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Research Article
Intraocular

Hyperthyroidism and its association with intraocular pressure and dry eye in teaching medical college

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Background: Hyperthyroidism associated eye disease is a cosmetically and functionally debilitating disease that is seen worldwide. **Objectives:** To investigate the association of Hyperthyroidism with Intraocular pressure and Dry eye. **Methods:** It was a hospital based cross sectional analysis conducted in teaching medical college for a period of 18 months from January 2018 to July 2019 in hyperthyroid patients, Consecutive sampling was done. Participants were divided into age groups. Hyperthyroidism was clinically and laboratory confirmed. Intraocular pressure and Dry eye were diagnosed by single ophthalmologist. SPSS version 22 was used for analysis. Chi square test was used to determine the association. **Results:** Total 70 established hyperthyroidism patients were studied. The study was female preponderance. Increased Intraocular in hyperthyroid patients was found to be statistically significant. The most common presenting eye sign was found to be diminished vision in almost all patients of Hyperthyroidism which was found to be statistically significant. Age progresses the signs tends to increase in hypothyroidism patients. Diminished vision was found to be the most common eye sign among all age groups which was statistically significant. ($p<0.05$) followed by Upper lid retraction and ptosis. **Conclusions**: Dry eye and increased IOP are commonly seen outcomes that should be managed diligently. This potentially sight- threatening condition is seen worldwide and has many functional and cosmetic consequences that need to be recognized. A larger prospective study will help us to know about the influence of risk factors on the severity of eye problems.

Keywords: Hyperthyroidism, Intraocular pressure, Dry eye, Thyroid eye disease, Graves' disease, Diminished vision

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Introduction

Thyroid-associated eye disease (TED), is a cosmetically disfiguring and functionally incapacitating, chronic, infiltrative ocular disease that is usually associated with Hyperthyroidism [1]. However, it may be seen with other thyroid diseases such as Hashimoto's thyroiditis and thyroid cancer [2]. More than 50% of patients with Hyperthyroidism will develop mild to severe, unilateral or bilateral TED at some point during their disease with severe forms affecting 3% to 5% of patients. Onset of eye disease is usually concomitant with the onset of hyperthyroidism, but ophthalmopathy may precede or follow hyperthyroidism and even occur in thyroid or hypothyroid patients. [2].

TED is seen six times more frequently in females than males (86% versus 14% of cases, respectively), but the female: male ratio is reduced to 4:1 with severe forms of eye disease [3,4,5,6]. Palikhe et al. from Nepal reported 71.7% prevalence of TED; 75% were hyperthyroiditic, 16.7% hypothyroiditic, and 8.3% euthyroid [7]. Kashkouli et al. showed that 53.4% had graves, 44.1% hypothyroid, and 5.5% euthyroid [8]. Dry eye syndrome (DES) is defined by an abnormal tear film that results in changes to the ocular surface, which can lead to ocular discomfort. Its symptoms may include blurred vision, burning, itchiness, redness, or grittiness in the eye, and sensitivity to light.

DES is a common disease and is increasingly prevalent among people with autoimmune disease and thyroid disorders, in postmenopausal women, and in the elderly. Two main types of dry eye are known, which are, namely, aqueous tear-deficient dry eye and evaporative dry eye. Aqueous tear-deficient dry eye is caused due to lack of lacrimal secretion and the conjunctiva failing to secrete water, while evaporative dry eye is caused due to certain internal and external causes that serve to accelerate the evaporation of tears. Disorders in the meibomian gland are the most common internal cause of evaporative dry eye.

Moreover, ocular surface disorders and the wearing of contact lenses are the most common external causes for evaporative dry eye [9]. Instability in the tear film can lead to dryness since tear film stability depends on several factors, such as tear osmolarity, tear clearance, appropriate blinking, normal lacrimal function, and the maintenance of a normal ocular surface.

As there are many articles on thyroid associated eye disorders but literature for association of Hyperthyroid patients with Intraocular pressure and dry eye is lacking and that's why this study was planned.

Materials and Methods

Study conducted in teaching medical college for a period of 18 months from January 2018 to July 2019. The was a descriptive cross-sectional analysis study, included all consecutive patients with confirmed diagnosis of Hyperthyroidism who referred to the endocrine clinic.

Inclusion criteria: Age and gender matched subjects ranging in age from 18 to 43 years (31.3±2.9 years) was recruited and examined under similar conditions.

Exclusion criteria: History of ocular surgery or medications, those demonstrating the recent use of contact lenses, pregnant or breastfeeding women, as well as diabetics

A total of 70 established cases of Hyperthyroidism were the sample size. Sociodemographic features, clinical history, duration of thyroid disease, any other systemic complaints, and treatment history were taken. The diagnosis of Hyperthyroidism was based on clinical and laboratory findings of diffuse enlargement of thyroid gland, raised free thyroxin or triiodothyronine levels, and suppressed thyroid-stimulating hormone levels. Information regarding ocular symptoms, family history associated systemic disease and the treatment regimens were obtained.

All patients with documented history of Hyperthyroidism with any age, onset or type of intervention were included. Detailed ophthalmology examinations included best-corrected visual acuity, soft-tissue changes, periorbital changes, measurement of proptosis by Hertel's ophthalmometer, extraocular movements, lid signs, anterior segment evaluation for involvement of cornea, pupil reaction, and fundoscopy examination.

Intraocular pressure (IOP) was measured with Goldmann applanation tonometer. Glaucoma was confirmed if the patient had IOP of >21 mmHg in the primary gaze with typical glaucomatous optic neuropathy and/or visual field changes. A single ophthalmologist performed ocular examinations in all patients. A comprehensive ophthalmic examination was done Best-corrected visual acuity (BCVA) was documented using Snellen chart.

Intraocular pressure (IOP) was measured in primary position and upward gaze. Retraction of either upper or lower eyelid was defined as any exposed superior or inferior sclera beyond the limbus in the primary gaze. Dry eye was also diagnosed clinically.

Statistical analysis: The recorded observations were analyzed using the SPSS Version 18. (SPSS 18- IBM Corp. Armonk, NY). Categorical variables were expressed as counts and percentages. The Chi-square test for independent proportions or Fisher's exact test was used. P<0.05 is considered statistically significant.

Written Informed consent was taken after thoroughly explaining the objectives to the participants. The study was approved by Institutional Ethics Committee.

Results

Table-1: Demographic Details and Clinical Characteristics of Study Participants (N=70)

Characteristics	Male (n=30)	Female (n=40)	p-value
Age (mean± SD)	42.5±22.4	44.6±16.6	0.06*
Smoking history	5	1	0.123
Increased Intraocular Pressure	11 (36.6%)	4 (10%)	0.01*

*P<0.05 is statistically significant

According to Table 1 a total 70 patients with established hyperthyroidism were studied. The study was female preponderance comprising 25% of hyperthyroid patients. The mean age in males is 42.5 ±22.4 years and in females is 44.6±16.6 years which was found to be statistically significant (p<0.05). Increased Intraocular pressure was seen in of hyperthyroid patients and the association was found to be statistically significant.

Table-2: Distribution of presenting eye signs in Hyperthyroid Patients (N=70)

Signs	Male (n=30)	Female (n=40)	Total(n=70)	p-value
Proptosis	10(30%)	32(80%)	42(60%)	<0.01*
Dry eye	2(6.6%)	10(25%)	12(17%)	<0.05*
Upper lid retraction	7(23.3%)	20(50%)	27(38.5%)	<0.01*
Diminished vision	18(60%)	29(72.5%)	47(67%)	<0.01*
Ptosis	19(63.3)	27(67.5%)	46(65.5%)	<0.01*

*P<0.05 is statistically significant

As per Table 2 the most common presenting eye sign was found to be diminished vision in almost all patients of Hyperthyroidism which was found to be statistically significant. (p<0.05).

Table-3: Prevalence of hyperthyroid eye signs according to different age groups

Signs	<20 years	20-39 years	40-59 years	>60 years	p-value
Proptosis	6	10	10	16	0.21
Dry eye	1	1	2	8	0.11
Upper lid retraction	2	2	10	13	0.02*
Diminished vision	5	12	10	10	0.01*
Ptosis	4	12	10	20	0.01*

*P<0.05 is statistically significant

It has been clear as the age progresses the signs tends to increase in hypothyroidism patients. Diminished vision was found to be the most common eye sign among all age groups which was statistically significant. (p<0.05) followed by Upper lid retraction and ptosis (Table 3).

Discussion

Involvement of the eyes in thyroid disease is a well-acknowledged entity. In the present study, our objective was to determine the association of hyperthyroidism with raised IOP and Dry eye in a patient population in based on different age groups and gender. Most studies around the world have shown a higher female to male ratio [3,8]. The present study had a male to female ratio of 1: 1.3. Besharati [5] Etezad-Razavi [9] and Perros [10] also found a higher frequency in females but Kashkouli et al reported more prevalent thyroid eye disease in males [11]. More than 80% of our patients were under the age 50. Etezad- Razavi reported a mean of 34.7 years for females and 44.7 years for males, which is slightly different from our mean of 33.0 and 38.1 years for females and males, respectively [9]. As per the present study raised Intraocular pressure and Dry eyes were seen in our female population, our results were clinically significant (P<0.05). One notable finding in this study was elevation of IOP. The orbit is a bony structure and any increase in intra-orbital volume will cause both displacement of the globe anteriorly and increased intraocular pressure [9]. The association of Hyperthyroidism with increased IOP has been known for more than a century. Increased IOP in up gaze is commonly seen in hyperthyroidism however it is not specific and can be seen in any infiltrative orbitopathy due to mechanical compression of the globe. In addition, it has been proposed that thyroid related ocular hypertension may be caused by increased episcleral venous pressure or glycosaminoglycan deposition in the trabecular meshwork [12].

In a study by Haefliger et al., performed on 500 patient charts, the prevalence of increased IOP was noted to be 24% [13]. In 2007, Behrouzi et al. reported a prevalence of 11%, and He reported an incidence of 31.3% in Chinese patients [14]. With persistence of exophthalmos, there was an increased chance of development and progression of glaucoma signs such as cupping of the disc and visual field defects. The present study had (36.6%) cases of increased IOP in primary position. Increase in IOP can be explained by increased pressure on the globe by enlarging muscle masses and by impediment of episcleral outflow. Increased IOP was seen more in men (36.6%) than women (10%), P=0.01. Persistence of hyperthyroidism may lead to progressive increase of IOP, leading to overt manifestations of glaucoma such as cupping of the disc and visual field loss, therefore, follow-up of patients in this regard is warranted.

The studies by Besharati, Perros and Lee also demonstrated the same trend. [5,10,12] It appears that even though dry eyes and raised intraocular pressure was more frequently seen in females, a more aggressive form is seen with increasing age and the male gender. The ocular complaint was observed in 44.27% of patients; foreign body sensation being the most common presenting symptoms in 61.79%. In a study done by Kashkouli et al., bilateral proptosis (9.9%), burning sensation (5.4%), pain behind the eye (5.3%), and puffiness (4.7%) were the most common signs and symptoms [13]. The frequency of in the present study is 67% of have common symptoms.

Dry eye has historically been explained by increased tear evaporation from proptotic eyes. [15,16] Nonetheless recently it has been shown that the lacrimal gland may also be a target of TSH antibodies [17]. Clinical evidence of dry eye was noted in 12 (17%) of our patients significant in women when compared to male. When dry eye was cross-referenced with presence of proptosis, it was not found to be significant, indicating that lacrimal gland dysfunction should be considered as an entity by itself and not merely a consequence of proptosis. Interestingly, it has been shown by Gupta et al. that in patients presenting with dry eyes, previously undiagnosed thyroid dysfunction may be the underlying cause [18].

Limitations: Smoking has been shown to correlate with the severity of hyperthyroidism but in the present study there were only 10 smoker who had hyperthyroidism, yet there was not enough data to Statistical statement, Study was a relatively small size of patients.

Conclusions

The prevalence of dry eye and raised Intraocular pressure in patients of hyperthyroidism was high and was more common in males. Dry eye and increased IOP are commonly seen outcomes that should be managed diligently. This potentially sight-threatening condition is seen worldwide and has many functional and cosmetic consequences that need to be recognized. Hyperthyroidism was significantly associated with the severity.

What the study adds to the existing knowledge?

A larger prospective study will help us to know about the influence of risk factors on the severity of eye problems. Eye drops and lubricants may possibly help patients with thyroid disorders by reducing their ocular discomfort and by smoothing the ocular surface, thereby providing better vision and relief from such debilitating symptoms.

Author's contributions

Dr. M. Samuel Christopher: Concept, study design

Dr. Y. Jaya Santhi Latha: Data analysis, manuscript review

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