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# Association of Thyroid Autoimmunity and Thyroid Dysfunction in Women with Infertility

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*Abstract-* *Background:* In women of reproductive age, thyroid illness is the second most frequent endocrine disorder. While overt thyroid disease is well known as a cause of infertility, the effects of mild thyroid dysfunction or thyroid autoimmunity are still unknown. Thyroid function may play a role in female reproduction, which is especially important when the cause of infertility is unknown.

*Objective:* The study aims to determine the association of thyroid autoimmunity (antithyroglobulin and antithyroid peroxidase) and thyroid dysfunction (hypo-or hyperthyroidism) among women with infertility.

*Method:* This retrospective case-control study was conducted from January 2020 to July 2021 at the Gynaecology Department of Patuakhali Medical College Hospital, Bangladesh. This study was purposefully selected for 220 cases, and cases were chosen by unique inclusion and exclusion criteria.

*Keywords:* *thyroid autoimmunity, thyroid dysfunction, infertility.*

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# Association of Thyroid Autoimmunity and Thyroid Dysfunction in Women with Infertility

Dorothy Shahnaz Mukul Fatema [α], Abdul Khaleque [σ] & Pratima Rani Biswas [ρ]

*Abstract-* ***Background:*** In women of reproductive age, thyroid illness is the second most frequent endocrine disorder. While overt thyroid disease is well known as a cause of infertility, the effects of mild thyroid dysfunction or thyroid autoimmunity are still unknown. Thyroid function may play a role in female reproduction, which is especially important when the cause of infertility is unknown.

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***Results:*** Overall, the median TSH was significantly higher in female patients with infertility than in the control group, 1.4 (0.5) and 1.1 (0.4) mIU/L. The prevalence of positive thyroid peroxidase antibody (TPO-Ab) was higher in infertile women compared to the control group (14% vs. 8%. About 21 (16%) patients had TPO-Ab+ and 99 (84%) patients had TPO-Ab-. On the other hand, the free thyroxine level was not much higher in infertile women than in a control group of women (13 vs. 12. The level of causes of infertility was higher in OD patients (59%) than patients with endometriosis (11%) and tubal (30%).

***Conclusion:*** The current study found that thyroid autoimmunity traits are much more common in infertile women than in healthy fertile controls, particularly in the endometriosis subgroup.

*Keywords: thyroid autoimmunity, thyroid dysfunction, infertility.*

## I. Introduction

Infertility is defined as the lack of conception following a year of regular menstrual cycles and unprotected intercourse. It affects 10–15 percent of marriages in wealthy countries [1]. Female infertility can be caused by endometriosis, tubal disease, or ovulatory dysfunction (OD) [2]. Thyroid hormones obstruct a variety of reproductive functions. Thyroid diseases, such as hypothyroidism and hyperthyroidism, have been shown to interfere with ovarian function and negatively impact pregnancy outcomes [3]. The question of whether modest thyroid dysfunction or thyroid autoimmunity affects normal female fertility is still unclear.

Thyroid dysfunction is the second most common endocrine condition among women of reproductive age, behind diabetes mellitus, and thyroid autoimmunity (TAI) is the most common autoimmune disorder among these women. The prevalence of hypothyroidism in women of reproductive age is estimated to be 2-4%, with a TAI level of 5-20% [4]. Furthermore, more than 20% of women with thyroid dysfunction have an aberrant menstruation pattern, the most well known of which is oligomenorrhea[3]. The thyroid hormone is a hormone that affects metabolism in almost every tissue in the human body. The availability of thyroid hormone is critical for normal female reproductive. Overt hypothyroidism can result in a blunting of luteinizing hormone (LH) pulsatility, hyperprolactinemia, menstruation, and ovulation abnormalities, and decreased overall fertility, all of which can be reversed by re-establishing a euthyroid state [2]. According to research, even minor thyroid dysfunction or thyroid autoimmunity might harmthe female reproductive [3,4]. Several studies have found that infertile women are more likely to have mild hypothyroidism or thyroid autoimmunity [1,3]. Thyroid hormone fluctuation already within the normal range, according to preclinical studies, modulates the stimulatory effects of follicle-stimulating hormone (FSH) on follicular development and apoptosis suppression [5,6]. On the other hand, high thyroid hormone levels may inhibit pre-antral follicle formation by reducing granulosa cell aromatase activity [6,7]. We conducted a retrospective case-control study in a group of infertile women to see if thyroid dysfunction and autoimmune were linked.

## II. Objective

The study's objective is to determine the association of thyroid autoimmunity (antithyroglobulin and antithyroid peroxidase) and thyroid dysfunction (hypo-or hyperthyroidism) among women with infertility.

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## III. Materials and Methods

*Type of Study:* A retrospective case-control study

*Place of Study:* Gynaecology Department of Patuakhali Medical College Hospital, Bangladesh

*Period of study:* January 2020 to July 2021

*Sample size:* 220 cases

*Data collection method:* Data collected from the patients in a prescribed protocol.

*Data analysis:* Standard statistical tool (SPSS version 23) analyzed all data.

## IV. Results

Table 1 shows that the mean age of the case group consisting the infertile women was 35±7. The mean age of the women in the control group was 34±6. We then measured the median thyrotropin (TSH) between our two groups. The median TSH was significantly higher in female patients with infertility than in the control group, 1.4 (0.5) and 1.1 (0.4). The prevalence of positive thyroid peroxidase antibody (TPO-Ab) was higher in infertile women compared to the control group (14% vs. 8%). The free thyroxine level was not much higher in infertile women than in a control group of women (13 vs. 12). See table 1-

*Table 1:* Age and thyroid parameters of female infertile patients

| Variables | Infertile women N=120 | Control group N=100 |
|---|---|---|
| Age | 35±7 | 34±6 |
| TSH[a] | 1.4 (0.5) | 1.1 (0.4) |
| TPO-Ab[b] | 17% | 9% |
| $FT_4$[a] | 13 (3) | 12 (4) |
| 95% CI | 1.08-4.73 | 0.72-2.48 |

In figure 1, the causes of infertility among female patients are observed. The level was higher in OD patients (59%) than patients with endometriosis (11%) and tubal (30%). See figure 1 below-

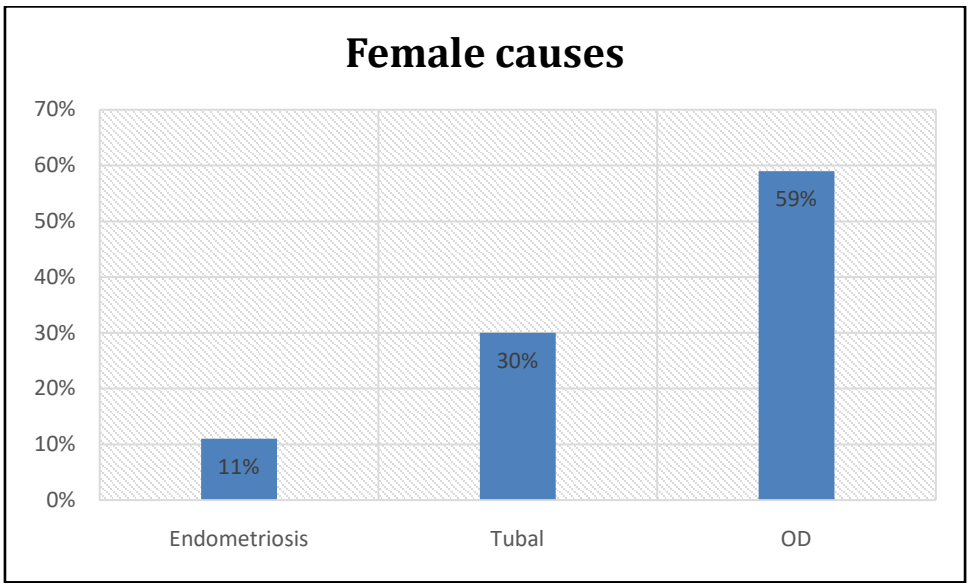



*Figure 1:* Cause of infertility in female patients with infertility

In figure 2, the pie chart shows the percentage of thyroid dysfunction in women. About 21 (16%) patients had TPO-Ab+ and 99 (84%) patients had TPO-Ab-. See figure 2 here-



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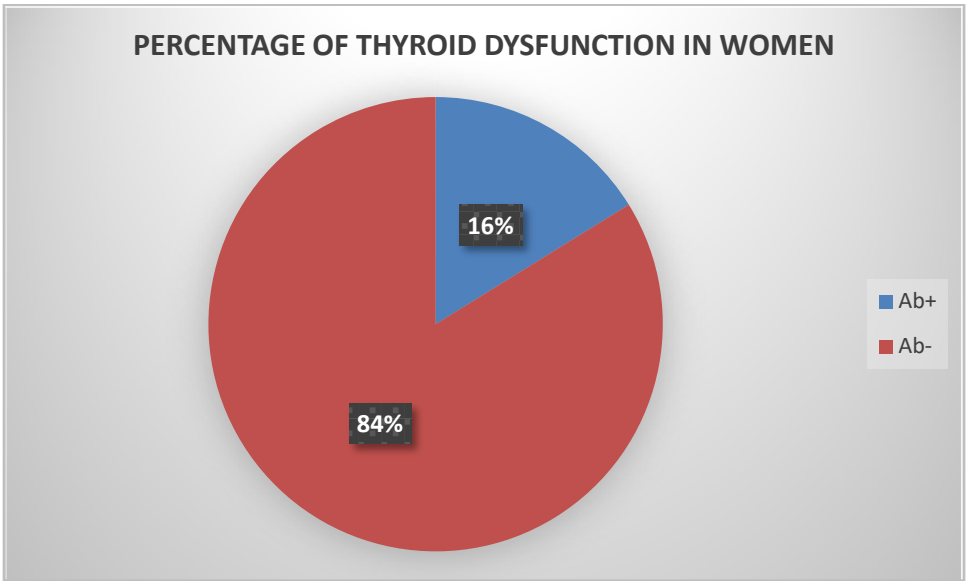



*Figure 2:* Pie chart of thyroid dysfunction in women

In table 2, it shows the TPO-Ab antibody-positive and antibody-negative patients. The maximum number of patients were TPO-(Ab-)/ antibody negative. In the control group, 86 patients were TPO-(Ab-)/ antibody negative. See table 2 below-

*Table 2:* Thyroid dysfunction in antibody-positive and antibody-negative patients as a percentage

| Female cause | TPO-Ab (Ab+) | TPO-Ab (Ab-) |
|---|---|---|
| Endometriosis | 7 | 19 |
| Tubal | 17 | 42 |
| Ovulatory dysfunction | 13 | 22 |
| Controls | 14 | 86 |

Table 3 shows the percentages of thyrotropin (TSH) in antibody-positive and antibody-negative in infertile women patients. Here maximum number (17%) of patients with TSH-ia had Tubal (Ab+), and the maximum number (16%) of patients with TSH-sa had Endometriosis (Ab+). See table 3 below-

*Table 3:* Thyrotropin (TSH) percentage in antibody-positive and antibody-negative patients

| Female cause | TSH-i[a] | TSH-s[a] |
|---|---|---|
| Endometriosis (Ab+) | 3% | 16% |
| Endometriosis (Ab-) | 1% | 0% |
| Tubal (Ab+) | 17% | 15% |
| Tubal (Ab-) | 1% | 0% |
| Ovulatory dysfunction (Ab+) | 4% | 1% |
| Ovulatory dysfunction (Ab-) | 1% | 0% |
| Controls (Ab+) | 1% | 0% |
| Controls (Ab-) | 0% | 2% |

## V. Discussion

In the current study, we looked into whether thyroid autoimmunity and thyroid dysfunction are risk factors for infertility in women. As a result, we systematically screened all female infertility patients. All patients had their anti-TPO, TSH, and FT4 levels tested, and the underlying cause of infertility was determined using strict objective criteria. Positive TPO-Ab antibodies were shown to be more common in patients than in controls, and women with endometriosis had a much higher frequency of positive TPO-Ab antibodies than controls. Similar findings were reported by Gerhard et al. [8], who found that 44 percent of infertile women with positive thyroid antibodies developed endometriosis, compared to just 9% of women who did not have antibodies. When the findings from Gerhard et al. [8] are considered, they support the concept that autoimmune thyroid disease (AITD) and endometriosis are linked. Such results could back up the theory that an immunological malfunction causes endometriosis.

The tendency toward a higher incidence of TPO-Ab in the two types of female infertility (tubal and OD) remains unclear [9]. TPO-Ab positivity was roughly



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6% in women of reproductive age, hypothyroidism was 2%, and hyperthyroidism was 1.3 percent, all of which are close to the present control group prevalence [6,7]. In a recent retrospective study of 299 infertile women in Finland, hypothyroidism (both subclinical and overt) was shown to constitute 4 percent of the overall prevalence of infertility [10].

In our study, subgroup analysis identified 59% of infertile women with OD, 30% among those with tubal infertility, 11% among those with endometriosis. In two separate prospective investigations, increased serum TSH was found in 0.7 percent and 2.3 percent of women with infertility, the majority of whom were infertile due to OD; however, neither study included a control group of healthy fertile women [11,12]. The overall mean serum TSH in women with infertility was considerably higher than in controls in the current study. When compared to antibody-negative women, all antibody-positive women had considerably higher and lowered TSH levels. Thyroid hormones affect granulosa and luteal cells, as well as oocytes, directly. Therefore overt thyroid failure in infertile women has clear clinical implications [10,13]. Thyroid disorders should be treated as soon as feasible. Women with AITD have a substantially increased likelihood of having an early miscarriage, according to research [14]. Early thyroid hormone therapy significantly enhanced the frequency of live births compared to intravenous immunoglobulin delivery throughout pregnancy in women with recurrent abortions and positive TPO-Ab and mild thyroid insufficiency, according to an intervention study [15]. It has previously been shown that women with infertility have a high prevalence of depression and a lower quality of life, including physical and emotional elements [16,17].

## VI. Conclusion

The current study found that women with positive TPO-Ab had a considerably higher risk of female infertility, particularly infertility caused by endometriosis. All women with a female cause of infertility should have their TSH, FT4, and thyroid abnormalities tested thoroughly. The effects of thyroid hormone or thyroid autoimmunity on infertility diagnosis were found to differ significantly. This suggests that thyroid hormone or thyroid autoimmunity involvement can be influenced by the various underlying pathophysiological mechanisms involved. Future research is needed to confirm this exploratory study's findings and look into the function of the underlying infertility diagnosis in the relationship between thyroid hormone and female reproduction outcomes.

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