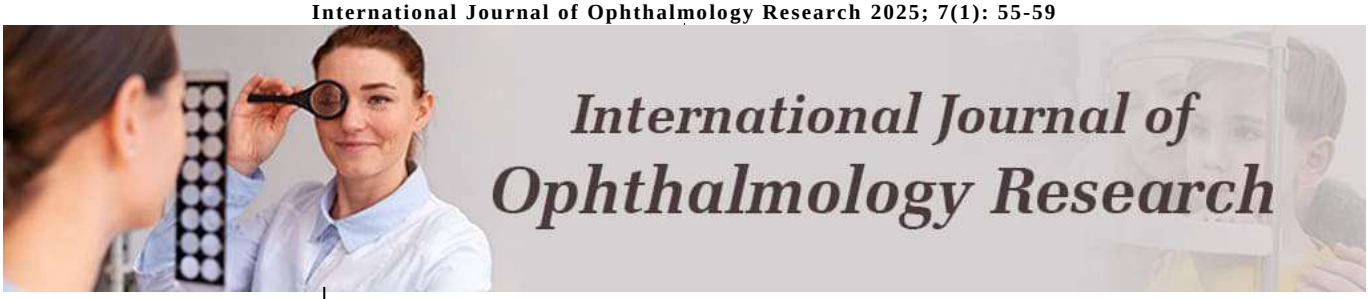

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Ocular manifestations in patients with thyroid eye disease: A cross-sectional study

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Abstract
Background: Patients with thyroid insufficiency experience significant ocular morbidity resulting from thyroid eye disease (TED), an autoimmune disorder that impacts orbital tissues. TED can manifest in individuals who are euthyroid or hypothyroid, however it is more prevalent in those with Graves' disease. Clinical symptoms encompass diplopia, optic neuropathy, eyelid retraction, and proptosis. There is a lack of epidemiological data on TED in Bangladesh.
Objective: To determine the prevalence and distribution of ocular manifestations in patients with thyroid eye disease (TED) at a tertiary care hospital in Bangladesh.
Methods: A cross-sectional research was conducted with 120 participants who had clinically confirmed TED. We wrote down information on the thyroid's function, how long the disease had been going on, and the person's age, sex, and race. The ophthalmologic evaluation included checking the person's vision, eyelids, proptosis, extraocular motility, and fundus. Data analysis was done with SPSS v26.0, and chi-square was used to test for connections. A p-value of less than 0.05 was considered important.
Results: 68.3% of the participants were female, with a mean age of 41.6 ± 11.8 years. Hyperthyroidism was identified in 65% of patients. Eyelid retraction (71.7%) and proptosis (61.7%) were the most common eye problems. Conjunctival congestion (35%) and lid lag (48.3%) were next. 32.5% experienced diplopia, 17.5% encountered exposure keratopathy, and 7.5% got optic neuropathy. Proptosis and eyelid retraction were substantially more prevalent in hyperthyroid individuals compared to those with hypothyroidism or euthyroidism ($p<0.05$). A longer duration of thyroid dysfunction was connected to more frequent and worse eye problems.
Conclusion: Middle-aged women are the primary victims of TED, and hyperthyroid individuals demonstrate more severe ocular involvement. To prevent issues that could harm eyesight, it is essential to discover them early and have regular eye exams. These results provide foundational data to guide the formulation of clinical management strategies and policies for TED in Bangladesh.

Keywords: Ocular manifestations, proptosis, eyelid retraction, diplopia, optic neuropathy

Introduction
Thyroid eye disease (TED), Graves' orbitopathy, or thyroid-associated ophthalmopathy is an autoimmune illness characterized by inflammation and remodeling of orbital tissues, including connective tissue, orbital fat, and extraocular muscles [1]. The illness often occurs alongside Graves' disease; however, it can also manifest in individuals who are euthyroid or hypothyroid. The pathogenesis includes autoantibodies (especially thyroid-stimulating immunoglobulins), orbital fibroblast activation, glycosaminoglycan deposition, edema, and adipogenesis. These things can cause proptosis, eyelid retraction, diplopia, and, in very bad cases, optic neuropathy [2]. It is believed that 25% to 40% of people with Graves' illness around the world also have TED. Based on population data, the incidence rates for men and women are around 3 and 16 per 100,000 person-years, respectively [3]. These rates vary according on diagnostic criteria, geographic region, and ethnicity. Men usually have worse instances, while women are affected more often. Cases are documented throughout all adult age demographics, with the predominant age range being 30 to 50 years. TED can show up with a number of different clinical signs. Eyelid retraction is one of the most prevalent results, according to various studies. It happens in 80-90% of individuals [4]. Proptosis, often bilateral yet frequently asymmetrical, arises from the enlargement of orbital fat and

extraocular muscles. Some other typical symptoms are tearing, photophobia, exposure keratopathy, conjunctival congestion, diplopia from restrictive myopathy, and the feeling of having something in your eye. Severe side effects, such as corneal ulceration, compressive optic neuropathy, and elevated intraocular pressure, can lead to irreversible vision loss, notwithstanding their infrequency [5]. The natural history of TED typically consists of two stages: an active inflammatory phase lasting from months to a few years, marked by progressive orbital changes and inflammation, and an inactive or fibrotic phase, characterized by reduced inflammation and potential structural alterations. There are several risk factors that can make the illness happen more often or make it worse, such as smoking, not getting diagnosed right away, having too much or too little thyroid hormone, and being hyperthyroid. It has also been observed that more severe ocular damage is associated with a prolonged period of thyroid dysfunction [6]. Epidemiological studies indicate a substantial prevalence of TED and thyroid dysfunction in South Asia. For instance, research conducted in a hospital in India revealed that 65% of patients with Graves' illness exhibited ocular involvement, with eyelid retraction and proptosis being the most common manifestations. Research in Nepal found that 70% of the people who took part had eye problems, with conjunctival symptoms being the most frequent [7]. Research in Bangladesh is less comprehensive; limited estimates suggest that 15-20% of adults in certain regions are affected by thyroid illness, however there is a scarcity of adequate TED-specific data. There still deficiencies in the literature, particularly concerning Bangladesh. Many studies lack an adequate sample size and stratification of thyroid functional status [8]. Limited research has quantified the prevalence and severity of particular ocular symptoms such as diplopia, optic neuropathy, or dry eye symptoms, or differentiated between active and inactive phases of the condition. The measurement methods used are also not the same; for example, eyelid retraction grading, proptosis measurement, and ocular surface illness rating varied amongst research [9]. It is important to close these gaps. Early detection of ocular signs can improve the quality of life for patients, make the best use of resources, and avoid the disease from getting worse and jeopardizing vision. Clinical recommendations in Bangladesh necessitate local, complete data, encompassing referral criteria and multidisciplinary management.

Materials and Methods

This hospital-based cross-sectional study was conducted over a period of six months, from March 2025 to August 2025. The study aimed to determine the prevalence and distribution of ocular symptoms in persons with thyroid eye disease. The research was performed in Bangladesh's tertiary referral center, specifically the Department of Ophthalmology at Dhaka Medical College Hospital. One hundred and twenty individuals diagnosed with thyroid eye illness were recruited. Purposive sampling was employed to choose patients sequentially, ensuring that all eligible people presenting during the study period were considered for inclusion.

Inclusion and Exclusion Criteria

Inclusion Criteria

- Patients aged 18 years and above.
- Patients with a clinical diagnosis of thyroid eye disease confirmed by both ophthalmological and endocrinological evaluation.
- Patients who provided informed consent to participate.

Exclusion criteria

- Patients with ocular conditions unrelated to thyroid eye disease
- Patients with previous orbital surgery or radiotherapy.
- Patients unwilling or unable to undergo ophthalmological examination.

Data Collection Procedure

A complete medical history was gathered from each participant. This included information about their age, sex, where they lived, how long they had had thyroid disease, if they smoked, and how well their thyroid worked (hyperthyroid, hypothyroid, or euthyroid). The clinical ophthalmological examination included tests of visual acuity, a slit-lamp exam, an assessment of eyelid position, a measurement of proptosis with a Hertel exophthalmometer, tests of extraocular motility, and a fundus exam. Thyroid status was determined using endocrinology examinations and patient data.

Statistical Analysis

We used SPSS version 26.0 (IBM Corp., Armonk, NY, USA) to enter and look at the data. Descriptive statistics were calculated for clinical and demographic data, with findings displayed as frequencies and percentages for categorical variables and means and standard deviations for continuous variables. We utilized chi-square tests to look at how ocular symptoms were related to thyroid functional status, sex, and how long the thyroid disease had been going on. A p-value of less than 0.05 was used to indicate statistical significance.

Results

There were 120 people in this study who had thyroid eye illness. The average age was 41.6 years, with a range of 19 to 70 years. There were 38 males (31.7%) and 82 females (68.3%).

Table 1: Demographic Characteristics of the Study Population (n=120)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	18-30	28	23.3
	31-40	34	28.3
	41-50	31	25.8
	≥51	27	22.6
Sex	Male	38	31.7
	Female	82	68.3
Residence	Urban	74	61.7
	Rural	46	38.3

Table 1 shows how many patients there are by age and sex. The biggest group was people between the ages of 31 and 40 (28.3%), followed by people between the ages of 41 and 50 (25.8%). There were 23.3% of the patients who were between 18 and 30 years old and 22.6% who were over 50. Women were more likely to be affected than men (68.3% vs. 31.7%). There were more cases in cities (61.7%) than in rural regions (38.3%). This indicates that middle-aged adults are the most susceptible to TED, with a significant female predominance.

Table 2: Distribution of Thyroid Functional Status among Patients

Thyroid status	Frequency (n)	Percentage (%)
Hyperthyroid	78	65.0
Hypothyroid	24	20.0
Euthyroid	18	15.0

Table 2 shows how well the patients' thyroids are working. Most of them (65.0%) had hyperthyroidism, followed by hypothyroidism (20.0%) and euthyroidism (15.0%). This shows that most TED instances are associated to hyperthyroidism, even if a large number of them also happen in people who are hypothyroid or euthyroid.

Table 3: Frequency of Ocular Manifestations

Ocular manifestation	Frequency (n)	Percentage (%)
Eyelid retraction	86	71.7
Proptosis	74	61.7
Lid lag	58	48.3
Conjunctival congestion	42	35.0
Diplopia	39	32.5
Exposure keratopathy	21	17.5
Optic neuropathy	9	7.5

Table 3 shows the eye indications that were seen. Eyelid retraction (71.7%) was the most prevalent, followed by lid lag (48.3%) and proptosis (61.7%). 32.5% experienced diplopia, and 35.0% exhibited conjunctival congestion. Optic neuropathy was present in 7.5% of individuals, while exposure keratopathy was observed in 17.5%. These findings indicate that a significant proportion of patients encounter potentially blinding problems, despite eyelid and orbital soft tissue abnormalities being the most prevalent.

Table 4: Ocular Manifestations by Sex

Manifestation	Male (n=38)	Female (n=82)	p-value (χ^2 test)
Proptosis	25 (65.8%)	49 (59.8%)	0.54
Eyelid retraction	26 (68.4%)	60 (73.2%)	0.61
Diplopia	14 (36.8%)	25 (30.5%)	0.51
Exposure keratopathy	8 (21.1%)	13 (15.9%)	0.46

Table 4 compares male and female eye findings. Males had marginally higher proptosis rates (65.8%) compared to females (59.8%); however, this difference lacked statistical significance (p=0.54). Eyelid retraction occurred in 68.4% of men and 73.2% of women, with no significant difference observed between the two categories (p=0.61).

Table 5: Ocular Manifestations by Thyroid Functional Status

Manifestation	Hyperthyroid (n=78)	Hypothyroid (n=24)	Euthyroid (n=18)	p-value
Proptosis	54 (69.2%)	12 (50.0%)	8 (44.4%)	0.04*
Eyelid retraction	62 (79.5%)	13 (54.2%)	11 (61.1%)	0.03*
Diplopia	29 (37.2%)	6 (25.0%)	4 (22.2%)	0.25
Optic neuropathy	7 (9.0%)	1 (4.2%)	1 (5.6%)	0.64

Table 5 shows how thyroid function affects the distribution of ocular symptoms. The occurrence of proptosis was more significant in hyperthyroid patients (69.2%) than in hypothyroid individuals (50.0%) and euthyroid individuals (44.4%) (p=0.04). Moreover, eyelid retraction was substantially more prevalent in hyperthyroid cases (79.5%) compared to hypothyroid (54.2%) and euthyroid (61.1%) groups (p=0.03). There was no evident association between thyroid function status and diplopia or optic neuropathy. These results suggest that more pronounced ocular alterations are significantly associated with hyperthyroidism.

Table 6: Duration of Thyroid Disease and Ocular Manifestations

Duration of thyroid disease	n (%)	Proptosis (%)	Eyelid retraction (%)	Diplopia (%)
<1 year (n=29)	24.2	41.4	48.3	17.2
1-3 years (n=44)	36.7	65.9	77.3	31.8
>3 years (n=47)	39.1	78.7	83.0	44.7
p-value		0.01*	0.03*	0.04*

Table 6 looks at how long a sickness lasts affects things. Patients with a length of disease greater than three years most commonly experienced proptosis (78.7%), eyelid retraction (84.0%), and diplopia (44.7%). Conversely, patients with a disease duration of less than one year exhibited markedly lower frequencies (41.4%, 48.3%, and 17.2%, respectively). All trends were statistically significant ($p<0.05$). This indicates that the duration of thyroid disease correlates with the frequency and severity of ocular symptoms.

Discussion

This study examined the prevalence and variety of ocular symptoms in patients with thyroid eye disease (TED) at a tertiary care hospital in Bangladesh. The data add to the scarce local literature on TED and provide crucial information concerning thyroid functional state, demographic trends, and the clinical profile of ocular involvement in this community. The majority of patients (54.1%) in the present study were aged between 31 and 50, with a mean age of 41.6 years. This aligns with previous research indicating that middle-aged adults, particularly those in their fourth and fifth decades of life, are the demographic most impacted by TED [10]. The recognized female prevalence of autoimmune thyroid illnesses, including Graves' disease and associated orbitopathy, was corroborated by the statistic that 68.3% of cases occurred in females [11]. This predominance of females has been consistently documented in both South Asian and Western communities, even though males often have more severe signs of the disease. Hyperthyroidism was the most common thyroid ailment among participants, affecting 65% of them. Hypothyroidism (20%) and euthyroidism (15%) were the subsequent most prevalent thyroid disorders. Epidemiological studies in South Asia indicate that 60-70% of people with TED have hyperthyroidism [12]. The presence of TED in both hypothyroid and euthyroid individuals indicates that orbital involvement is not exclusively associated with hyperthyroid circumstances. This underscores the imperative for all patients with thyroid disease to receive comprehensive eye screening [13]. The most prevalent eye sign was eyelid retraction, which happened in 71.7% of patients. Proptosis (61.7%) and lid lag (48.3%) were the following two things. Optic neuropathy (7.5%), exposure keratopathy (17.5%), diplopia (32.5%), and conjunctival congestion (35%) were less common but nonetheless clinically important. Changes in the soft tissues of the eyelids and orbits are the most common, which is what regional and global studies have found [14]. Proptosis primarily indicates the development of orbital fat and extraocular muscles, although eyelid retraction often serves as the initial and most conspicuous manifestation of TED, resulting from heightened sympathetic tone and fibrotic remodeling of the levator muscle [15]. Approximately one-third of patients experienced diplopia, attributable to restricted myopathy. This is similar to what was found in Western studies (30-35%), but it is a little lower than what was found in certain South Asian studies, which found rates as high as 40%. Estimates of its global prevalence, which range from 5% to 10%, show that optic neuropathy is nevertheless a sight-threatening condition, even if it is not very common [16]. When we looked at thyroid functional status, we saw that proptosis (69.2%) and eyelid retraction (79.5%) were much more common in hyperthyroid patients than in hypothyroid and euthyroid people. This corroborates with studies indicating that heightened orbital involvement correlates with elevated thyroid hormone levels [17]. Conversely, no statistically significant differences were detected in optic neuropathy or diplopia among thyroid functional groups, suggesting that these complications may occur independently of hormone status and are likely affected by individual susceptibility, inflammatory activity, and disease duration [18]. The duration of thyroid disease significantly affected ocular involvement. Proptosis (78.7%), eyelid retraction (83%), and diplopia (44.7%) were most prevalent in patients with a disease duration exceeding three years, whereas these conditions were significantly less common in patients with a duration of less than one year. These findings underscore the progressive nature of TED, with chronicity contributing to the increased frequency and severity of orbital symptoms [19,20]. The finding corroborates the hypothesis of an active inflammatory phase and a fibrotic phase, wherein structural modifications become entrenched despite a reduction in inflammation [21]. Interestingly, whereas males had marginally elevated rates of proptosis and diplopia, sex did not significantly influence the prevalence of ocular symptoms. This aligns with recent studies showing that men often display more severe orbital involvement, despite TED being more prevalent in women [22]. In the same way, the research cohort's urban predominance (61.7%) might not be because of real epidemiologic disparities, but because it was simpler for them to go to tertiary care facilities. The results have important effects on clinical practice. To facilitate early identification, eyelid retraction and proptosis must be consistently assessed in all thyroid patients, regardless of thyroid hormone levels. Second, clinicians should be more aware of the higher risk of severe eye problems if thyroid problems last longer. This would support more frequent eye exams. Third, early detection is important to stop visual loss that can't be fixed, even though optic neuropathy is rare. These results underscore the imperative for multidisciplinary care involving ophthalmologists, endocrinologists, and, when necessary, orbital or oculoplastic surgeons [23]. This work addresses critical deficiencies in the Bangladeshi context, characterized by insufficient prior TED data, a limited sample size, and inadequate ocular characterisation. The research findings will impact future clinical guidelines and the allocation of local resources, providing baseline prevalence statistics for eyelid, orbital, and visual problems, categorized by thyroid functional status and disease duration.

Conclusion

Thyroid eye illness is much more common in women than in males, and it mostly affects middle-aged adults. Hyperthyroid patients have the most obvious visual problems, such as eyelid retraction and proptosis. Even though they don't happen as often, diplopia and optic neuropathy are serious problems that can harm vision. The research indicates that ocular manifestations are more prevalent and more severe with prolonged thyroid insufficiency. These findings underscore the importance of early identification, consistent ophthalmologic assessment, and multidisciplinary management to halt progression and preserve visual function. Local epidemiological data, such as those presented here, provide a foundation for developing

context-specific therapeutic guidelines and enhancing treatment for TED patients in Bangladesh.

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