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Research Article

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Thyroid Profile in Primary Infertility-Study at A Tertiary Care Hospital in Telangana

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ABSTRACT

Background: In the condition of primary hypothyroidism, the levels of thyrotropin-releasing hormone (TRH) are higher to raise thyroid-stimulating hormone (TSH) levels, causing hyperprolactinemia, oligomenorrhea, and anovulation. Hypothyroidism may result in miscarriage, premature birth, and neurodevelopmental deformities. Thyrotoxicosis is also associated with spontaneous abortions, risk of congenital anomalies, and aplasia cutis. The present study primarily focuses on studying thyroid hormones in female infertility.

Methods: The current study was a cross-sectional investigation conducted on individuals attending outpatient departments (OPD) after considering the inclusion-exclusion criteria. Euthyroid, Primary hypothyroid, Primary hyperthyroid, Secondary hypothyroid, Secondary hyperthyroid, Subclinical hypothyroid, and Subclinical hyperthyroid were the seven characteristics that were used to classify the total number of patients that were included in the study.

Results: After the data has been thoroughly obtained, it is recorded into tables with the appropriate titles using Microsoft Excel software. According to the findings of our analysis, there is no correlation between age and thyroid function in groups. Our research findings show no statistically significant link between age and thyroid health across all categories ($p>0.05$).

Conclusion: With our study, we can propose thyroid supplementation in subclinical hypothyroidism for treating infertile women. Simultaneously, females with marginal levels of TSH shall not be ignored in infertile women, which may lead to asymptomatic subclinical hypothyroidism. It can be concluded that thyroid dysfunction is related to primary infertility in females. Hence, primary infertility may be better studied with a large sample size and long-term follow-up to confirm our findings further.

Key-words: Female infertility, Hyperthyroid, Hypothyroid, T3, T4, Thyroid hormones, TSH

INTRODUCTION

Infertility is defined as a condition in males or females without pregnancy, even after about 1 year or more, duration of regular sexual intercourse without any contraceptives.

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The severity and prevalence of infertility are of significance worldwide, particularly in developing countries, for its proper management [1].

Infertility is a rising major problem affecting more than 50 million couples globally every year [2]. As per the latest WHO news, the prevalence of infertility is higher. It is about 17.5%, which is around 1 in every 6 persons who may have infertility in the world, which emphasises the significance of increasing access to affordable, high-quality fertility care [3]. As per WHO, the prevalence of infertility in India ranges from 3.5%-16.8% [4]. Thyroid abnormalities and infertility are highly related, which

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may vary from 2% to 4%, and may also include autoimmune thyroid diseases (AITD) in the presence or absence of autoantibodies [5]. Subclinical hypothyroidism may not be related to thyroid autoimmunity [6]. The occurrence of thyroid autoimmunity (TAI) is higher in infertile when compared to age-matched women [7]. Hormones have a significant role in intercellular and inter-organ communication. Among many endocrine glands, the thyroid gland has significance in regulating the physiology of humans. Tri-iodo-L-thyronine (T3 or triiodothyronine) and tetra-iodo-L-thyronine (T4 or thyroxine) hormones are released by the thyroid gland that is stimulated by TSH, which is produced by the pituitary gland [8]. Thyroid hormones play an important role in the body's growth, development, basal metabolic rate, and cell or organ differentiation, making them essential for everyday activities [9]. Among many reasons that are known to cause female infertility, the diseases of thyroid are significant [10].

In the condition of primary hypothyroidism, the levels of TRH are more likely to raise TSH levels, causing hyperprolactinemia, oligomenorrhea and anovulation [7]. Hypothyroidism may result in miscarriage, premature birth, and neuro-developmental deformities [11]. Thyroid antibodies in infertile females cause failure in *in-vitro* fertilisation (IVF) as they mimic the interaction between zona pellucida and sperm cells [12]. Moreover, thyroid autoantibodies may result in early pregnancy loss due to their effect on the embryo [13]. In hypothyroidism, factors VII, VIII, IX and XI and estrogen deficiency lead to bleeding secondary to anovulation, resulting in frequent, prolonged and heavy menstruation [14]. In addition, thyrotoxicosis has been linked to spontaneous miscarriages, the risk of congenital abnormalities, and aplasia cutis. Stress, luteal phase problems, and structural and functional reproductive disorders have all been linked to infertility, according to studies that have been conducted on the topic. Several thyroid-dysfunctioning infertile women exhibited hyperprolactinemia and elevated TSH [15]. The present study primarily focuses on studying thyroid hormones in female infertility.

MATERIALS AND METHODS

Research Design- The present cross-sectional study was conducted at the outpatient department, Arundhati Institute of Medical Sciences, Hyderabad. Subjects attending the infertility clinic and Obstetrics & Gynecology Department were selected after obtaining informed consent. Written informed consent in the language understandable to the subjects has been obtained from all the study participants. A total of 183 women have consented to participate in the present study. Of these, 142 women were eligible after considering the inclusion-exclusion criteria.

Inclusion Criteria

- Participants eligible for the study were women with primary infertility, aged 20-40, and married for over a year.
- The research involved an analysis of comprehensive medical and marital background, a rigorous gynaecological assessment, an abdominal Ultrasonography, a premenstrual endometrial biopsy, and a hormonal profile including TSH, FT3, and FT4. All examination results were recorded in the predetermined questionnaire and report form.

Exclusion Criteria

- Patients with a documented history of thyroid surgery, currently using thyroid drugs, or diagnosed with benign thyroid illness were not included in the study.
- Female spouses of males with verified infertility are likewise excluded. Women with infertility caused by tubular obstruction, pelvic inflammatory illness, endometriosis, and concurrent hepatic or renal disorders were not included in the study.

Sample collection- Five millilitres of venous blood was taken from each subject and then dispensed into plain vacutainers that were disposable and sterile. The sample is allowed to coagulate, and then the serum is recovered by centrifuging it at 5000 revolutions per minute. The sera were kept at -20 degrees Celsius for subsequent examination. Acculite CLIA microwells were utilised to carry out the chemiluminescence test for the thyroid [16]. Utilising control sera that were generated from commercial sources and were of both low and high quantities, the reproducibility of the assay was evaluated. When the serum TSH level was less than 0.3 mIU/L, hyperthyroidism was identified, while hypothyroidism was diagnosed when the serum TSH

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level was greater than 4.0 mIU/L. Euthyroid, Primary hypothyroid, Secondary hyperthyroid, Subclinical hypothyroid, and Subclinical hyperthyroid were the seven characteristics that were used to classify the total number of patients that were included in the study [17].

Statistical Analysis- The data was structured into tables with appropriate categories for analysis. All parameter subgroups had their results aggregated as mean±standard deviation. Using a sample t-test, we evaluated each characteristic. We ran the numbers with the help of IBM's SPSS Statistics 20. The p-value is deemed statistically significant if it is less than 0.05 and highly significant if it is less than 0.005.

Ethical Approval- The Institutional Ethics Committee, Arundhati Institute of Medical Sciences, Hyderabad, has approved the study.

RESULTS

Demographic information about the distribution of people across various age groups is shown in Table 1. With relative counts of 21, 38, 55, and 28 persons, the age categories span from 20-25 years to 36-40 years. Among the 142 participants, the percentages show the following breakdown by age group: the highest at 38.73% for those between the ages of 31 and 35, followed by 26.77% for those between the ages of 26 and 30, 14.79% for those between the ages of 20 and 25, and 19.71% for those between the ages of 36 and 40. The age distribution of the investigated population can be seen in this breakdown, with a concentration of individuals in the 31-35 years range.

Table 1: Demographic information of patients

Age group	Number	Percentage (%)
20 – 25 years	21	14.79
26 – 30 years	38	26.77
31 – 35 years	55	38.73
36 – 40 years	28	19.71
Total	142	100

Table 2 shows reference ranges for Free Triiodothyronine (FT3), Free Thyroxine (FT4), and Thyroid Stimulating Hormone (TSH) levels with different thyroid diseases. Pmol/L is the unit of measurement for FT3 and FT4 reference ranges, while IU/ml is the unit of measurement for TSH levels. A patient's thyroid function can be classified as euthyroid, primary hypothyroidism, primary hyperthyroidism, secondary hypothyroidism, secondary hyperthyroidism, subclinical hypothyroidism, or subclinical hyperthyroidism depending on the ranges of FT3, FT4, and TSH levels. From healthy thyroid function (Euthyroid) to hypothyroidism (both overt and subclinical) and hyperthyroidism (both overt and subclinical), these classes aid in the diagnosis and management of a wide range of thyroid problems.

Table 2: Categorization of cases based on thyroid profile

FT3 (pmol/L)	Category	FT4 (pmol/L)	TSH (IU/ml)
4.12 -8.10	Euthyroid	10.10-28.14	0.50-4.85
<4.12	Primary hypothyroid	< 10.10	> 4.85

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>8.1	Primary hyperthyroid	> 28.14	< 0.5
<4.12	Secondary hypothyroid	< 10.10	< 0.5
>8.1	Secondary hyperthyroid	> 28.14	> 4.85
4.12-8.10	Subclinical hypothyroid	10.10-28.14	> 4.85
4.12-8.10	Subclinical hyperthyroid	10.10-28.14	< 0.5

Table 3 displays the distribution of thyroid function test findings (FT3, FT4, and TSH levels) among several categories of thyroid diseases. The classifications are Euthyroid, Primary Hypothyroidism, Primary Hyperthyroidism, Secondary Hypothyroidism, Secondary Hyperthyroidism, Subclinical Hypothyroidism, and Subclinical Hyperthyroidism. The table displays the quantity and proportion of cases in each category. The report includes each group's average values and standard deviations for FT3, FT4, and TSH levels. This table compares thyroid hormone levels across thyroid diseases to help diagnose and treat thyroid illnesses.

Table 3: Distribution of cases according to thyroid status and mean thyroid hormone.

Category	No (142)	%	FT3 (pmol/L)	FT4 (pmol/L)	TSH (IU/ml)
Euthyroid	97	68.32	05.32±1.21	15.22±3.11	02.14±1.58
Primary hypothyroid	14	09.87	02.16±1.06	04.2±2.58	11.05±2.15
Primary hyperthyroid	2	01.40	14.28±1.53	36.0±3.38	00.44±0.17
Secondary hypothyroid	2	01.40	02.46±1.25	05.16±0.28	00.35±0.17
Secondary hyperthyroid	1	00.70	15.00±1.44	34.00±1.56	09.26±1.18
Subclinical hypothyroid	23	16.20	05.56±1.27	15.67±2.85	09.48±1.05
Subclinical hyperthyroid	3	02.11	05.36±1.18	16.03±1.57	00.47±0.18

DISCUSSION

The current investigation found that thyroid dysfunction was connected with 31.68% of cases, with hypothyroidism accounting for 27.47% of the cases as the most common condition. It would appear that hypothyroidism is the most common cause of infertility among the cases that were examined in the study, with subclinical hypothyroidism being the most prevalent form of hypothyroidism. Several other authors have also reported findings that are comparable to these. This relationship between hypothyroidism and infertility in developing countries can be mainly attributed to the low iodine intake [18]. Mostly, it was found that low iodine deficiency is related to more hyperthyroidism and low hypothyroidism [19]. Hypothyroidism is more common than hyperthyroidism [20]. Few studies stated that hypothyroidism is more prevalent in pregnant women when compared to non-pregnant women. Most of the cases of euthyroid in our study were more prone towards hypothyroidism.

In our present study, it has been observed that the prevalence of hypothyroidism is higher compared to a few other studies [21]. However, the high prevalence findings of our study were related to most studies [22,23]. Maternal hypothyroidism is related to maternal and fetal outcomes affecting their health [24]. The high prevalence of female infertility may be related to gonadotropin-releasing hormone and abnormal pulsatile release of LH

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in hypothyroidism. Few studies have shown serum TSH levels to be significantly related to fertilisation failure among women receiving IVF [25]. Women with alteration of thyroid hormone levels shall be considered for chances of infertility and further pregnancy outcome. This confirms the significance of thyroid hormone level study in women for pregnancy and its best outcome.

CONCLUSIONS

Thyroid dysfunction and female infertility are usually correlated. To some extent, female infertility can be managed by managing the thyroid hormone levels. With our study, we can propose thyroid supplementation in subclinical hypothyroidism for treating infertile women. Simultaneously, females with marginal levels of TSH shall not be ignored in infertile women, which may lead to asymptomatic subclinical hypothyroidism. It can be concluded that thyroid dysfunction is related to primary infertility in females. Hence, primary infertility may be better studied with a large sample size and long-term follow-up to confirm our findings further.

CONTRIBUTION OF AUTHORS

Research concept- Dr. Radhika Rani Akkineni, Dr. Ch. Venkata Pavan
Research design- Dr. Radhika Rani Akkineni, Dr. Ch. Venkata Pavan
Supervision- All researchers
Materials- Dr. Radhika Rani Akkineni, Dr. Ch. Venkata Pavan
Data collection- All researchers
Data analysis and interpretation- All researchers
Literature search- All researchers
Writing article- All researchers
Critical review- All researchers
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REFERENCES

[1] World Health Organization. Infertility prevalence estimates, 1990–2021 [Internet]. World Health Organization, 2023; 10(2): 20-21.
[2] Anitha NB. A study of thyroid profile in cases of primary infertility attending a tertiary care hospital of south India. Int J Reprod Contraception, Obstet Gynecol., 2018; 7(6): 21-80.
[3] World Health Organization. 1 in 6 people globally affected by infertility: WHO, 2023; 12(1): 10-15.
[4] Rutstein SO SI. DHS Comparative Reports Infecundity, Infertility, and Childlessness in Developing Countries, 2024; 12(2): 12-43.
[5] Oiwa A, Minemura K, Nishio SI, Yamazaki M, Komatsu M. Implications of thyroid autoimmunity in infertile women with subclinical hypothyroidism in the absence of both goiter and anti-thyroid antibodies: lessons from three cases. Endocr J., 2019; 66(2): 193-98.
[6] Abalovich M, Mitelberg L, Allami C, Gutierrez S, Alcaraz G, Otero P, et al. Subclinical hypothyroidism and thyroid autoimmunity in women with infertility. Gynecol Endocrinol., 2007; 23(5): 279-83.
[7] Poppe K, Velkeniers B, Glinoer D. Thyroid disease and female reproduction. Clin Endocrinol., 2007; 66(3): 309-21.
[8] Sudhakar NK, Ranjith BK, Madhurima NK, Ranjithbabu K. Study of Thyroid Hormones in Male Infertility. Scholars J Appl Med Sci., 2018; 22(3): 21-30.
[9] Wagner MS, Wajner SM, Maia AL. The role of thyroid hormone in testicular development and function. J Endocrinol., 2008; 199(3): 351-65.
[10] Aghayeva S, Sonmezer M, Şükür YE, Jafarzade A. The Role of Thyroid Hormones, Vitamins, and Microelements in Female Infertility. Rev Bras Ginecol Obs., 2023; 45(11): 683-88.
[11] Lazarus JH, Bestwick JP, Channon S, Paradice R, Maina A, et al. Antenatal thyroid screening and childhood cognitive function. N Engl J Med., 2012; 366(6): 493-501.
[12] Twig G, Shina A, Amital H, Shoenfeld Y. Pathogenesis of infertility and recurrent pregnancy loss in thyroid autoimmunity. J Autoimmun, 2012; 38(1): 2-3.
[13] Medenica S, Garalejic E, Arsic B, Medjo B, Jovic DB, et al. Follicular fluid thyroid autoantibodies, thyrotropin, free thyroxine levels and assisted reproductive technology outcome. PLoS One, 2018; 13(10): 12-18.
[14] Putowski L, Darmochwal-Kolarz D, Rolinski J, Oleszczuk J, Jakowicki J. The immunological profile of infertile women after repeated IVF failure (Preliminary study). Eur J Obstet Gynecol Reprod Biol 2004;112(2): 192-96.
[15] Poppe K, Velkeniers B. Thyroid and infertility. Verh K Acad Geneeskd Belg., 2002; 64(6): 382-89.

DOI: 10.21276/SSR-IIJLS.2024.10.2.10

[16]Shim C, Chong R, Lee JH. Enzyme-free chemiluminescence immunoassay for the determination of thyroid stimulating hormone. Talanta, 2017; 171: 229-35.

[17]Monaco F. Classification of Thyroid Diseases: Suggestions for a Revision. J Clin Endocrinol Metab., 2024; 88(4): 1428-32.

[18]Bohnet HG, Fiedler K, Leidenberger FA. Subclinical hypothyroidism and infertility. Lancet, 2024; 2(1): 12-27.

[19]Aghini-Lombardi F, Antonangeli L, Martino E, Vitti P, et al. The spectrum of thyroid disorders in an iodine-deficient community: the Pescopagano survey. J Clin Endocrinol Metab., 2024; 84(2): 561-66.

[20]Kumar R, Bansal R, Shergill HK, Garg P. Prevalence of thyroid dysfunction in pregnancy and its association with feto-maternal outcomes: A prospective observational study from a tertiary care institute in Northern India. Clin Epidemiol Glob Health, 2019; 22(1): 39-84.

[21] Arojoki M, Jokimaa V, Juuti A, Koskinen P, Irjala K, et al. Hypothyroidism among infertile women in Finland. Gynecol Endocrinol., 2024; 14(2): 127–31.

[22]Goswami B, Patel S, Chatterjee M, Koner BC, Saxena A. Correlation of Prolactin and Thyroid Hormone Concentration with Menstrual Patterns in Infertile Women. J Reprod Infertil., 2024; 10(3): 207.

[23]Elahi S, Tasneem A, Nazir I, Nagra SA, Hyder SW. Thyroid dysfunction in infertile women. J Coll Physicians Surg Pak., 2007; 17(4): 191-94.

[24]Sahay RK, Nagesh VS. Hypothyroidism in pregnancy. Indian J Endocrinol Metab., 2024; 16(3): 364-70. doi: 10.4103/2230-8210.95667.

[25]Cramer DW, Sluss PM, Powers RD, McShane P, Ginsburg ES, et al. Serum prolactin and TSH in an in vitro fertilization population: is there a link between fertilization and thyroid function? J Assist Reprod Genet., 2024; 20(6): 210-15. doi: 10.1023/a:1024151210536.