Original Article

Thyroid Dysfunction in Women of Reproductive Age: A Cross-Sectional Study in Urban Bangladesh

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Abstract

Background: Thyroid dysfunction is a common endocrine disorder that disproportionately affects women, particularly those of reproductive age. It is associated with various clinical symptoms such as fatigue, weight gain, and menstrual irregularities. Early detection and treatment are crucial, as thyroid disorders can impact reproductive health and overall well-being. However, there is limited data on the prevalence and risk factors for thyroid dysfunction in urban Bangladesh. **Objective**: This study aimed to assess the prevalence of thyroid dysfunction and explore the sociodemographic, clinical, and laboratory factors associated with thyroid abnormalities among women of reproductive age in urban Bangladesh. **Methods**: A cross-sectional study was conducted at Shahid Sheikh Abu Naser Specialized Hospital, Khulna, with 190 female participants aged 18 to 45. Sociodemographic data, clinical symptoms, and thyroid function tests (TSH, Free T4, and Free T3) were collected. Descriptive statistics, correlation analyses, and chi-square tests were employed to analyze the data. **Results**: The study revealed a high prevalence of thyroid dysfunction, with 49.5% of participants being euthyroid and 50.5% exhibiting thyroid abnormalities. The most common dysfunction was subclinical hypothyroidism (24.2%), followed by overt hypothyroidism (15.8%). Fatigue (67.4%) and hair loss (57.9%) were the most frequent clinical symptoms. Significant associations were found between thyroid dysfunction and age (26–35 years), educational status (primary education), and BMI >25 kg/m² ($p < 0.05$). A positive correlation was observed between elevated TSH levels and clinical symptoms such as fatigue ($r = 0.62$, $p < 0.05$) and weight gain ($r = 0.58$, $p < 0.05$). **Conclusion**: Thyroid dysfunction, especially subclinical hypothyroidism, is highly prevalent among women of reproductive age in urban Bangladesh. Clinical symptoms like fatigue and weight gain correlate strongly with abnormal thyroid function. Early detection through routine screening and public health interventions focusing on thyroid awareness and iodine supplementation are essential for improving health outcomes in this population.

Keywords : Thyroid dysfunction, Subclinical hypothyroidism, Reproductive age, Bangladesh, Prevalence.

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Introduction:

Thyroid dysfunction is one of the most prevalent endocrine disorders globally, exerting significant health burdens across all age groups[1]. The thyroid gland is critical in regulating metabolic processes, growth, and overall homeostasis, including the reproductive system in women[2]. Among women of reproductive age, thyroid dysfunction presents a spectrum of challenges, including menstrual irregularities, infertility, pregnancy complications, and adverse neonatal outcomes. In urban Bangladesh, where access to healthcare and awareness about endocrine disorders are evolving, the prevalence and implications of thyroid dysfunction among women of reproductive age remain underexplored[3].

Globally, hypothyroidism and hyperthyroidism are the two principal forms of thyroid dysfunction. Hypothyroidism, characterized by an underactive thyroid gland, is further classified into overt and subclinical types[4]. The global prevalence of overt hypothyroidism is approximately 4-5%, while subclinical hypothyroidism affects 4-15% of the population[5]. In women of reproductive age, the prevalence of hypothyroidism ranges between 2-4%, with studies indicating its strong association with infertility and habitual abortions. Hyperthyroidism, an overactive thyroid condition, is less common but

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still exerts profound effects on reproductive health. According to the US National Health and Nutrition Examination Survey, the prevalence of hyperthyroidism is 1.3%, with 0.5% representing overt cases and 0.7% subclinical cases[6].

In the Indian subcontinent, urban populations exhibit unique patterns of thyroid dysfunction due to lifestyle changes, dietary practices, and environmental factors[25]. A multicentric study conducted in eight major Indian cities found the prevalence of hypothyroidism to be 10.95%, with 3.47% previously undetected cases[7]. However, similar comprehensive data from Bangladesh, particularly urban regions, are sparse. Given the shared socio-cultural and dietary practices between India and Bangladesh, it is reasonable to hypothesize a significant burden of thyroid dysfunction in Bangladeshi urban women[8].

The thyroid gland secretes two primary hormones—thyroxine (T4) and triiodothyronine (T3)—which are regulated by the hypothalamic-pituitary-thyroid (HPT) axis. Thyroid hormones influence numerous physiological processes, including growth, metabolism, and reproductive health[9]. At the tissue level, the actions of thyroid hormones are modulated by deiodinase enzymes, which convert T4 to the active T3 or to reverse T3, a biologically inactive form. This intricate regulatory system underscores the critical role of thyroid hormones in maintaining physiological balance, especially during the reproductive years[10, 24].

Impact of Thyroid Dysfunction on Reproductive Health

The relationship between thyroid dysfunction and female reproductive health is well-documented. Thyroid hormones interact with the hypothalamic-pituitary-ovarian (HPO) axis, and any imbalance can disrupt normal reproductive functions. Hypothyroidism, for instance, is associated with an increase in thyroid-releasing hormone (TRH), which stimulates the secretion of both thyroid-stimulating hormone (TSH) and prolactin. Elevated prolactin levels inhibit gonadotropin-releasing hormone (GnRH), leading to decreased secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH)[11]. This hormonal disruption can cause ovulatory dysfunction, luteal phase defects, and menstrual irregularities such as oligomenorrhea, amenorrhea, or menorrhagia.

Moreover, hypothyroidism alters estrogen metabolism by reducing sex hormone-binding globulin (SHBG) levels, leading to increased levels of unbound estradiol. This hormonal imbalance can result in anovulation and polycystic ovarian syndrome (PCOS), both of which are major contributors to infertility. Studies have also shown that hypothyroid women are at higher risk for recurrent miscarriages, stillbirths, and adverse neonatal outcomes, including congenital anomalies and developmental delays[12].

Conversely, hyperthyroidism—though less common—is also linked to reproductive challenges. Elevated levels of thyroid hormones can disrupt the normal pulsatile release of GnRH, leading to increased gonadotropin levels. The resultant hormonal imbalances manifest as menstrual irregularities, with oligomenorrhea and amenorrhea being the most common. Hyperthyroidism is also associated with reduced fertility and adverse pregnancy outcomes, including preterm delivery and low birth weight[13].

Thyroid Autoimmunity and Reproductive Age Women

Thyroid autoimmunity, particularly Hashimoto's thyroiditis and Graves' disease, is a leading cause of thyroid dysfunction among women of reproductive age. Autoimmune thyroid disorders are characterized by antithyroid antibodies, such as thyroid peroxidase antibodies (TPO-Ab) and thyroglobulin antibodies (Tg-Ab)[14]. These antibodies not only impair thyroid function but also directly affect ovarian function, leading to diminished ovarian reserve and poor reproductive outcomes. Several studies have highlighted the association between thyroid autoimmunity and recurrent pregnancy loss, even in euthyroid women, emphasizing the need for early detection and management[15].

Urbanization and Thyroid Dysfunction

Urbanization has significantly influenced the prevalence and presentation of thyroid dysfunction. Urban lifestyles, characterized by sedentary behavior, high stress levels, and dietary iodine fluctuations, contribute to thyroid disorders. In Bangladesh, rapid urbanization has led to significant dietary and environmental changes, including increased consumption of processed foods, which may alter iodine intake. Environmental pollutants such as perchlorates and thiocyanates, commonly found in urban settings, can disrupt thyroid function by interfering with iodine uptake[16].

In urban populations, the increased use of healthcare facilities often leads to higher detection rates of thyroid dysfunction. However, awareness about thyroid disorders, particularly their impact on reproductive health, remains low[17]. Many women with symptoms such as irregular menstruation, infertility, or recurrent pregnancy loss may not seek timely medical advice or undergo thyroid function testing. This underscores the importance of targeted awareness campaigns and routine screening for thyroid dysfunction among women of reproductive age in urban areas[18].

Knowledge Gap and Study Rationale

Despite the well-established link between thyroid dysfunction and reproductive health, there is a paucity

of data from Bangladesh, particularly focusing on urban women of reproductive age. Existing studies have largely been conducted in Western or Indian populations, with limited representation from Bangladesh. Given the unique socio-cultural and healthcare context of urban Bangladesh, there is a critical need to understand the prevalence, patterns, and reproductive health implications of thyroid dysfunction in this population.

This study aims to bridge this knowledge gap by conducting a cross-sectional analysis of thyroid dysfunction among women of reproductive age in urban Bangladesh. By examining the prevalence of hypothyroidism and hyperthyroidism, as well as their associations with menstrual and reproductive health issues, this research will provide valuable insights for clinicians and policymakers. Furthermore, the study will explore the role of thyroid replacement therapy in mitigating reproductive health challenges associated with thyroid dysfunction.

Methodology

This cross-sectional study was conducted by a pathologist at Shahid Sheikh Abu Naser Specialized Hospital, Khulna, Bangladesh, over 11 months from February to December 2024. The study focused on evaluating thyroid dysfunction in women of reproductive age, with a total sample size of 190 participants. Pathological data were collected and analyzed with a primary emphasis on thyroid function tests, including serum TSH, T3, and T4 levels, which were measured using standardized laboratory techniques within the hospital's pathology department. Additional clinical and pathological data, such as thyroid gland ultrasonography and autoimmune markers (if available), were also incorporated to strengthen diagnostic precision. Participants were recruited through the hospital's outpatient and inpatient departments, ensuring a diverse representation of cases. Data collection involved face-to-face interviews to gather sociodemographic and clinical histories, complemented by detailed pathological investigations. The study adhered to strict quality control measures in sample collection, processing, and reporting. Before participation, written informed consent was obtained from all individuals after providing clear explanations of the study objectives, procedures, and confidentiality measures. This pathology-focused approach ensured robust and reliable data for assessing thyroid dysfunction in this population.

Results

Sociodemographic Characteristics

Table 1: Sociodemographic Characteristics of the Study Participants (n = 190)

Variables	Categories	Frequency (n)	Percentage (%)
Age (years)	18-25	42	22.1
	26-35	91	47.9
	36-45	57	30.0
Educational Status	Illiterate	16	8.4
	Primary	56	29.5
	Secondary	73	38.4
	Higher Secondary	45	23.7
Occupation	Housewife	112	58.9
	Service Holder	48	25.3
	Student	30	15.8

Table 1 shows that nearly half (47.9%) of the participants were aged 26–35 years, with the majority (38.4%) having completed secondary education. Most participants (58.9%) were housewives.

Clinical Presentation

Table 2: Distribution of Clinical Features and Symptoms Among Participants (n = 190)

Clinical Features	Present (n)	Percentage (%)	Absent (n)	Percentage (%)
Fatigue	128	67.4	62	32.6
Weight Gain	102	53.7	88	46.3
Palpitations	72	37.9	118	62.1
Menstrual Irregularities	85	44.7	105	55.3
Hair Loss	110	57.9	80	42.1

Table 2 demonstrates that fatigue (67.4%) and hair loss (57.9%) were the most common clinical features reported by participants.

Laboratory Findings

Table 3: Thyroid Function Test Results of the Participants (n = 190)

Thyroid Function Tests	Range	Mean ± SD	Abnormal Cases (n)	Percentage (%)	p-value
TSH (mIU/L)	0.3–10.0	5.2 ± 3.8	76	40.0	<0.05
Free T4 (ng/dL)	0.8–2.0	1.1 ± 0.4	64	33.7	<0.05
Free T3 (pg/mL)	2.3–4.2	3.0 ± 0.7	50	26.3	<0.05

Table 3 indicates that 40% of participants had abnormal TSH levels, while abnormalities in Free T4 and Free T3 were observed in 33.7% and 26.3%, respectively. The differences in thyroid dysfunction across groups were statistically significant ($p < 0.05$).

Prevalence of Thyroid Dysfunction

Table 4: Prevalence of Thyroid Dysfunction (n = 190)

Thyroid Dysfunction Type	Frequency (n)	Percentage (%)
Subclinical Hypothyroidism	46	24.2
Overt Hypothyroidism	30	15.8
Subclinical Hyperthyroidism	12	6.3
Overt Hyperthyroidism	8	4.2
Euthyroid	94	49.5

Table 4 shows that nearly half (49.5%) of participants were euthyroid, while the most prevalent thyroid dysfunction was subclinical hypothyroidism (24.2%).

Risk Factors for Thyroid Dysfunction

Table 5: Association Between Sociodemographic Variables and Thyroid Dysfunction (n = 190)

Variables	Categories	Thyroid Dysfunction (n)	p-value
Age	26–35 years	50	<0.05
Educational Status	Primary	40	<0.05
BMI (kg/m²)	>25	58	<0.05

Table 5 highlights significant associations between thyroid dysfunction and age, educational status, and BMI, with p-values <0.05 for all.

Correlation Between TSH and Clinical Features

Table 6: Correlation Between TSH Levels and Clinical Features

Clinical Features	Correlation Coefficient (r)	p-value
Fatigue	0.62	<0.05
Weight Gain	0.58	<0.05
Menstrual Irregularities	0.44	<0.05

Table 6 demonstrates a significant positive correlation between elevated TSH levels and fatigue, weight gain, and menstrual irregularities, with p-values <0.05 for all.

Discussion

The present study provides a comprehensive analysis of thyroid dysfunction among women of reproductive age, focusing on sociodemographic characteristics, clinical presentations, and laboratory findings. Conducted at Shahid Sheikh Abu Naser Specialized Hospital, Khulna, with a sample size of 190, the findings underscore the significant burden of thyroid disorders in this demographic group.

In this study, the most prevalent thyroid dysfunction was **subclinical hypothyroidism**, affecting 24.2% of participants, followed by overt hypothyroidism (15.8%). A smaller proportion exhibited subclinical hyperthyroidism (6.3%) and overt hyperthyroidism (4.2%), while 49.5% were euthyroid. These findings are consistent with other studies conducted in similar settings. For example, a study by Unnikrishnan et al. (2013) reported a prevalence of subclinical hypothyroidism ranging from 8% to 28% in women of reproductive age in South Asia. The high prevalence in this study may be attributed to urbanization, stress, and dietary iodine variations.

Sociodemographic characteristics reveal that the majority (47.9%) of participants were aged 26–35 years, with 38.4% having completed secondary education. Most participants (58.9%) were housewives. Age was significantly associated with thyroid dysfunction, with the 26–35 age group having the highest prevalence ($p < 0.05$). This aligns with findings by Garber et al. (2012), who noted that women in their reproductive years are particularly vulnerable to thyroid dysfunction due to hormonal fluctuations during pregnancy and menstrual cycles.

Clinical symptoms like fatigue (67.4%), weight gain (53.7%), and hair loss (57.9%) were prominent in participants with thyroid dysfunction. A significant positive correlation was found between elevated TSH levels and symptoms such as fatigue ($r = 0.62$, $p < 0.05$) and weight gain ($r = 0.58$, $p < 0.05$). These results are comparable to those of Biondi and Cooper (2008), who highlighted fatigue and weight changes as hallmark symptoms of hypothyroidism.

Laboratory findings showed that **40% of participants** had abnormal TSH levels, while abnormalities in Free T4 and Free T3 were observed in 33.7% and 26.3%, respectively. The mean TSH level in this study (5.2 ± 3.8 mIU/L) is higher than the upper limit of normal, indicating the prevalence of thyroid dysfunction in the cohort. This is consistent with the findings of Nyrström et al. (1988), who observed that TSH abnormalities were a reliable indicator of thyroid dysfunction in primary care settings.

Body mass index (BMI) was also significantly associated with thyroid dysfunction, with 58% of participants having a BMI >25 kg/m² ($p < 0.05$). This supports evidence from a study by Pearce et al. (2013), which found a strong association between obesity and hypothyroidism, likely due to the impact of thyroid hormones on metabolic regulation.

Interestingly, the study revealed that **44.7% of participants reported menstrual irregularities**, which is higher than findings in other studies, such as by Krassas et al. (2010), who reported a prevalence of 20%–30%. The higher prevalence in this study may be due to delayed diagnosis and lack of awareness among the participants.

Our findings have significant clinical implications. Thyroid dysfunction in women of reproductive age can have far-reaching consequences, including infertility, miscarriage, and adverse pregnancy outcomes. The high prevalence of subclinical hypothyroidism underscores the importance of early detection and regular screening. The study also highlights the need for public health interventions focusing on dietary iodine supplementation and increased awareness of thyroid disorders among urban Bangladeshi women.

Strengths and Limitations

One major strength of this study is its focus on pathology. Robust data were collected using laboratory-confirmed thyroid function tests, ensuring accurate classification of thyroid dysfunction. However, the cross-sectional design limits the ability to establish causality. Additionally, the study was conducted at a single hospital, which may affect the generalizability of the findings. Future multicenter studies with larger sample sizes are recommended to validate these results.

Conclusion

In conclusion, this study highlights a high prevalence of thyroid dysfunction, particularly subclinical hypothyroidism, among women of reproductive age in urban Bangladesh. Fatigue, weight gain, and menstrual irregularities were the most common clinical features, significantly associated with age, BMI, and educational status. Public health interventions and routine screening are critical to mitigating the burden of thyroid dysfunction and improving health outcomes in this vulnerable population.

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