

## EVALUATE THE RATE OF PRODUCTION OF TEARS IN PATIENTS DIAGNOSED WITH HYPOTHYROIDISM USING SCHIRMER STRIPS, A DESCRIPTIVE CROSS-SECTIONAL STUDY

Manisba Ashfaq<sup>1</sup>, Muhammad Shayyan<sup>2</sup>, Muhammad Saleem<sup>3</sup>, Khalid Mahmood<sup>4</sup>

<sup>1,4</sup>The University of Lahore, Pakistan

<sup>1</sup>[manisba456@gmail.com](mailto:manisba456@gmail.com), <sup>2</sup>[dr.muhammadshayyanlatif@gmail.com](mailto:dr.muhammadshayyanlatif@gmail.com)

<sup>3</sup>[muhammadsaleemoptom@gmail.com](mailto:muhammadsaleemoptom@gmail.com), <sup>4</sup>[mk695524@gmail.com](mailto:mk695524@gmail.com)

Corresponding Authors: \*

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### ABSTRACT

*Background:* Hypothyroidism" refers to the pathological condition of thyroid hormone shortage, the definition of hypothyroidism is primarily biochemical because of the vast range of clinical presentations and the general lack of specificity of symptoms. In the general population, the prevalence of overt hypothyroidism ranges from 0.2 to 5.3% in Europe and from 0.4 to 3.9% in the United States of America. One there aren't many research on the incidence of diseases in Colombia, but those that have been done so far have revealed that the prevalence of hypothyroidism is high—10%—when compared to the rest of Latin America. According to a study done in Bogotá, the prevalence is 18.5%<sup>2</sup>, 3 while 20.6%. Women and people over 50 are more likely to have it. *Methodology of Study:* This cross-sectional study included 101 clinically diagnosed hypothyroidism patients, ranging in age from 20 to 60. A dry eye questionnaire and the Schirmer's test were used to measure the rate of production of tears in hypothyroidism. *Results:* Out of 101 hypothyroidism patients, 30.91% of participants had normal eyes. Of the remaining, 39.09% had mild dry eyes, and 25.50% had moderate dry eyes. Significant evidence from the Schirmer test indicated that 4.50% of patients had suffered from severe dry eyes. *Conclusions :* This study has demonstrated that patients with hypothyroidism had a noticeably less increase incidence of dry eye. A tear production rate evaluation is also necessary for patients with hypothyroidism in order to improve their prognosis for dry eye condition.

**Keywords:** Hypothyroidism (HT), Dry eye (DE), Schirmer Test (ST)

## INTRODUCTION

Tear film loss is the outcome of an inflammatory and destructive cycle of the ocular surface that characterises dry eye disease, a complex sickness. Environmental variables, lifestyle decisions, ocular diseases, and systemic illnesses all have an impact on this secondary source of tear film loss<sup>1</sup>.

Visual impairment, irritation, and an unstable tear film are the hallmarks of dry eye. Tissue damage, inflammation, and hyperosmolarity are its main causes. Tear film thinning, instability, and break-up are impacted by the tear film lipid layer, which stops tear water from evaporating. The most frequent cause of dry eye is the meibomian gland, which regulates the evaporation and patterns of tear dispersal. If left untreated, meibomian gland abnormalities might result in permanent epithelial changes, chronic inflammation, and frequent changes in vision quality<sup>2</sup>.

The prevalence of dry eye (DE) symptoms varies greatly, ranging from 4% to 87%. Risk factors include keratitis, allergies, contact lenses, thyroid abnormalities, and certain drugs. Infections and injuries are the most prevalent causes of keratitis, whereas allergens cause allergies. Dry eyes are a common adverse effect of LASIK, thyroid eye disease, and an autoimmune condition. DE can also be exacerbated by outdoor activities<sup>3</sup>. Inconsistencies in tear homeostasis might exacerbate dry eye syndrome and may result in mental health comorbidities. Computer use can exacerbate symptoms for those with computer vision syndrome. Mood swings, anxiety, and depression are some of the negative effects of dry eye disease on health and quality of life. It is a serious public health concern since treatment failure and persistent symptoms can cause discontent<sup>4</sup>.

The tear film, covering the eye's surface, protects the conjunctiva and cornea, shields it from elements, and maintains ocular surface smoothness for light refraction<sup>5</sup>.

The tear film structure comprises mucin, aqueous, and lipid layers, with mucin covering ocular surface, aqueous lubricating cornea, and lipid reducing tear overspill and evaporation<sup>6</sup>.

The tear film, composed of lipid, aqueous, and mucin layers, is crucial for eye health, moisturizing and shielding the cornea, and serving as a light refraction surface<sup>7</sup>.

Hypothyroidism is a condition where the thyroid gland doesn't produce enough thyroid hormone, leading to a slowdown in various body functions. Symptoms can include fatigue, weight gain, cold intolerance, dry skin, and depression. These symptoms can vary in severity and may develop gradually, often over several years<sup>8</sup>.

Low TSH, high FT4, or FT3 are examples of biochemical tests used to diagnose hypothyroidism, a common illness. To determine the underlying condition, a nosological diagnostic that includes thyroid ultrasonography, scintigraphy, TSH-receptor antibodies, and thyroid peroxidase antibodies is required<sup>9</sup>.

In Pakistan, 4.1% of the population have hypothyroidism overall. Another recent study revealed that 6.8% of women and 5.8% males had hypothyroidism<sup>10</sup>.

By reducing the normal tear break-up time (TBUT), hypothyroidism has been observed to affect the eyes and to be a cause of ocular dryness. Thyroid-associated orbitopathy (TAO), which is typically observed in cases of Graves thyrotoxicosis, is linked to thyroid production<sup>11</sup>.

The autoimmune systemic ocular condition known as thyroid eye disease (TED), thyroid-associated orbitopathy, or Graves'

ophthalmopathy, affects the orbit, which has antigens that resemble those of the thyroid gland. It may result in fibroblast growth, cytokine cascades, fatty tissue expansion, and eyesight loss<sup>12</sup>.

#### **MATERIAL AND METHODOLOGY OF STUDY:**

This descriptive cross sectional study was conducted on early clinically diagnosed patients of hypothyroidism in Department of Endocrinology of Mayo Hospital Lahore from January 2020 to June 2020. Between the ages of 20 to 60, we evaluated 101 individuals who had been diagnosed with hypothyroidism. P value by using SPSS software as  $p < 0.5$ . Patients of all genders were included. And results are significant. The study was authorized by the institutional review boards of our hospitals and all patients gave their informed permission.

Data collection was conducted using a straightforward non-probabilistic sampling approach. Only the willing individuals were included in the study. If the first patient refused to be examined, the next one was selected. The following patients were not allowed to participate in the study: those with uncontrolled systemic diseases (such as hypertension, diabetes mellitus, and ischemic heart disease), ocular pathologies, pregnancy, rheumatoid diseases that can cause dry eye, such as Sjogren syndrome, prior orbital radiation, use of steroids, autoimmune diseases, chronic kidney disease, and ocular surgeries or traumas.

In hypothyroidism, the normal range for Thyroid Stimulating Hormone (TSH) is generally considered to be between 0.4 to 4.5 mIU/L. While levels from 0.45 to 4.5 mIU/L are considered normal, some laboratories may have slightly different ranges. TSH levels above 10 mIU/L typically

indicate overt hypothyroidism, which usually requires treatment with medication.

The Schirmer test was conducted using the Schirmer test strips. The Schirmer test results were classified as follows: 15 mm to 35 mm for normal eye, 10 mm to 15 mm for mild dry eye, 5 mm to 10 mm for moderate dry eye, and  $<5$  mm for severe dry eye.

#### **Inclusion criteria**

Patients between 20-60 years

Visual Acuity 6/9 - 6/6

Patients diagnosed with Hypothyroidism

#### **Exclusion Criteria**

Existence of any unmanaged chronic illnesses (Hypertension, Diabetes Mellitus, ischemic heart diseases)

Ocular Pathologies

Pregnancy

Rheumatic disease that may cause dry eye including Sjogren syndrome

Previous orbital radiotherapy

Steroid users

Autoimmune diseases

Non-Cooperative

Chronic kidney Diseases

Ocular Surgeries or traumas

#### **RESULTS**

Amongst a total of 101 patients, 31 were male and 70 female. A total of six age groups, comprising both male and female patients, were utilized to classify the 101 hypothyroid individuals. 24.50% of the patients belonged to the 20-30 age range. The age group of 31 to 40 accounted for 17.25 of the cases. Patients between the ages of 41-50 made up 33.25% of the total. Of these, 25% were between the ages of 51 to 60 years.

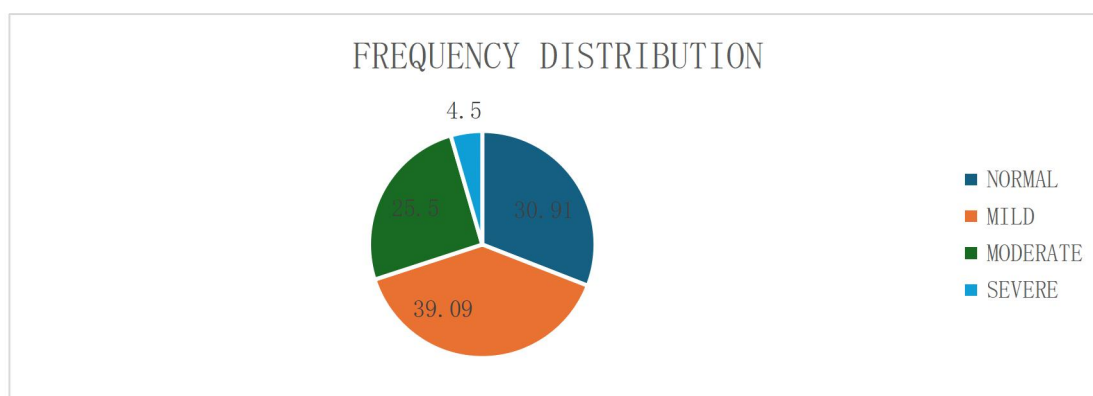
Out of 101 hypothyroidism patients, 30.91% of participants had normal eyes. Of the remaining, 39.09% had mild dry eyes, and 25.50% had moderate dry eyes. Significant evidence from the Schirmer test indicated that 4.50% of patients had suffered from severe dry eyes.

Data on the gender distribution of the 101 patients diagnosed with hypothyroidism showed that 30.69% of the patients were male and 69.31% of the patients were female (Fig 2: Frequency distribution of gender

**Table 1: Frequency distribution of age**

Age	Frequency Distribution
20-30 Years	24.50%
31-40 Years	17.25%
41-50 Years	33.25%
51-60 Years	25.00%

**Table 2: Frequency Distribution of Dry Eye in Hypothyroidism Patients**



**Table 3: Frequency Distribution of Gender**

Gender	No.	Percentage
Male	31	30.69
Female	70	69.31

## DISCUSSION

The weakened tear film functions in hypothyroidism patients have been assessed in recent studies. Patients with hypothyroidism typically have a normal tear breakup time, which leads to a serious reduction. The hypothyroidism patient has a Schirmer value of less than 10 mm and dry eyes<sup>13</sup>. An additional dangerous characteristic is bulging of the eyes, which causes the palpebral fissure to widen and cause the tear

film to evaporate and become more osmolar<sup>14</sup>. Consequently, it may be said that the hyperosmolarity brought on by the protruding eyeballs is the reason behind the decrease in tear break up time<sup>15</sup>. Thyroxin hormone has been shown to be superior to other hormones for normalizing tear breakup time in individuals with hyperthyroidism who also have severe dry eye disease<sup>16</sup>. It is also advised that these individuals receive artificial tears and surroundings

adjustments<sup>17</sup>. A related study also demonstrated that TBUT decreased in hyperthyroidism, which in turn led to an increase in ocular dryness. Following the biopsy of the hyperthyroidism patients conjunctival tissues, it was observed that Orbitopathy affected the majority of people with hyperthyroidism<sup>18,19</sup>. In a related study, it was shown that individuals with ptosis who have myasthenia graves, an autoimmune disease, often had reduced tear breakup times. As a result, the action of eye bulging alone does not cause dry eyes in hyperthyroidism<sup>20</sup>.

In Pakistan, not much work has been done to estimate the numbers affected with thyroid eye disorders. A further investigation revealed that 400,000 individuals in the UK suffer from thyroid eye disease<sup>21,22,23</sup>. The Graves' disease is of about 2% (estimate value from 1% to 2.8%), and incidence of thyroid eye disorder in Graves' disorder with reduced tear breakup time and dry eye disorder is about of 37.5%<sup>23</sup>. A thyroid eye problem is a very annoying, painful, stressful condition for the appearance, characterized by decreased tear breakup time, dryness, and occasionally dangerous eyesight. In the previous 20 years, advances in medicinal management have been made. Recent developments indicate that treating thyroid eye disorders discriminatorily should be a legitimate goal<sup>24,25</sup>.

## CONCLUSION

This study concluded by showing the significantly lower frequency of dry eye among patients with hypothyroidism. Patients suffering from hypothyroidism should also undergo tear production rate assessment for a better prognosis of dry eye disease.

## Compliance with Ethical Standards

**Conflict of Interest:** There is no conflict of

interest.

**Ethical approval:** This study was approved by the institutional review board of Mayo Hospital, Lahore.

**Informed consent:** All patients provided informed consent

## AUTHORS' CONTRIBUTION

MA: Data Collection, proof reading. MS: Data collection, write up MS: Literature review, write-up.. KM: Data analysis.

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