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Original Research Article

Association of thyroid dysfunction and hyperprolactinemia with subfertility in women at a tertiary care hospital

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ABSTRACT

Background: Endocrine abnormalities, particularly thyroid dysfunction and hyperprolactinemia, are recognized contributors to female subfertility. Both disorders are potentially correctable causes of impaired reproductive function through their effects on the hypothalamic-pituitary-ovarian axis. This study aimed to investigate the association between thyroid dysfunction and hyperprolactinemia with subfertility in women attending a tertiary care hospital in Bangladesh.
Methods: This case-control study was conducted at the department of obstetrics and gynecology, BIRDEM General Hospital, from January 2022 to March 2024. A total of 100 women were enrolled in the study: 50 subfertile (cases) and 50 fertile (controls). The demographic and clinical characteristics were recorded. Serum TSH, FT3, FT4, and prolactin levels were measured using chemiluminescent magnetic microparticle assays. Thyroid status and prolactin levels were compared. The correlation between TSH and prolactin levels was assessed using Pearson's test.
Results: Thyroid dysfunction was observed in 16% of subfertile women compared to 6% of controls. Hyperprolactinemia was significantly more frequent among cases (32% versus 10%, p=0.007). A moderate positive correlation was found between TSH and prolactin in the case group (r=+0.537, p<0.001) and a weak positive correlation in the control group (r=+0.263, p=0.065).
Conclusions: Thyroid dysfunction and hyperprolactinemia were more prevalent among subfertile women and were strongly associated. Routine screening for thyroid and prolactin abnormalities should be incorporated into infertility evaluations, as correction of these disorders may restore fertility.

Keywords: Hyperprolactinemia, Subfertility, Thyroid dysfunction

INTRODUCTION

Infertility, defined as the inability to conceive after 12 months of unprotected intercourse, is a global public health issue affecting an estimated 10-15% of couples of reproductive ages.[1] The burden is disproportionately high in low- and middle-income countries, where sociocultural factors amplify the stigma associated with childlessness and access to assisted reproductive technologies remains limited.[2] In South Asian societies, including Bangladesh, infertility often results in psychological distress, marital disharmony, and social ostracization, particularly for

women, making early recognition and correction of treatable causes imperative.[3]

Among the diverse etiologies of female subfertility, endocrine disorders stand out as potentially reversible factors. Thyroid dysfunction and hyperprolactinemia are two of the most significant endocrine abnormalities implicated in female infertility. Their roles are particularly important given their prevalence, shared pathophysiological pathways, and the fact that both conditions can be diagnosed through routine laboratory evaluation and effectively managed with medical therapy.[4]

Thyroid hormones regulate a wide range of physiological functions, including growth, metabolism, and reproduction. Their influence on female fertility is mediated through multiple mechanisms such as regulation of gonadotropin secretion, ovarian steroidogenesis, follicular development, and endometrial receptivity.[5] Both hypothyroidism and hyperthyroidism can impair ovulation, alter menstrual patterns, and increase the risk of miscarriage. Subclinical hypothyroidism, even in the absence of overt symptoms, has been recognized as a common cause of unexplained infertility and recurrent pregnancy loss.[6,7]

Prolactin, secreted by the anterior pituitary, plays a key role in lactation but also exerts regulatory effects on reproduction. Elevated prolactin levels suppress the pulsatile secretion of gonadotropin-releasing hormone (GnRH), reduce luteinizing hormone (LH) and follicle-stimulating hormone (FSH) release, and subsequently impair ovulation.[8] Clinically, hyperprolactinemia manifests as oligomenorrhoea, amenorrhoea, luteal phase defects, galactorrhoea, and infertility. Studies report that 15-30% of women with infertility present with hyperprolactinemia.[9] Importantly, hyperprolactinemia may occur independently or as a secondary effect of hypothyroidism, since thyrotropin-releasing hormone stimulates both thyroid-stimulating hormone (TSH) and prolactin secretion.[10]

The coexistence of thyroid dysfunction and hyperprolactinemia has important reproductive implications. Several studies have documented a significant overlap between these two conditions, with hypothyroidism frequently associated with secondary hyperprolactinemia. This interplay exacerbates reproductive dysfunction and contributes to a higher prevalence of anovulation and menstrual irregularities.[11] Goswami et al. found a strong correlation between thyroid abnormalities and elevated prolactin in infertile women, reinforcing the importance of screening for both conditions in infertility workups.[11]

Despite substantial global research, there is a lack of robust evidence from Bangladesh, where infertility remains under-recognized and often managed without systematic evaluation of hormonal abnormalities. Most women undergo costly and invasive procedures without correction of simple, treatable causes such as thyroid dysfunction and hyperprolactinemia.[12] Given this gap, examining the prevalence and interaction of these disorders in subfertile women is crucial.

The present study was designed to investigate the association of thyroid dysfunction and hyperprolactinemia with subfertility in women attending a tertiary care hospital in Dhaka. The study specifically aimed to compare thyroid and prolactin profiles between subfertile and fertile women, assess the coexistence of hypothyroidism and hyperprolactinemia, and evaluate correlations between TSH and prolactin levels. Findings from this work are expected to provide evidence to support routine endocrine evaluation in subfertile women in the Bangladeshi context, thereby enhancing diagnostic precision and enabling cost-effective interventions.

METHODS

This case-control study was conducted at the Center for Assisted Reproduction (CARE) and the outpatient department of obstetrics and gynecology, BIRDEM General Hospital, Dhaka. The study duration was two years and three months (January 2022-March 2024). A total of 100 women were enrolled in the study: 50 subfertile women (cases) and 50 fertile women (controls).

Inclusion criteria

Women aged 18-40 years with primary subfertility. Fertile controls matched for age and parity. Male partners with normal semen analysis.

Exclusion criteria

Women with systemic illnesses (diabetes, hypertension, renal or liver disease, autoimmune disorders). Women with prior thyroid treatment. Women with pelvic causes of infertility (endometriosis, infection, tubal blockage, genital tuberculosis, PCOS).

Data collection and study procedure

This cross-sectional study, conducted at the outpatient department of obstetrics and gynecology, BIRDEM General Hospital, purposively recruited 100 women aged 18-45 years, comprising 50 primary subfertile women as the case group and 50 fertile women as the control group. Data were collected using a pre-designed form encompassing medical history, physical and anthropometric measurements, and laboratory tests. For laboratory analysis, approximately 5 ml of fasting venous blood was collected aseptically from each participant and processed at the hospital's endocrine laboratory. Serum FT3, FT4, TSH, and prolactin levels were measured within seven days of collection using chemiluminescence magnetic microparticle immunoassay (CMIA). This two-step method involved incubating the sample with anti-β TSH antibody-coated microparticles, followed by the

addition of an acridinium-labelled anti-α TSH conjugate after washing. Thyroid function was classified based on reference ranges (TSH: 0.47–5.01 µIU/ml; FT3:1.86-6.43 pmol/l; FT4:9.14-23.18 pmol/l) into categories of euthyroid, overt, or subclinical hypo-/hyperthyroidism, while hyperprolactinemia was defined as prolactin levels >25 ng/ml. Transvaginal sonography was performed on all participants to assess the signs of ovulation. Throughout the process, stringent safety protocols, including the use of personal protective equipment and proper disposal of biohazardous waste, were meticulously followed to ensure the safety of both the personnel and participants.

Ethical considerations

The study was approved by the BIRDEM institutional review board. Written informed consent was obtained from all participants. Confidentiality was maintained by assigning coded identifiers. Participants had the right to withdraw at any time without penalty.

Statistical analysis

Data checked for completeness and inconsistencies. All data were presented in a suitable table, and a graph was given to understand them clearly. All Statistical analyses will be performed using the Statistical Package for Social Sciences (SPSS-27) software. Comparison of means was done by using the Unpaired t-test and, Mann-Whitney test. Categorical data were analyzed by the Chi-square test. Pearson correlation test was utilized, and a p value <0.05 was considered significant.

RESULTS

The age distribution showed a higher proportion of individuals aged 21-30 in the case group compared to controls (70.0% versus 54.0%), while those aged 31-40 were more prevalent in the control group (44.0% versus 24.0%). The mean age of the case group was 27.94±4.28 years, and the control group 29.66±4.27 years; the mean difference of age was not statistically significant (p=0.097).

Table 1: Demographic characteristics of the study subjects in two groups (n=100).

Age groups	Case (n=50) (%)	Control (n=50) (%)	P value
<20 years	3 (6.0)	1 (2.0)	0.097
21-30 years	35 (70.0)	27 (54.0)	
31-40 years	12 (24.0)	22 (44.0)	
Mean±SD (years)	27.94±4.28	29.66±4.27	

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Table 2: Comparison of thyroid hormone disorder between two groups (n=100).

Thyroid status	Case (n=50) (%)	Control (n=50) (%)	P value
Euthyroid	42 (84.0)	47 (94.0)	0.271
Subclinical hypothyroidism	6 (12.0)	2 (4.0)	
Overt hypothyroidism	2 (4.0)	1 (2.0)	

Table 2 shows the comparison of thyroid hormone disorders between the two groups. The majority of women in both the case and control groups were euthyroid, with 84.0% in the case group and 94.0% in the control group. Only a small percentage of women had overt hypothyroidism, with 4.0% in the case group and 2.0% in the control group. Subclinical hypothyroidism was observed in 12.0% of women in the case group and 4.0% in the control group. These differences were not statistically significant (p=0.271).

Table 3: Comparison of prolactin level between two groups (n=100).

Prolactin status	Case (n=50) (%)	Control (n=50) (%)	P value
Normal	34 (68.0)	45 (90.0)	0.007
Hyperprolactinemia	16 (32.0)	5 (10.0)	

Table 3 shows the comparison of prolactin levels between the two groups. The majority of women in the control group had normal prolactin levels, with 90.0% compared to 68.0% in the case group, showing a statistically significant difference (p=0.007). Hyperprolactinemia was observed in 32.0% of women in the case group and 10.0% in the control group.

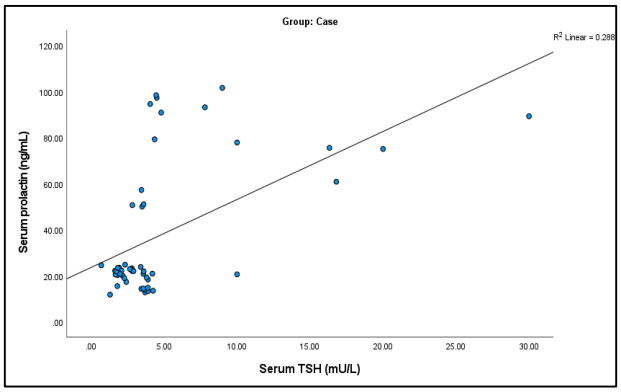

Figure 1: Correlation of serum TSH level with serum prolactin in case group.

Figure 1 shows the correlation of serum thyroid-stimulating hormone (TSH) levels with serum prolactin levels in the case group. The Pearson correlation coefficient (r) between these two variables was +0.537, indicating a moderate positive correlation. The p<0.001 suggests that this correlation was statistically significant.

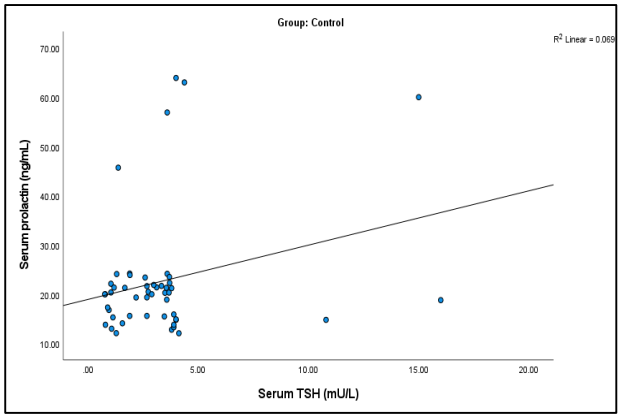

Figure 2: Correlation of serum TSH level with serum prolactin in control group.

Figure 2 shows the correlation of serum thyroid-stimulating hormone (TSH) levels with serum prolactin levels in the control group. The Pearson correlation coefficient (r) between these two variables was +0.263, indicating a weak positive correlation. The p=0.065 suggests that this correlation was not statistically significant.

DISCUSSION

The present study investigated the association between thyroid dysfunction and hyperprolactinemia with subfertility in women attending a tertiary care hospital in Dhaka, Bangladesh. The findings revealed that subfertile women exhibited a higher prevalence of both thyroid dysfunction and hyperprolactinemia than fertile controls, with subclinical hypothyroidism being the most common thyroid disorder. Importantly, hyperprolactinemia was significantly more frequent in the cases, and a strong association was observed between hypothyroidism and hyperprolactinemia. Additionally, a moderate positive correlation between serum TSH and prolactin levels was identified in subfertile women. These findings highlight the intertwined endocrine mechanisms underlying female infertility and reinforce the importance of routine hormonal evaluation during infertility workups.

The demographic profile of the study participants showed no significant differences between the two groups with respect to age, residence, education, occupation, or socioeconomic status. The mean age of cases (27.94±4.28 years) and controls (29.66±4.27 years) was comparable, reflecting the reproductive age range typical for infertility investigations. Similar demographic comparability has been reported in other case-control studies, ensuring that differences in fertility outcomes are more likely attributable to biological factors rather than confounders such as education or socioeconomic background.[2,3]

The prevalence of thyroid dysfunction was 16% in subfertile women compared to 6% among controls, though the difference did not reach statistical significance. Subclinical hypothyroidism was more common than overt hypothyroidism, aligning with international findings that subclinical thyroid dysfunction is often more prevalent in reproductive-aged women and has significant reproductive consequences.[6] Sharma et al similarly reported higher rates of subclinical hypothyroidism in infertile women compared to fertile controls, highlighting its importance as a hidden cause of infertility.[7] Subclinical hypothyroidism affects ovulatory function and endometrial receptivity, even when overt hypothyroid symptoms are absent.[8] The higher proportion observed in the present study supports routine thyroid screening, especially given the reversibility of this condition with levothyroxine therapy.

Hyperprolactinemia was observed in 32% of subfertile women, compared with 10% in fertile controls, a statistically significant difference (p=0.007). Where other studies stated the same findings, conducted on the Bangladeshi population by Akhter and Hassan, they found hyperprolactinemia among infertile patients at 37.5%.[13] Another study conducted by Pratinidhi et al found a prevalence of hyperprolactinemia of about 34.6% and Nallusamy et al found 24.67% among infertile patients.[14,15] This prevalence is consistent with earlier studies by Goswami et al, who reported hyperprolactinemia in 41% of infertile women.[11] Elevated prolactin levels impair reproductive function by suppressing GnRH pulsatility, reducing LH and FSH secretion, and inhibiting ovarian steroidogenesis. The reproductive consequences include luteal phase defects, anovulation, oligomenorrhoea, and amenorrhoea- all of which directly compromise fertility. The current study's findings strongly support the established role of prolactin in subfertility.

In our study, we found a moderate positive correlation of TSH and serum prolactin in the case group (r=+0.537, p value <0.001) and similarly a non-significant weak correlation in the control group (r=+0.263, p value=0.065). This finding can be justified based on other researchers' findings. Nath et al found a strong correlation between TSH and prolactin in the case group (r=+0.78, p value=0.0001) and in the control group, no correlation between TSH and prolactin (r=+0.14, p value=0.45).[3] Another study conducted by Bassey et al also found a strong positive correlation (r=0.285, p value<0.05) in infertile women.[16] Similar findings were also stated by Banu found a positive correlation, which was significant, between TSH and prolactin in infertile women (r=+0.507, p value <0.004).[10] Those findings resemble that raised serum TSH levels lead to an increased level of serum prolactin. This statement is according to our study.

Taken together, the results of this study underscore the importance of evaluating thyroid and prolactin status in the diagnostic workup of infertility. While many infertility assessments focus on anatomical and tubal factors, endocrine causes such as thyroid dysfunction and hyperprolactinemia are often overlooked despite being relatively easy to diagnose and treat. In resource-limited settings such as Bangladesh, where advanced reproductive technologies are costly and often inaccessible, identifying correctable hormonal abnormalities offers a cost-effective and non-invasive first-line intervention. Early treatment of hypothyroidism and hyperprolactinemia can restore ovulation and fertility in a substantial proportion of women, reducing the need for invasive procedures and improving reproductive outcomes.

The findings of this study align with international guidelines that recommend routine thyroid and prolactin testing in women presenting with infertility. The data also contribute to the limited body of literature from Bangladesh, highlighting the need for a systematic endocrine evaluation in clinical practice. By demonstrating the significant overlap between thyroid dysfunction and hyperprolactinemia, this study provides a rationale for the development of integrated screening protocols in infertility clinics.

In summary, this study strengthens the evidence linking thyroid dysfunction and hyperprolactinemia to subfertility. Both disorders are treatable, and their coexistence further complicates reproductive dysfunction. Addressing these hormonal abnormalities early may reduce the burden of infertility in Bangladesh and similar countries.

The study had some limitations. All samples were collected from a single tertiary care center; therefore, it may not reflect the total picture of the population. The sample size was small. The sample was taken purposively.

CONCLUSION

Thyroid dysfunction and hyperprolactinemia were more prevalent among subfertile women than among fertile controls in this study. Subclinical hypothyroidism was the predominant thyroid disorder, and hyperprolactinemia was significantly associated with infertility. A strong association was identified between hypothyroidism and hyperprolactinemia, with a moderate positive correlation between TSH and prolactin levels in subfertile women. These findings support the routine evaluation of thyroid and prolactin status in women with infertility, as timely correction of these disorders may restore fertility and reduce the reliance on invasive reproductive technologies.

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