

Significance of thyroid profile (serum T₃, T₄ & TSH) in infertile women

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Abstract

Objective: To evaluate the relation of female infertility to thyroid dysfunction.

Material & Methods: The present study was carried out in the department of Biochemistry in collaboration with the Gynae & Obst deptt., Subharti Medical College & Hospital Meerut. Serum T₃, T₄ and TSH estimation was done by Enzyme Linked Fluorescent Assay.

Results: Serum T₃ level in control group was 1.8 ± 0.64 nmol/L while it was 10.5 ± 0.5 nmol/L in hyperthyroid (p value <0.001, i.e., highly significant), 1.1 ± 0.49 nmol/L in hypothyroid (p value <0.001, i.e., highly significant). Serum T₄ level in control group was 85.9 ± 26.1 nmol/L while it was 163.5 ± 3.5 nmol/L in hyperthyroid (p value <0.001 i.e., highly significant), 83.5 ± 22.4 nmol/L in hypothyroid (p value >0.05, i.e., not significant). Serum TSH in control group was 3.5 ± 1.71 mIU/L, while it was 0.14 ± 0.01 mIU/L (p value <0.001, i.e., highly significant) in hyperthyroidism, 8.4 ± 1.06 mIU/L in hypothyroidism (p value <0.001, i.e., highly significant). Out of 65 patients of study group thyroid dysfunction was associated with 25 (38.5%) infertile women. 23 (35.4%) women had hypothyroidism, 2 (3.1%) women had hyperthyroidism and 40 women (61.5%) were with euthyroid state, while in control group all the 25 women had euthyroid profile.

Conclusions: Every infertile woman with ovulatory dysfunction should also investigated thyroid profile along with other investigations, to open better prospects of conception for such desperate infertile women.

Keywords: Thyroid dysfunction, Infertility, Hypothyroidism, Hyperthyroidism

Introduction:

Infertility implies apparent failure of a couple to conceive, while sterility indicates absolute inability to conceive for one or more reasons. Infertility although, is not lethal but the desire to reproduce is a basic human instinct and deprivation of fertility may lead to guilt and depression. Approximately one-tenth of marriages are barren and 10% have fewer than desired number of children. If a female fails to achieve pregnancy after one year of unprotected and regular sexual intercourse, it is an indication to investigate the couple. Although in fair percentage male is the causative factor (33%), female is at fault in the predominant number of cases. It should be remembered that infertility is not a disease and the couple generally is otherwise healthy, they should be encouraged to be active in their evaluation and in determining their course of therapy.

Fertility in female is maintained by prevailing hormonal milieu, which is delicately balanced by hypothalamic-pituitary-thyroid-adrenogonadal axis. Infertility is common

accompaniment of disorders of thyroid functions. Abnormalities of thyroid function hypo as well as hyperthyroidism are associated with variety of changes in reproductive system, including delayed onset of puberty, anovulatory cycle, infertility, menstrual irregularities and recurrent fetal wastage¹⁰. Anovulation is more commonly noted in association with hyperthyroidism. Significant interrelations have been found between thyroid disorders and gonadal functions by various laboratory and clinical studies. Clinical thyrotoxicosis and myxedema are rare sight in an infertility clinic, however, subtle changes in thyroid function, may have permissive role in production of absolute and relative infertility in some individuals¹.

In the evaluation and treatment of infertile women, the knowledge of hormonal milieu is of major importance. The introduction of highly specific and sensitive method of Enzyme Linked Fluorescent Assay for the measurement of serum T₃, T₄ and TSH has enabled the clinician to diagnose this endocrine dysfunction accurately^{5,6,7,13,21}.

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Material & Methods:

Study Design

This study was carried out on 90 women selected from outpatient and inpatient department of Obstetrics and Gynecology, Subharti Medical College & Hospital, Meerut & has been referred the biochemistry department for thyroid profile evaluations. Study group included 65 cases among which 52 women were having primary infertility and 13 women had secondary infertility, while control group included 25 fertile euthyroid women.

Assay of thyroid function

Thyroid function test panel (T₃, T₄ and TSH) were assayed by the ELFA technique (Enzyme linked fluorescent assay) using standard kit. T₃ and T₄ were assayed by competitive immunoassay method and TSH was assayed by sandwich immunoassay method. All three parameters were estimated by following the same standard protocol provided by the manufacturer (M/s Biomerieux)^{5,6,7,13,21}.

Criteria of thyroid dysfunction

Thyroid function is considered normal (Euthyroid) when subjects were presented with normal T₃, T₄ and TSH. Abnormal thyroid function was further categorized as hyperthyroid (Increased T₃, T₄ and decreased TSH), Subclinical hyperthyroid (increased T₃, T₄ and normal TSH), hypothyroidism (decreased T₃, T₄ and increased TSH), and Subclinical hypothyroidism (decreased T₃, T₄ and normal TSH)

Statistical analysis

Data were represented as percentage, frequency, mean and standard error. Student 't' test, Chi-square test, ANOVA test and Mann Whitney Test were applied.

Observation & Results:

The present study on "Thyroid profile (serum T₃, T₄ and TSH) in infertile women" was conducted to correlate the role of T₃, T₄ and TSH as causative agent for infertility among females. The patients were divided as follows: Study group were included 65 patients of primary and secondary infertility & Control group contains 25 healthy fertile women of reproductive age group.

All the patients taken for study were in reproductive age group. Out of 65 patients in the study group, 52 cases (80%) were having primary infertility and 13 cases (20%) secondary infertility. [Table 1]

Out of 65 infertile women in study group, 23 (35.4%) cases of primary infertility and 2 (3.1%) cases of secondary

infertility were of 20-25 years age; 20 (30.8%) patients of primary infertility and 3 (4.6%) patients of secondary infertility belonged to 26-30 year age; 7 (10.7%) patients of primary infertility and 6 (9.2%) cases of secondary infertility were between 31 and 35 year age and 2 (3.1%) in each group belonged to age more than 35 year age, so the maximum patients of primary infertility were in age group 20-30 years while secondary infertility patients in 26-35 year age group. Among 25 controls cases, 6 (24%) women were of 20-25 year of age, 10 (40%) women of 26-30 year of age, 8 (32%) belonged to 31-35 year of age and only 1 (4%) case above 35 year age. [Table 1]

Among study group, 2 (3.1%) hyperthyroid patients had serum T₃ level 10.5±0.5 nmol/L (p value <0.001, i.e., highly significant), in 23 (35.4%) hypothyroid patients 1.1±0.49 nmol/L (p value <0.001, i.e., highly significant), and in 40 (61.5%) euthyroid women 2.9±2.56 nmol/L (p value >0.05, i.e., not significant), when compared with control group of 25 women (100%) with serum T₃ level 1.8±0.64 nmol/L. [Table 2].

Serum T₄ level was 163.5±3.5 nmol/L in 2 (3.1%) hyperthyroid women (p value <0.001, i.e., highly significant), 83.5±22.4 nmol/L in 23 (35.4%) hypothyroid women (p value >0.05, i.e., not significant), 93.9±36.7 nmol/L in 40 (61.5%) euthyroid group women (p value >0.05, i.e., not significant), when compared with control group 25 (100%) women were in euthyroid range with serum T₄ 85.9±26.1 nmol/L. [Table 2]. Serum TSH level in 2 (3.1%) hyperthyroid women was 0.14±0.01 mIU/L (p value <0.001, i.e., significant); 8.4±1.06 mIU/L in 23 (35.4%) hypothyroid women (p value <0.001, i.e., significant); 4.3±2.54 mIU/L in 40 (61.5%) euthyroid group women (p value >0.05, i.e., not significant); when compared with control group 25 (100%) women who had serum TSH levels 3.5±1.71 mIU/L [Table 2].

Out of 52 patients of primary infertility, 2 (3.1%) were hyperthyroid, 17 (26.2%) were hypothyroid and 33 (50.7%) had euthyroid profile. 6 (9.23%) cases in secondary infertility group showed hypothyroid profile and 7 (10.77%) cases had euthyroid profile. [Table 3]

It was observed that anovulatory cycles were present in 6 (24%) cases having thyroid dysfunction. Among 23 hypothyroid women, 5 (20.0%) were having proliferative endometrium, suggestive of anovulation, while 18 (72.0%) with secretory endometrium indicative of ovulatory cycles. Out of 2 hyperthyroid women, 1 (4.0%) revealed proliferative endometrium indicating anovulation and 1 (4.0%) had secretory suggestive of ovulatory cycles. [Table 4]

Table No.1: Distribution of cases according to Study groups & Age

Age groups (in years)	Study group			Controls group
	Primary Infertility No. (%)	Secondary Infertility No. (%)	Total No. (%)	No (%)
20-25	23 (35.4)	02 (3.1)	25 (38.1)	06 (24.0)
26-30	20 (30.8)	03 (4.6)	23 (35.4)	10 (40.0)
31-35	07 (10.7)	06 (9.2)	13 (19.9)	08 (32.0)
>36	02 (3.1)	02 (3.1)	04 (6.2)	01 (4.0)
TOTAL	52 (80)	13 (20)	65 (100)	25 (100)

Table No.2: Thyroid Profile in Study and control group

Thyroid Profile	Study group			Control group	P value
	Hyperthyroid	Hypothyroid	Euthyroid	Euthyroid	
Serum T3(nmol/L)	10.5 ±0.5	1.1 ±0.49	2.9±2.56	1.8±0.64	<0.001* <0.001** >0.05***
Serum T4(nmol/L)	163.5±3.5	83.5±22.4	93.9±36.7	85.9±26.1	<0.001* >0.05** >0.05***
Serum TSH(mIU/L)	0.14±0.01	8.4±1.06	4.3±2.54	3.5±1.71	<0.001* <0.001** >0.05***

*p value between hyperthyroid and control group

**p value between hypothyroid and control group

***p value between euthyroid study and control group

Table 3: Relation of Type of Infertility and Thyroid Profile

S. No.	Type of Infertility	Hyperthyroid No. (%)	Hypothyroid No. (%)	Euthyroid No. (%)	Total
1	Primary	02 (3.1)	17 (26.2)	33 (50.7)	52(80)
2.	Secondary	-	06 (9.23)	07 (10.77)	13(20)
	Total	02 (3.1)	23 (35.4)	40 (61.5)	65(100)

Table 4: Relation of abnormal thyroid profile and Ovulation

Thyroid Profile	Anovulatory Cycles No. (%)	Ovulatory Cycles No. (%)	Total No. (%)
Hyperthyroid	01 (4.0)	01 (4.0)	02 (8.0)
Hypothyroid	05 (20.0)	18 (72.0)	23 (92.0)
Total	06 (24.0)	19 (76.0)	25 (100)

Discussion:

The common endocrine disorders resulting in infertility are hyperprolactinemia, hypothyroid state, hyperthyroid state, polycystic ovary syndrome, diabetes mellitus, Cushing's syndrome, adrenogenital syndrome and inadequate corpus luteum. Among these thyroid disorders are very important as incidence of subclinical hypothyroidism in ovulatory dysfunction women is 11.3%¹⁹. Most of the studies available in literature have been done to find out infertility in cases of thyroid disorders, not the association of infertility with thyroid profile, only few studies have been done so far^{2,3,15,20}.

All the patients under present study belong to reproductive age group. Ageing is inevitability of life, but Mariotti (1995)¹⁶ and Kabadi & Rosman (1988)¹⁴ noted that age seems to have little effect on potential fertility during reproductive age group.

Lakshmi et al (1990) in their study found that incidence of primary infertility being 61.7% and secondary infertility to be 38.3% and most of the patients were in age group of 25-29 years¹⁴. In this present study maximum patients of primary infertility were of 20-30 age (80%) and secondary infertility (20%) cases were in 26-35 year age group.

Only 2 cases (3.1%) had the symptoms related to thyroid disorders in the form of letharginess and dryness of skin. Our observations are also in accordance with other studies^{15,20}.

In the present study, serum T₃ level in control group was 1.8±0.64nmol/L while it was 10.5±0.5 nmol/L in hyperthyroid (p value <0.001, i.e., highly significant), 1.1 ±0.49nmol/L in hypothyroid (p value<0.001, i.e., highly significant). Serum T₄ in control group was 85.9±26.1 nmol/L while it was 163.5±3.5 nmol/L in hyperthyroid (p value <0.001, i.e., highly significant), 83.5± 22.4 nmol/L in hypothyroid women (p value >0.05, i.e., not significant). Similarly, serum TSH in control group was 3.5±1.71mIU/L, while it was 0.14±0.01

mIU/L in hyperthyroid (p value <0.001, i.e., highly significant); 8.4±1.06 mIU/L in hypothyroid women (p value <0.001, i.e., highly significant). Other workers also depicted the same pattern but at different levels concentrations of thyroid profile associated with infertility^{2,4,17,18}.

In our study we observed that out of 65 patients of study group thyroid dysfunction was associated with 25 (38.5%) infertile women, among whom 23 (35.4%) women had hypothyroidism, 2 (3.1%) women had hyperthyroidism. While 40 cases (61.5%) were in euthyroid state. This is similar to the observations made by Lakshmi et al & other workers^{9,20,22}.

Among 52 primary infertility patients, 17 women was hypothyroid (26.2%), 2 (3.1%) women had hyperthyroidism and 33 cases (50.7%) had euthyroid state and among 13 patients of secondary infertility, 6 (9.23%) cases showed hypothyroid and 7 (10.77%) women had euthyroid profile. Same is the opinion of Lakshmi et al, Daniel M. Strickland & other experts^{15,20}.

It was found in the present series that anovulatory cycles were present in 6 (24%) cases having thyroid dysfunction. Among 23 hypothyroid women, 5 (20.0%) were having proliferative endometrium, suggestive of anovulation, while 18 (72.0%) with secretory endometrium indicative of ovulatory cycles. Out of 2 hyperthyroid women, 1 (4.0%) revealed proliferative endometrium indicating anovulation and 1 (4.0%) had secretory suggestive of ovulatory cycles, which is nearly similar to that observed by Costin et al, Goh & Ratnam & other workers^{8,11,15,19,20}. It was also observed that 32.7% women of primary infertility group and 30.8% women of secondary infertility group had anovulatory cycles⁸.

In a study done by Shanti et al²¹, 40.6% had regular menses, 18.9% had irregular menses, 7 18.9% had secondary amenorrhoea and 21.6% had primary amenorrhoea. These findings are consistent with the present study, Lakshmi et al and with other workers^{15,20}.

Conclusion:

- Study group included 65 infertile women, out of which 52 patients were having primary infertility and 13 patients had secondary infertility, with control group included 25 fertile euthyroid women.
- Maximum cases of primary infertility were in 20-30 year age group (80%) and secondary infertility (20%) cases were in 26-35 years age group.
- Out of 65 patients of study group thyroid dysfunction was associated with 25 (38.5%) infertile women, among whom 23 (35.4%) women had hypothyroidism, 2 (3.1%) women had hyperthyroidism. While 40 cases (61.5%) were in euthyroid state.
- Among 52 primary infertility patients, 17 women was hypothyroid status (26.2%), 2 (3.1%) women had hyperthyroidism and 33 cases (50.7%) had euthyroid state and among 13 patients of secondary infertility, 6 (9.23%) cases showed hypothyroid and 7 (10.77%) women had euthyroid profile.
- Every infertile woman with ovulatory dysfunction should also have thyroid profile along with other investigations because 32.7% women of primary infertility group and 30.8% women of secondary infertility group had anovulatory cycles.

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