

Hypothyroid Patients Show Significant Association with Antithyroid Antibodies: A Cross Sectional Study in Khulna

Dr. Utpal Kumar Chanda^{1*}, Dr. Manika Rani Kundu², Dr. MD. Mijanur Rahman Sardar³, Dr. Shatabdi Mallick⁴, Dr. Palash Tarafder⁵, Dr. Muhammed Arshad- UL- Azim⁶, Dr. Nripendra Nath Biswas⁷

¹Assistant Professor of Medicine, Khulna Medical College, Khulna, Bangladesh

²Consultant of Gyne and Obst., Upazila Health Complex, Bagerhat, Bangladesh

³Associate Professor of Physiology, Khulna Medical College, Khulna, Bangladesh

⁴Lecturer of Microbiology, Khulna Medical College, Khulna, Bangladesh

⁵Assistant Professor of Nephrology, Khulna Medical College, Khulna, Bangladesh

⁶Associate Professor of Nephrology, Khulna Medical College, Khulna, Bangladesh

⁷Professor, Pharmacy Discipline, Khulna University, Khulna, Bangladesh

DOI: [10.36348/sjm.2024.v09i07.003](https://doi.org/10.36348/sjm.2024.v09i07.003)

| Received: 12.05.2024 | Accepted: 25.06.2024 | Published: 08.07.2024

*Corresponding Author: Dr. Utpal Kumar Chanda

Assistant Professor of Medicine, Khulna Medical College, Khulna, Bangladesh

Abstract

Background and Objectives: A high prevalence of thyroid disorder is found worldwide and it is a serious public health problem. A community-based investigations showed that; overall occurrence of thyroid disease was 20.43%, highest incidence of diffuse goiter (7.35%), followed by sub-clinical hypothyroidism (6.59%), hypothyroidism (4.97%), hyperthyroidism (0.86%) and sub-clinical hyperthyroidism (0.65%) in Khulna, Bangladesh. Antithyroid autoantibodies are one of the most important causes of thyroiditis resulting hypothyroidism. The aim of this study was to investigate the prevalence of antithyroid antibody to hypothyroid patients in Khulna region. **Methods:** This cross-sectional study was done on Hypothyroid patients of Khulna Medical College Hospital and Institute of Nuclear Medicine and Allied Science (INMAS), Khulna, from July 2023 to December 2023. After having informed written consent of adult sixty hypothyroid patients, was interviewed and examined the blood sample for relevant information; data recorded in a preformed, semi-structured data collection sheet (Patient particulars form) and analyzed. **Results:** About 20 percent had positive family history of hypothyroidism, 27 percent patient was associated with other autoimmune diseases and about 80 percent was associated with anti-thyroid antibody. Out of the sixty hypothyroid patients about fifty percent was obese, eighty percent was female of 30-60 years age group. Ninety percent of them belongs to poor socioeconomic conditions and came from rural area of Khulna district. **Conclusions:** Most of the patients were rural female of low socioeconomic back ground of reproductive age groups. There was very significant association of anti-thyroid antibody with these patients. They also associated with chronic autoimmune diseases and poverty.

Keywords: Thyroid, Public Health, Diffuse Goiter, Bangladesh, Nuclear Medicine, Blood Sample.

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INTRODUCTION

One of the most common thyroid disease is hypothyroidism. It has many life-threatening consequences [1]. Hypothyroidism can affect people of all ages, genders and ethnicities. A community-based survey showed that overall occurrence of thyroid disease in Khulna was 20.43%, highest incidence of diffuse goiter (7.35%), followed by sub-clinical hypothyroidism (6.59%), hypothyroidism (4.97%), hyperthyroidism (0.86%) and sub-clinical hyperthyroidism (0.65%) [2]. Hypothyroidism can have a primary or a secondary

cause. Hashimoto's thyroiditis is the most common cause of primary hypothyroidism. The other causes of primary hypothyroidism include: thyroiditis, treatment of hyperthyroidism (radiation and surgical removal of the thyroid gland), iodine deficiency, postpartum thyroiditis, drugs (carbimazole, methimazole, amiodarone, lithium etc), viral illness etc. [3]. Many predisposing factors are responsible for hypothyroidism like, age, sex, family history of thyroid and other autoimmune diseases, antithyroid antibodies, pregnancy, drugs etc. It is seen that environmental factors such as alcohol consumption, smoking, Iodine intake, deficiency in vitamin and

minerals such as Vitamin D and Selenium, infections, stress, and certain drugs (estrogens) may also affect the incidence of the thyroid dysfunction, Different environmental and lifestyle factors affect development of thyroid disease though exact mechanism is not known. Studies have indicated that environmental and lifestyle factors may interact with genetic factors [4]. The symptoms of hypothyroidism usually develop slowly over time – sometimes years. The clinical features of hypothyroidism depend on the duration and severity of the disease. The most common symptoms of hypothyroidism are, weight gain, fatigue, somnolence, cold intolerance, dry skin and hair, menorrhagia [2]. As it affects all the organ of the body and if, remains untreated, resulting devastating outcomes like, infertility, myxedema coma, heart failure, renal failure, liver failure, dyslipidemia, deafness, impotence, dementia, major depressive disorders, psychosis (myxedema madness) etc. [5]. Majority areas of Khulna, Bangladesh are in Southwestern costal region and these are not Iodine deficient area. Even then there is high prevalence of hypothyroidism. Different study shows that antithyroid antibody causes damage to thyroid gland resulting hypothyroidism [6]. Hypothyroid patient has significant association with number of autoimmune diseases and has strong association of family history of hypothyroidism. Sometimes, it can actually be difficult to diagnose hypothyroidism because the symptoms are insidious in onset and can be easily confused with other conditions. A high index of suspicion needs to be maintained for the early diagnosis of hypothyroidism specially in patients with non-specific symptoms, subclinical hypothyroidism etc. Antithyroid antibodies

may be a very effective tools for the diagnosis of clinical, subclinical as well as latent damage of thyroid gland [7-8]. These scenario makes us keen to investigate the detail about the prevalence of antithyroid antibodies in hypothyroid patients in Khulna region.

METHOD

This cross-sectional investigation was carried out on sixty hypothyroid patients of Khulna region in Khulna Medical College Hospital and Institute of Nuclear Medicine and Allied Science (INMAS), Khulna. After having informed written consent of patients, they were interviewed and examined for relevant information, data recorded in a preformed, semi-structured data collection sheet (Patient particulars form). Serum T4, TSH, thyroid autoantibody (TG Ab, TPOAb, TRAb) by Radioimmunoassay and other relevant investigations like -RBS, high resolution USG of thyroid gland were done according to available protocols. Thyroid function status was interpreted according to the reference range of the corresponding laboratory and categorized according to the American Thyroid Association guideline [9]. Statistical analysis done using Graph Pad Prism and Microsoft Excel (as applicable).

RESULTS

Among the sixty hypothyroid patients’ majority were female (78.33%). Male female ratio was about 1:2.2. People of rural costal areas are more prone to hypothyroidism. In our study we have found that 32% patients have positive family history of hypothyroidism (Table 1).

Table 1: Demography Vs Hypothyroidism

Sex (%)		Residence (%)		Family history of hypothyroidism	
Male	Female	Rural	Urban	Present	Absent
22	78	93	7	32	68

Among them 90% comes from low socioeconomic conditions presented in Figure 1. We found that the prevalence of hypothyroidism was very low in middle and higher socioeconomic classes of people.

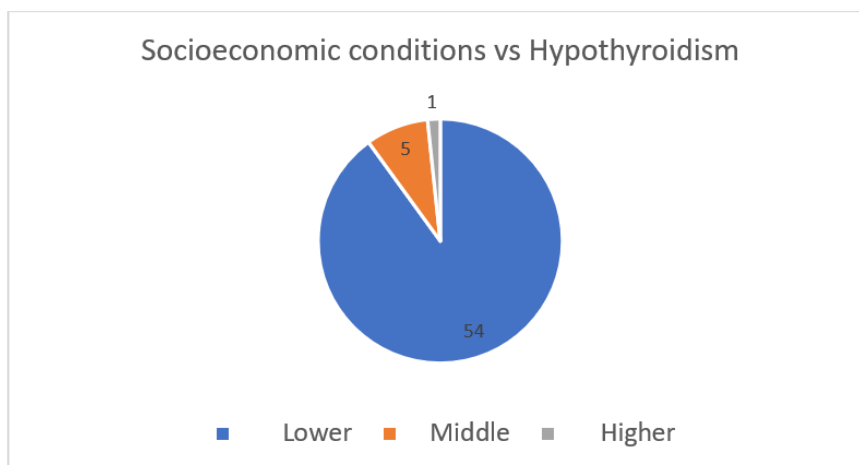


Figure 1: Socioeconomic conditions vs Hypothyroidism

In this study we have found that about 93% people were from rural coastal area of Khulna region (Table 2).

Table 2: % Hypothyroid patients from different districts of Khulna region

Khulna	Bagerhat	Pirojpur	Vhola
78	13	7	2

Forty-five percent of the total patients were of reproductive age group (15-45 years) where the individuals after thirty years of age are relatively at

greater risk (30%). At the same time the elderly patients also occupy a significant number (43%) (above the age of 45 year) (Figure 2).

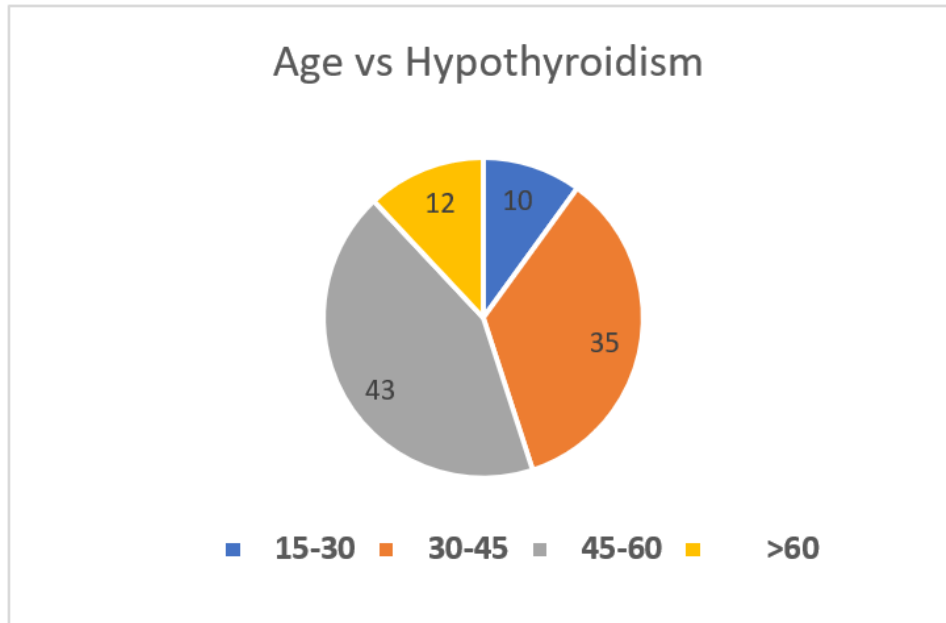


Figure 2: Age distribution of hypothyroid patients

More than half of the patients were obese (53.34%). That means body weight have impact on hypothyroidism.

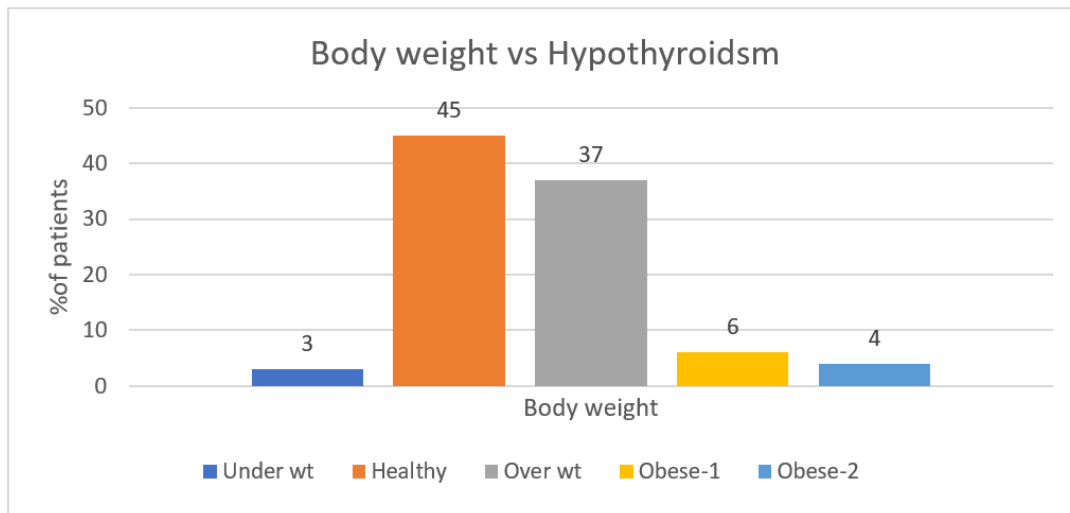


Figure 3: Body weight of hypothyroid patients

Generalized weakness, swelling of the body, bodyache & joint pain were the most common presenting symptoms of these patients (Figure 4).

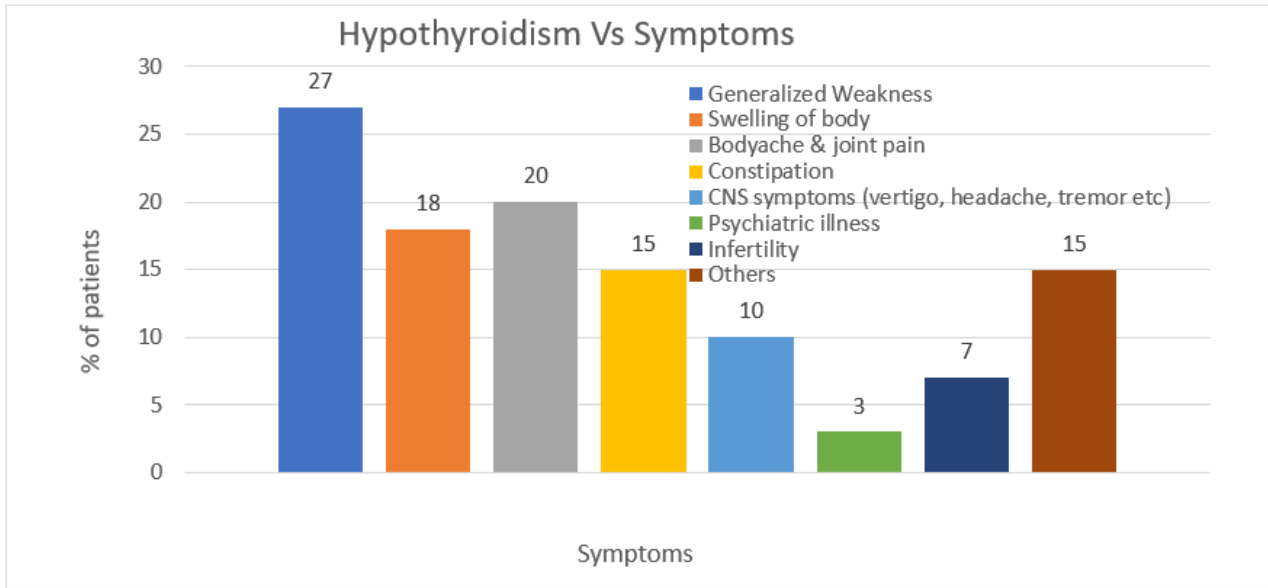


Figure 4: General clinical symptoms of hypothyroid patients

Autoimmunity, genetic factors and chronic autoimmune diseases play an important role for the causation of hypothyroidism. In this study 45% patients

were associated with different autoimmune diseases. Besides this, 22% were associated with DM, 25% HTN and 14% were associated both DM & HTN, (Figure 5).

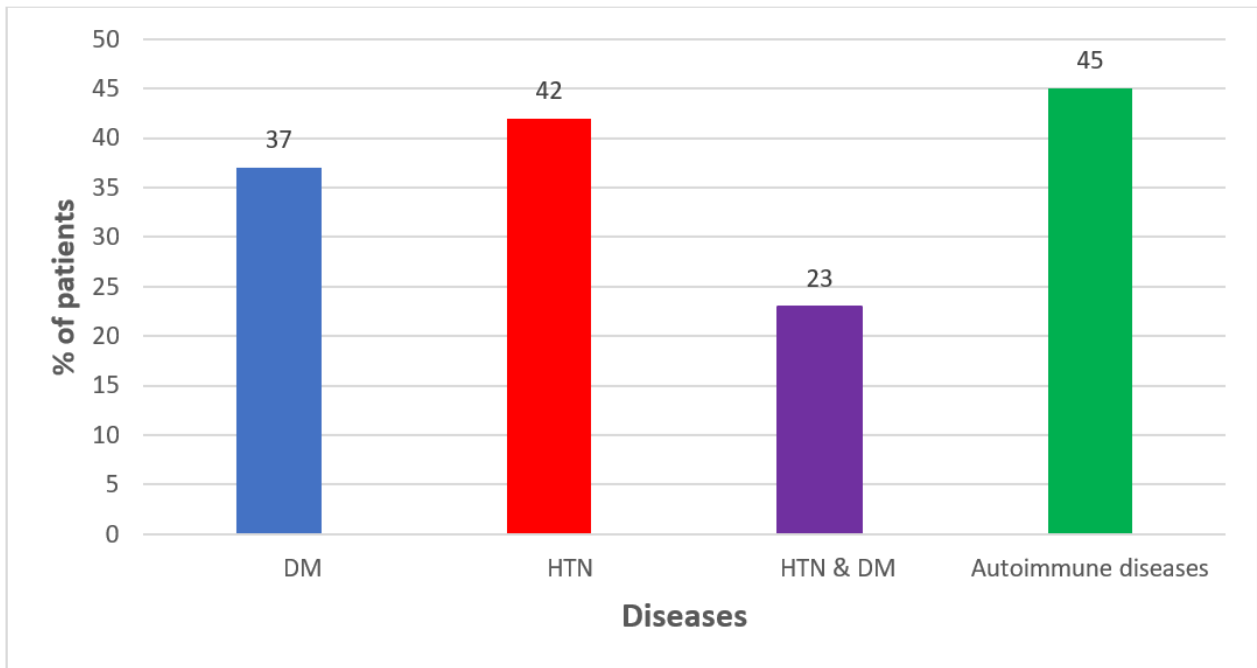


Figure 5: Association of hypothyroidism with other diseases

Very significant number of patients (88.67%) were associated with antithyroid antibody. Among them Ab was 70.73% and TPO Ab was 61.36%. (Figure 6)

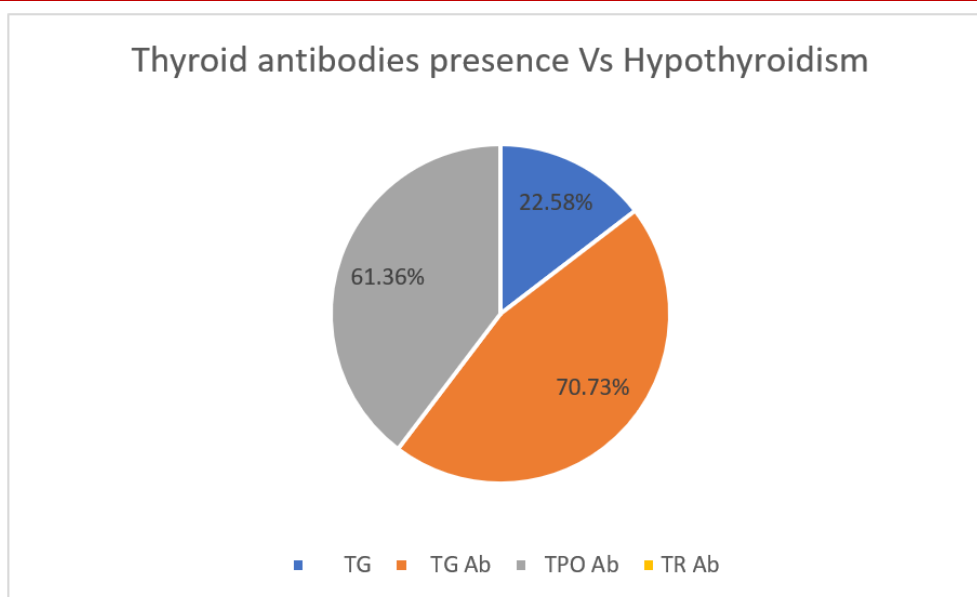


Figure 6: Association of hypothyroidism with different thyroid autoantibodies

DISCUSSION

Khulna district is in the south western part of Bangladesh. About ninety percent of its area are in coastal region. Most of the people of Khulna region consumes iodized salt. The chance of Hypothyroidism due to Iodine deficiency and goiter are less in this area [1-2]. Interestingly, the prevalence of hypothyroidism is high in Khulna region and causes behind this was not clearly reported. Only few studies were found on epidemiological survey of hypothyroid patient. In our study we aimed to investigate the association between thyroid autoantibodies and hypothyroidism and have got strong association of hypothyroidism with autoantibodies and epidemiological factors.

Hashimoto's Thyroiditis (Chronic Lymphocytic Thyroiditis) is also known as autoimmune thyroiditis. It is associated with the development of antibodies TPOAb and/or TGAb that damage thyroid gland. It occurs most commonly in women. Antithyroid autoantibodies are one of the most important cause of thyroiditis resulting hypothyroidism. Thyroid antibodies develop when a person's immune system mistakenly attacks the thyroid cells and tissues. This leads to inflammation, tissue damage or disrupted thyroid function. These antibodies cause autoimmune thyroid disorders, such as Graves' disease and Hashimoto's thyroiditis. In Hashimoto's thyroiditis, there is a marked lymphocytic infiltration of the thyroid with germinal center formation, atrophy of the thyroid follicles accompanied by oxyphil metaplasia, absence of colloid, and mild to moderate fibrosis. In atrophic thyroiditis, the fibrosis is much more extensive, lymphocyte infiltration is less pronounced, and thyroid follicles are almost completely absent. Autoimmune thyroiditis is characterized by polyclonal autoantibodies targeting the thyroid gland, T-cell infiltration and apoptosis of thyroid follicular cells. Autoantibodies in the serum is in the

serum of patients with autoimmune thyroiditis represent a response to the ongoing inflammatory reaction. The echogenicity markedly decreased, heterogeneity, and multifocal pseudonodular hypoechoic infiltration are indicative of a high level of inflammatory activity, and these sonographic findings were associated with significantly higher TPOAb activity [12]. Atrophic thyroiditis usually represents the end stage of Hashimoto's thyroiditis. As with most autoimmune disorders, susceptibility to autoimmune hypothyroidism is determined by a combination of genetic and environmental factors, and the risk of either autoimmune hypothyroidism or Graves' disease is increased among siblings. TPO antibodies fix complement, and complement membrane-attack complexes are present in the thyroid in autoimmune hypothyroidism. These antibodies cause inflammation in thyroid gland as a result thyroid gland can't produce enough thyroid hormone [13]. A number of recent prospective, case-control studies showed that the autoimmune diseases like; diabetes mellitus (DM), rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), celiac disease, sarcoidosis, psoriatic arthritis (PsA), systemic sclerosis (SSc), Addison's disease and ulcerative colitis are strongly associated with AIT [14-16].

In our study we found significant association of other autoimmune diseases with hypothyroidism like, DM, SLE, RA, Psoriasis, vitiligo etc. which was about 45%. (Figure-5). TPOAb and TGAb are clinically useful markers of thyroid autoimmunity.

It was significant findings of our study that most of the hypothyroid patients were female (78.33%) and was housewife. (T/F--) In our study we have found that about 78% patient was on 30-60 years age group, disproportionately affect those between 30 to 55 years of age. (Table-1) As we found that most of the patients are

in reproductive age group (18-45), Pregnancy and childbirth can cause inflammation of thyroid gland which may turn into hypothyroidism of some women. Postpartum thyroiditis (PPT) is a destructive autoimmune disease occurring in the first year after delivery in women without a history of thyroid disease prior to pregnancy. There are some reasons of susceptibility women to thyroid disorders at reproductive and post-menopausal age group. Women are more prone to autoimmune diseases like, Hashimoto's thyroiditis and Graves' disease due to their accelerated immune response than men. Massive hormonal changes and adaptation occurs during pregnancy and post-partum period. All the endocrine axis is altered during these periods may leads to endocrine abnormality like, hypo and hyperthyroidism, gestational diabetes mellitus etc. Hormonal imbalance also occurs in postmenopausal women. Study shows higher prevalence of hypothyroidism in women who have ever taken birth control pills (17.7%) [17]. Hypothyroidism causes menstrual irregularities and anovulatory cycles as results affect the fertility. Study showed high prolactin (PRL) level in infertile women with hypothyroidism that indicates relation between hypothyroidism and hyperprolactinemia. In our study we found, about 27% patient was of 15-45 years age group. About 13% of them were suffering from menstrual abnormality and 3.33% were suffering from primary or secondary infertility.

In this study we found significant association of obesity with hypothyroidism (Figure-3). A systematic review and meta-analysis of 22 study showed that obesity and TPOAb has significantly increased the risk of overt and subclinical hypothyroidism and Hashimoto's Thyroiditis suggested that prevention of obesity is crucial for thyroid disorders [18].

Socioeconomic conditions were one of the most noticeable variables of our study, as because about 90% of them comes from low socioeconomic conditions and 93% were resident of rural area. Low socioeconomic condition is strongly associated with nutrients of food and thyroid is a nutrient dependent gland [19]. High carbohydrate, sugar and fat content of food is associated with obesity and poor nutrient content. Lack of balance diet in the rural women and sedentary life style may play important role for hypothyroidism. We found that 32% of our study people were overweight and obese.

We have also found that about 32% of our study population have positive family history of hypothyroidism of first degree relative specially parents and siblings. Study identified five genome-wide significant associations of hypothyroidism, three of which were well known to be involved in a large spectrum of autoimmune diseases. Those results suggested heterogeneity in the genetic etiology of hypothyroidism, implicating genes involved in both autoimmune disorders and thyroid function [20]. Our study report also coherent with those previous reports

which strongly implies that among other causes, family history is also a strong cause of antibody mediated hypothyroidism.

CONCLUSION

Antithyroid autoantibodies have significant association with hypothyroidism. Due to different hormonal changes during pregnancy period the females of reproductive age from rural area of Khulna region with low living standards are mostly affected by this antibody mediated hypothyroidism. Adequate public awareness about the severity and reasons of this disease may help in early diagnosis and proper treatment of this life-threatening diseases. Antithyroid antibody may be used as a very useful tools along with other investigations for the early diagnosis of subclinical and overt hypothyroidism as well as presence of these antibodies can predict the possibility of occurrence of hypothyroidism and other autoimmune diseases of a non-hypothyroid patient.

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