



Significant Association of Epidemiological Factors with Hypothyroid Patients in Khulna Region: A Cross Sectional Study

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Abstract

Background and Objectives: *Thyroid disorder is one of the most common endocrine disorders worldwide. 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. High prevalence of hypothyroidism with autoimmunity are also observed in Khulna Region. The aim of this study was to conduct epidemiological survey of 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: *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. 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.*

Conclusions: *Most of the patients were rural female of low socioeconomic back ground of reproductive age groups. They also associated with other autoimmune diseases. Chronic autoimmune diseases, poverty, anti-thyroid antibody and salinity of environment may play an important role for the causation of hypothyroidism in Khulna region.*

Keywords: *Thyroid disorder, hypothyroidism, dyslipidemia, thyroiditis.*

Introduction

One of the most common thyroid disease is hypothyroidism. It has many life-threatening consequences. 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%)⁽¹⁾ Hypothyroidism can have a primary or a secondary cause. Hashimoto's thyroiditis is the most common cause of primary hypothyroidism⁽²⁾. 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. And these scenario makes us keen to investigate the detail insight about the prevalence of hypothyroidism in Khulna region. 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. Thus, this cross-sectional survey evaluated the association between hypothyroidism and epidemiological factors in the people of 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⁽⁶⁾. Statistical analysis done using Graph Pad Prism and Microsoft Excel (as applicable).

Results

Of this sixty patients' majority were female (78.33%). Male female ratio was about 1:2.2. Rural people are more vulnerable for

hypothyroidism indicated in table. We have found a significant association of positive family history of hypothyroidism of these patients which is about 32% (Table 1).

Table 1: Demography Vs Hypothyroidism

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

Among them 90% comes from low socioeconomic conditions presented in Figure 1. It is seen that prevalence of hypothyroidism is low

in upper middle and higher socioeconomic classes of people.

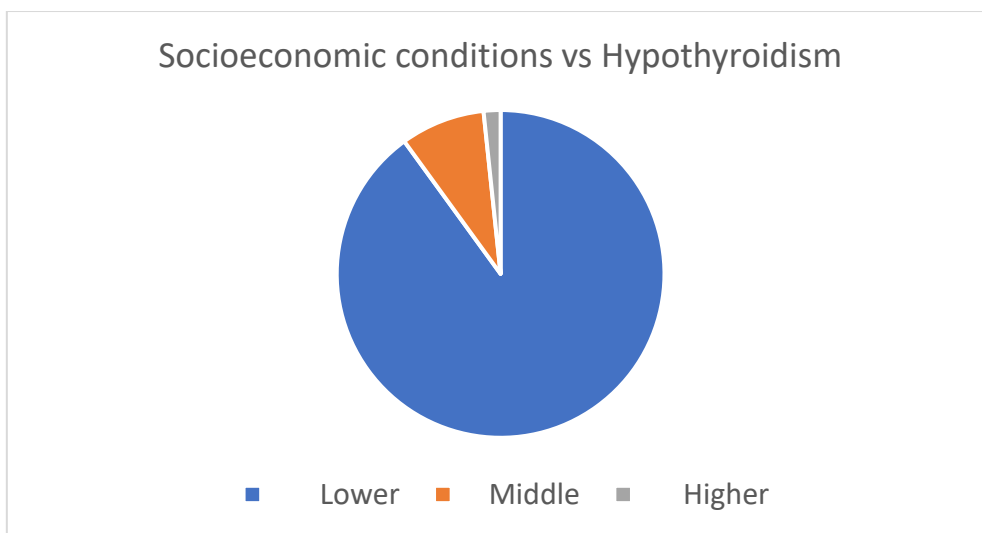


Figure 1: Socioeconomic conditions vs Hypothyroidism

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

Majority of the hypothyroid patients (total 45%) 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).

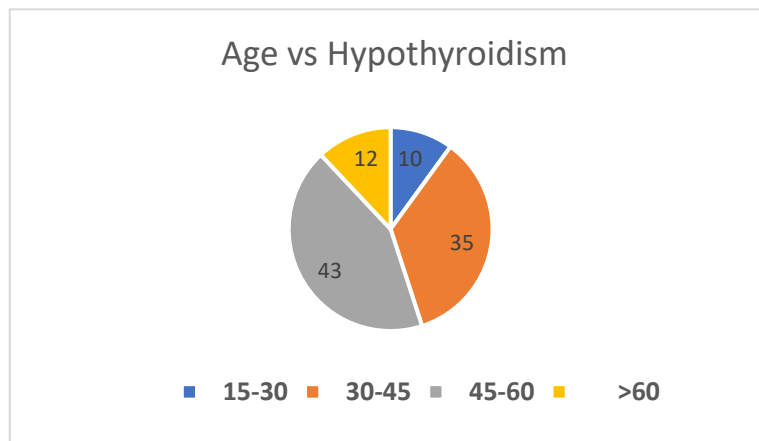


Figure 2: Age distribution of hypothyroid patients

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

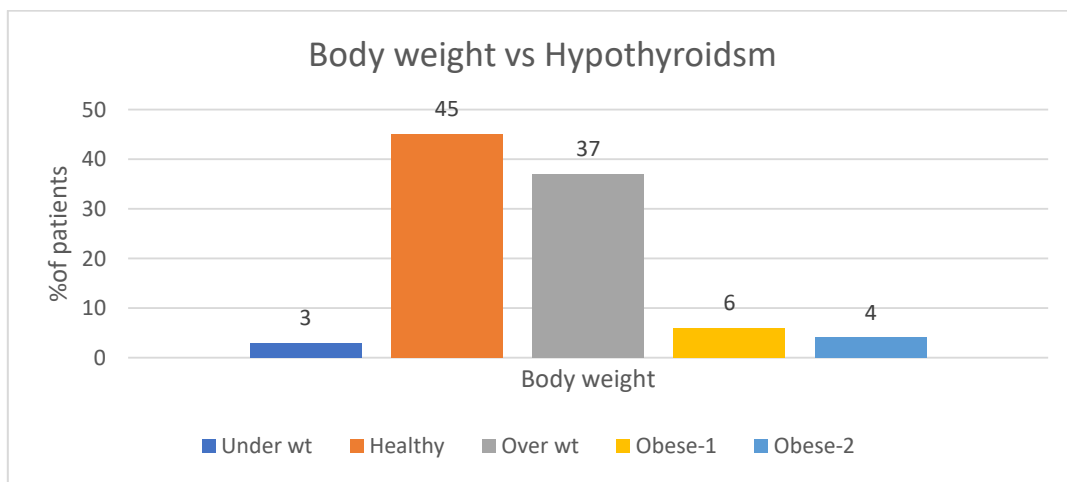


Figure 3: Body weight of hypothyroid patients

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

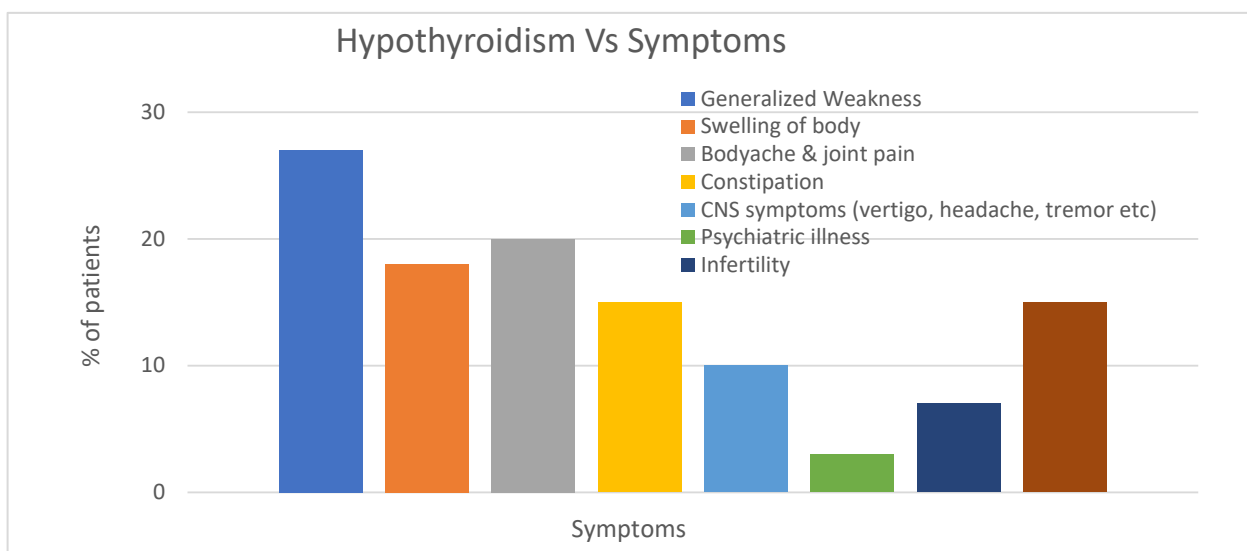


Figure 4: General clinical symptoms of hypothyroid patients

Genetic factors, chronic autoimmune diseases and autoimmunity play an important role for the causation of hypothyroidism. Among these patients 22% were associated with diabetes

melitus (DM), 25% hypertension (HTN) and 14% were associated both DM & HTN, 45% with different autoimmune diseases (Figure 5).

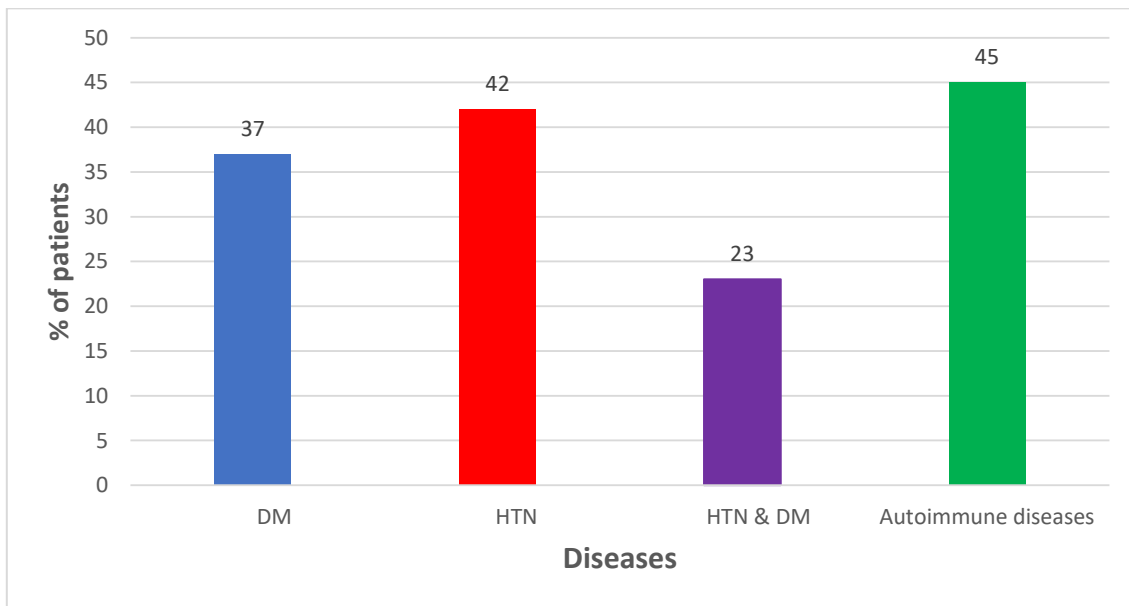


Figure 5: Association of hypothyroidism with other diseases

Antithyroid antibody was associated with 88.67% of patients, among them Thyroid globulin

antibodies (TG Ab) was 70.73% and Thyroid peroxidase (TPO Ab) was 61.36%. (Figure 6)

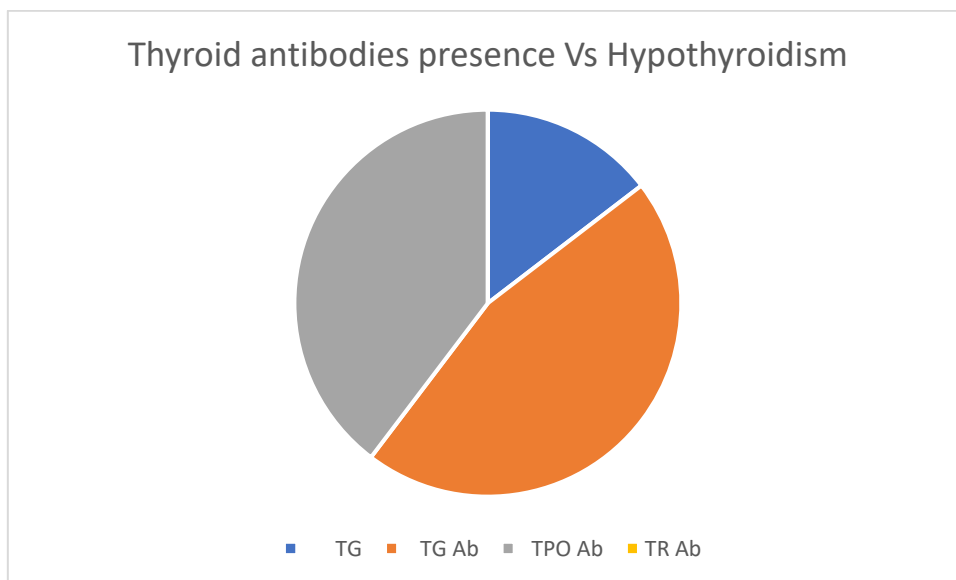


Figure 6: Association of hypothyroidism with different thyroid autoantibodies

Discussion:

Most of the regions of Khulna are in coastal area and most of the people of this region take iodized salt. There, it seems there is less chance of iodine

deficiency which is an important cause of hypothyroidism. Even though prevalence of hypothyroidism is high in Khulna region but exact causes behind this was not found. Only few

studies were found on epidemiological survey of hypothyroid patient. In our study we have got strong association of hypothyroidism with epidemiological factors.

From the study results we found that most of our hypothyroid patients were female (78.33%) and was housewife. Other thyroidal illness is also common in female sex. 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. A number of women aged 30-45 suffered from hypothyroidism patients are found due to post-partum thyroiditis. Pregnancy and childbirth can cause inflammation of thyroid gland which may turn into hypothyroidism of some women.

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%).⁽⁷⁾

In this study we found significant association of obesity with hypothyroidism. Table-. A systematic review and meta-analysis of 22 study showed that obesity has significantly increased risk of overt hypothyroidism and subclinical hypothyroidism, Hashimoto's Thyroiditis, presence of TPOAb and reduction of weight reduce the risk of hypothyroidism.⁽⁸⁾

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⁽⁹⁾. 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.

Hypothyroidism causes menstrual irregularities and anovulatory cycles as results affect the fertility. Study shows 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.

Different study shows that first-degree relatives of patients with hypothyroidism have a 9-fold higher risk to develop this disease as compared to the general population specially those suffering from Hashimoto's Thyroiditis.⁽¹⁰⁾ We have also found that about 31% of our study population have positive family history of hypothyroidism of first degree relative specially parents and siblings. Study identifies five genome-wide significant associations of hypothyroidism, three of which are well known to be involved in a large spectrum of autoimmune diseases. These results suggest heterogeneity in the genetic etiology of hypothyroidism, implicating genes involved in both autoimmune disorders and thyroid function.⁽¹¹⁾

Autoimmune thyroiditis (AIT) is the most common cause of hypothyroidism. Recently large prospective, case-control study shows the following autoimmune diseases are strongly associated with AIT like ; diabetes mellitus (DM), rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), multiple sclerosis, polymyalgia rheumatica (Polym), celiac disease, sarcoidosis (S), alopecia, psoriatic arthritis (PsA),

systemic sclerosis (SSc), and hepatitis C virus (HCV)-related mixed cryoglobulinemia (MC); and a near significant prevalence has also been shown for Addison's disease and ulcerative colitis⁽¹²⁻¹⁴⁾. In our study we found significant association of other autoimmune diseases like, DM, SLE, RA, Psoriasis, vitiligo etc. which was about 45%.

Antithyroid autoantibodies are one of the most important cause of thyroiditis resultings 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.⁽¹⁵⁾ Also, the presence of TPOAb is associated with an increased risk of overt hypothyroidism. 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. Antibodies to TPO and thyroglobulin (Tg) are clinically useful markers of thyroid autoimmunity. TPO antibodies fix complement, and complement membrane-attack complexes are present in the thyroid in autoimmune hypothyroidism.⁽¹⁶⁾

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