.0% of PCOS patients, among them hypothyroidism was almost three-fold more prevalent than hyperthyroidism. These findings were consistent with previous reports as stated that thyroid disorders were commonly detected among PCOS patients and the most common thyroid disorder in PCOS was hypothyroidism [2] [20] [21]. Sinha U *et al.* reported that, subclinical hypothyroidism (SCH) was present in 22.5% and clinical hypothyroidism was present in 2.5% cases. Among these hypothyroid patients, autoimmune hypothyroidism was present in 22.5% patients [22]. Janssen *et al.* observed a prevalence of autoimmune thyroiditis (biochemically) in 26.9% of their 175 PCOS patients [18]. Other studies reported higher prevalence of autoimmune thyroiditis in PCOS subjects. Thyroid pathologies were observed in half of the patients among 107 women with PCOS in a study by Ozdemir D *et al.* [25]. Among the most recent studies, Kachuei M *et al.* showed a significantly higher prevalence of autoimmune thyroiditis and goiter in PCOS patients than that in control subjects [26]. In another study, 20 (40%) of 50 patients with PCOS showed subclinical hyperthyroidism [27]. In a study, Michalakis e*t al.* reported prevalence of SCH was 23% among patients seeking treatment for infertility [28].

Thyroid disorders, mainly hypothyroidism, can interact with the ovaries through both a direct effect on ovarian function and autoimmunity pathways. Present study shows higher prevalence of hypothyroidism in the PCOS women. The overall prevalence of infertility in PCOS women was 57.5%. Both hypothyroidism and hyperthyroidism may result in menstrual disorders. Oligomenorrhoea was most common among PCOS women. Hypothyroidism is commonly associated with ovulation failure. Hence assessment of serum TSH is mandatory in the workup of all PCOS women especially those presenting with menstrual irregularities. Identify and treating hypothyroidism at an earlier stage before the appearance of ovulation dysfunction can have potentially great preventive value. Therefore THS screening of all PCOS females of early reproductive age groups

should be done so as to detect subclinical or overt thyroid problem and to prevent burden of infertility.

5. Conclusion

This study concluded that most patients with PCOS might have some degree of thyroid dysfunction, especially hypothyroidism. Present study demonstrated the overall prevalence of thyroid dysfunction in polycystic ovary syndrome (PCOS) women is 30.0%. Hypothyroidism is almost three-fold more prevalent than hyperthyroidism.

Limitation

It was a single centre study with a relatively small sample size.

Recommendation

A multi-center prospective study with large sample size should be done to identify the correct prevalence of thyroid dysfunction in patients with polycystic ovary syndrome.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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