SOCIAL SCIENCE REVIEW ARCHIVES
ISSN Online: 3006-4708
ISSN Print: 3006-4694
https://policyjournalofms.com

Correlation Between Severity of Hypothyroidism and Tear Film Parameters in Affected Patients

Zunira Rasool[1], Arslan Imtiaz[2], Sibgha Naseem[3], Ayesha Sajid[4], Zaryab Khan[5], Ghazala Arif[6], Iqra Javeed[7], Aleemullah[8], Saira Akram Mughal[9], Muhammad Aleem Sabir Khan[10]

[1] Optometrist, Doctor of Optometry, MS Clinical Optometry, Superior University Lahore, Pakistan, Corresponding Author's Email: zunairarasool465@gmail.com
[2] Optometrist, B. Sc Hons Vision Sciences (Optometry), COAVS Kind Edward Medical University Lahore, Pakistan, Email: arslan.imtiaz29@yahoo.com
[3] Clinical Optometrist, MS Rehabilitation Sciences, Faculty of Allied Health Sciences, Superior University Lahore, Pakistan, Email: sibghakhan62@gmail.com
[4] Optometrist, Doctor of Optometry, MS Clinical Optometry, Superior University Lahore, Pakistan, Email: sajid31ash@gmail.com
[5] Lecturer (Optometry & Vision Sciences), Faculty of Allied Health Sciences, Superior University Lahore, Sargodha Campus, Pakistan, Email: zaryabbakhar@gmail.com, ORCID: 0009-0009-6772-1957
[6] Optometrist, Department Of Ophthalmology, King Edward Medical University, Pakistan, Email: ghazalaarif300@gmail.com
[7] Optometrist & Orthoptist, Email: iqrajaved690@gmail.com
[8] Optometrist, Email: aleemoptom@gmail.com
[9] Clinical Optometrist, MS Biotechnology, Faculty of Allied Health Sciences, Superior University Lahore, Pakistan, Email: sairaakrammughal@gmail.com, ORCID: 0009-0009-3030-2206
[10] Clinical Optometrist, Faculty of Allied Health Sciences, Superior University Lahore, Pakistan, Email: maleemsabirkhan@gmail.com, ORCID: 0009-0007-7161-9985

DOI: https://doi.org/10.70670/sra.v4i2.2217

Abstract

To evaluate the correlation between the severity of hypothyroidism and tear film parameters in affected patients. This cross-sectional study was conducted at University of Lahore teaching hospital, over six months. A total of 64 hypothyroid patients aged 18-65 years were selected using consecutive sampling. For data collection uses the OSDI (ocular surface disease index) questionnaire, Schirmer 1 test, and tear break-up time test TBUT to assess tear production and stability. Inclusion and exclusion criteria were applied to minimize confounding factors. A total of 64 hypothyroidism patients were included, comprising 36 males (56.3%) and 28 females (43.8%) with a mean age of 39.19±11.84 years (range 18-65 years). The Shapiro-Wilk indicated non-normal data distribution ($p<0.05$). among ocular symptoms, dry eye was reported "always" by 31.3%, gritty/sandy sensation by 65.6%, and blurred vision by 64.1% of participants. Difficulties with reading (67.2%) and night driving (73.4%) were also frequent. No significant correlation was found between disease severity and tear function tests ($p<0.05$), though strong inter-eye consistency was observed for Schirmer ($r=0.923$) and TBUT ($r=0.967$) values. Hypothyroidism is strongly associated with increased dry eye symptoms, significantly impacting patients' daily activities and comfort. Regular ocular evaluation and timely management are essential to prevent chronic ocular surface complications in these patients.

Key Words: Dry Eye, Hypothyroidism, Tear Film, TBUT Test, Schirmer's Test

Introduction:

Thyroid surgery, autoimmune thyroiditis, or iodine shortage are the main causes of hypothyroidism, which affects 3.8% to 4.6% of people worldwide. Iodine deficiency is prevalent in Pakistan, where hypothyroidism and subclinical hypothyroidism are found to be 4.1% and 5.45% prevalent, respectively. Levothyroxine is the usual treatment; however, prolonged symptoms might damage quality of life. The cardiovascular system is most commonly impacted. (1-3) There are four forms of hypothyroidism: primary, secondary, tertiary, and peripheral. The most prevalent type, primary hypothyroidism, is brought on by insufficient T4 production. TSH or TRH shortages cause secondary and tertiary forms of hypothyroidism, which are together referred to as central hypothyroidism. Rarely, peripheral hypothyroidism results from compromised thyroid hormone function. Only a small percentage of people have central or peripheral types, which provide difficulties in diagnosis and treatment. (4, 5) Low free thyroxine (FT4) and low or abnormally normal TSH levels are the hallmarks of central hypothyroidism; on occasion, TSH may be slightly raised because of decreased bioactivity. Consumptive hypothyroidism is an uncommon condition caused by increased activity of the deiodinase 3 enzyme in some tumors, which renders thyroid hormone inactive. This is rare but has been documented in neonates with hepatic haemangiomatosis, fibrotic tumors, gastrointestinal, and vascular conditions. (5, 6) Age, sex, race, genetics, and environmental factors all have an impact on hypothyroidism. Iodine deficiency, radiation, congenital abnormalities, lithium use, immunotherapies, thyroid hormone resistance, overtreatment, goitrogen consumption, and subacute thyroiditis are common causes. It is more common in elderly persons, women, and people with autoimmune diseases such as celiac disease or type 1 diabetes. While moderate drinking and tobacco usage are linked to lower occurrence, syndromes including Turner's and Down syndrome significantly raise the risk (1, 7). Due to decreased tear production, hypothyroidism can result in dry eyes, which can cause symptoms like dryness, irritation, and a grainy feeling. Additionally, discomfort and visual problems may arise from structural changes and swelling of the eyelids. (8, 9) Tear film is a dynamic interface made up of proteins, lipids, mucin, water, and electrolytes. It develops into a coating of wet mucin that is coated in lipids throughout time. In order to preserve ocular comfort, avoid infection, manage inflammation, promote healing, remove debris, and guarantee clear vision, tears are essential. (10) The tear film preserves visual clarity, lubricates, and protects the ocular surface. It spans 3-10 µL, has a thickness of /;3µm, and secretes 1-2µL/min. the pH of tears is 7.45 on average, with seasonal and temporal variations. (11, 12) Tear film disruption and decreased secretion are caused by inflammation of the conjunctival and lacrimal glands. Lagophthalmos increases tear evaporation and osmolarity, which exacerbates dryness. 13-20% of patients suffer from dry eye, with 1-8% developing exposure keratopathy and 0.9% exhibiting superior limbic keratoconjunctivitis. (13) Hormonal alterations from menopause, PCOS, contraception, and androgen resistance are all associated with dry eye. Tear production is influenced by sex hormones, as well as thyroid conditions and insulin treatments. (14) Fatigue, dry skin, and dry eyes are symptoms of hypothyroidism that are frequently associated with autoimmune diseases. Enhancing tear function tests to direct lubricant therapy in hypothyroid individuals is the goal of this study. (15)

Material and Methods:

This analytical cross-sectional study was conducted at University of Lahore Teaching Hospital, over 6 months following synopsis approval. A total of 64 participants were recruited using a consecutive sampling technique, based on a calculated sample size with G-Power 3.1.9.7 of 64 with adjustments for a 10% dropout rate (95% confidence level, 80% power). Inclusion Criteria: Patients aged 20-60 years with a confirmed diagnosis of hypothyroidism and no prior

ocular pathology or surgery were included. Exclusion criteria were systemic conditions or medications affecting tear production, ocular trauma, active infection, contact lens use, smoking, alcohol use, pregnancy, and lactation. After obtaining informed consent, demographic and clinical histories were recorded. Tear production was assessed using the Schirmer I test, and tear film stability was evaluated via Tear Break-Up Time (TBUT) using fluorescein dye and slit-lamp examination. Symptom severity was measured using the Ocular Surface Disease Index (OSDI). Data were analysed to determine the relationship between hypothyroidism and dry eye parameters.

Results:

Normality of data was assessed through the Shapiro-Wilk test. Results indicated that data were not normally distributed (P <0.05). The present study was conducted on 64 patients, of whom 36(56.3%) were male and 28(43.8%) were female, as shown in Figure 1.

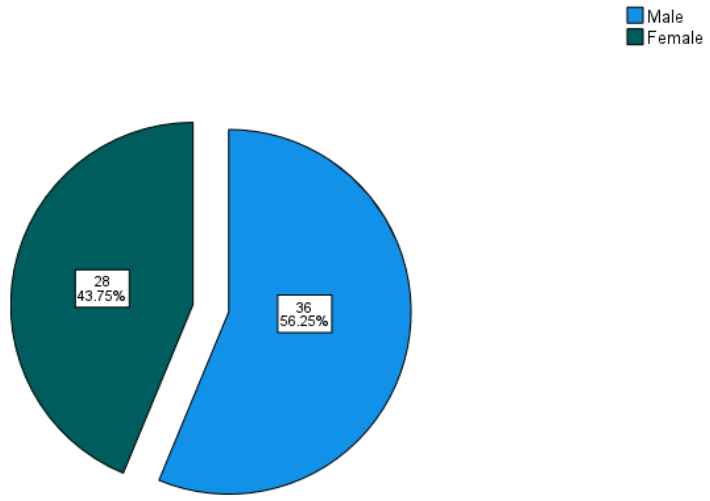

Figure No. 1: Gender Distribution of Study Participants

The Average age of study participants was 39.19±11.84 years, ranging from 21-59 years, as shown in Figure No. 2.

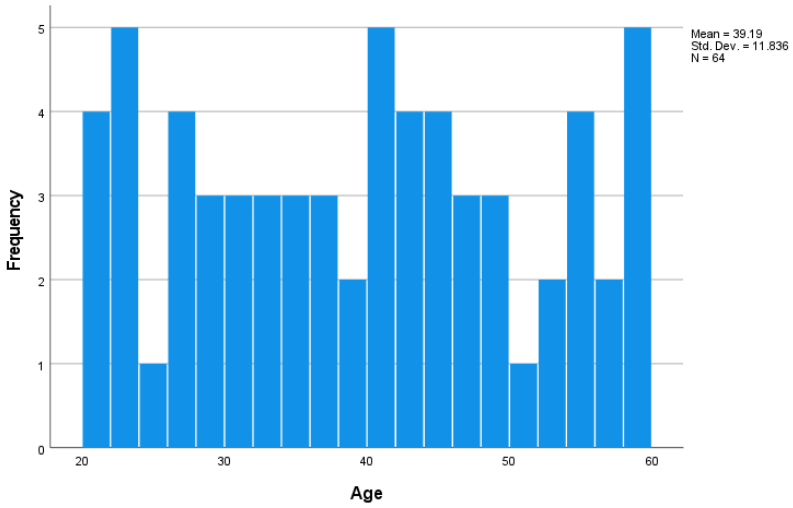

Figure No. 2: Age Distribution of Study Participants

Table no 1: Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	64	21	59	39.19	11.836

Table No. 2: Ocular Symptoms in Hypothyroidism Patients

Symptoms	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	P-value
Dry Eye	4 (6.3)	12 (18.8)	22 (34.4)	6 (9.4)	20 (31.3)	0.025
Gritty/Sandy	5 (7.8)	17 (26.6)	19 (29.7)	12 (18.8)	11 (17.2)	0.051
Painful/Sour Eyes	8 (12.5)	15 (23.4)	13 (20.3)	21 (32.8)	7 (10.9)	0.039
Blurred Vision	5 (7.8)	18 (28.1)	22 (34.4)	10 (15.6)	9 (14.1)	0.004
Light Sensitivity	7 (10.9)	16 (25.0)	20 (31.3)	16 (25.0)	5 (7.8)	0.011
Reading Difficulty	9 (14.1)	12 (18.8)	25 (39.1)	14 (21.9)	4 (6.3)	<0.001
Driving at night	7 (10.9)	10 (15.6)	19 (29.7)	23 (35.9)	5 (7.8)	<0.001
Computer use	8 (12.5)	19 (29.7)	19 (29.7)	14 (21.9)	4 (6.3)	0.007
Watching TV	6 (9.4)	16 (25.0)	21 (32.8)	13 (20.3)	8 (12.5)	0.022
Windy Conditions	3 (4.7)	15 (23.4)	23 (35.9)	12 (18.8)	11 (17.2)	0.003
Low Humidity	3 (4.7)	9 (14.1)	27 (42.2)	20 (31.3)	5 (7.8)	<0.001
Air Pollution	5 (7.8)	14 (21.9)	19 (29.7)	10 (15.6)	16 (25.0)	0.004

Results shows that a considerable proportion of hypothyroidism patients experienced dry eye symptoms affecting various aspects of daily life. For instance, dry eye and air pollution, related discomfort with 31.3% and 25.0% of participants respectively indicating they experienced these symptoms “always” while 65.6% experienced a gritty or sandy feeling with similar frequency. Painful eyes were reported “often” by 32.8% of participants, and 64.1% experienced blurred vision at least “sometimes.” Reading difficulty was particularly notable, with 67.2% reporting symptoms at least “sometimes,” and difficulties driving at night affected 73.4% of participants. Environmental factors further contributed to discomfort: 81.3% of participants reported symptoms related to low humidity, while 71.9% noted increased symptoms in windy conditions. These findings demonstrate that dry eye symptoms are highly prevalent among patients with hypothyroidism, with significant impacts on visual comfort, daily activities, and quality of life, underscoring the importance of early detection and comprehensive management in optometric practice.

Table No. 3: Correlation between disease severity, Tear function Tests, and Symptoms scores among study participants

Correlations							
		sverity	Schirmer Test OD (mm)	Schirmer Test OS (mm)	TBUT OD (sec)	TBUT OS (sec)	Total symptoms
sverity	Correlation Coefficient	1.000	-.137	-.132	-.057	-.041	.036
	Sig. (2-tailed)	.	.280	.299	.653	.751	.776
	N	64	64	64	64	64	64
Schirmer Test OD (mm)	Correlation Coefficient	-.137	1.000	.923**	.889**	.876**	-.050
	Sig. (2-tailed)	.280	.	.000	.000	.000	.697
	N	64	64	64	64	64	64
Schirmer Test OS (mm)	Correlation Coefficient	-.132	.923**	1.000	.904**	.899**	-.047
	Sig. (2-tailed)	.299	.000	.	.000	.000	.712
	N	64	64	64	64	64	64
TBUT OD (sec)	Correlation Coefficient	-.057	.889**	.904**	1.000	.967**	-.053
	Sig. (2-tailed)	.653	.000	.000	.	.000	.677
	N	64	64	64	64	64	64
TBUT OS (sec)	Correlation Coefficient	-.041	.876**	.899**	.967**	1.000	-.014
	Sig. (2-tailed)	.751	.000	.000	.000	.	.911
	N	64	64	64	64	64	64
Total_symptoms	Correlation Coefficient	.036	-.050	-.047	-.053	-.014	1.000
	Sig. (2-tailed)	.776	.697	.712	.677	.911	.
	N	64	64	64	64	64	64
**. Correlation is significant at the 0.01 level (2-tailed).							

This table shows the correlation coefficients between disease severity. Schirmer test values, tear breakup time (TBUT), and total symptom scores among 64 participants. A strong positive correlation was observed between the right and left eye measurements for both Schirmer test values ($r=0.923$, $p<0.001$) and TBUT ($r=0.967$, $p<0.001$), indicating high inter-eye consistency in tear production and tear film stability. Additionally, Schirmer and TBUT values shows strong, significant positive correlations with each other across eyes (r ranging from 0.876 to 0.904, $p<0.001$). In contrast, disease severity and total symptom scores shows no significant correlation with objective tear parameters (Schirmer or TBUT), suggesting that subjective symptom severity did not directly correspond to measured tear film parameters in this sample.

Discussion:

This study assessed dry eye symptoms and tear function in hypothyroidism patients. A proportion of participants reported ocular discomfort, with 31.3% experiencing dryness "always" and over two-thirds reporting gritty sensation, blurred vision, or difficulty with daily visual tasks such as reading and driving at night. Environmental factors like low humidity and wind further aggravated symptoms. Despite the high frequency of complaints, no significant correlation was found between disease severity and objective tear function tests (Schirmer and TBUT). However, strong inter-eye correlations for these tests indicate consistent tear film measurements. The lack of association between symptoms and test values aligns with previous studies, suggesting that dry eye in hypothyroidism may involve neurosensory dysfunction or subclinical inflammation not detected by routine tests.

Karla Randelovic et al in 2025 studied 150 individuals who were split into three groups for the study: 50 HT patients, 50 without-HT patients, and 50 control subjects. The Schirmer test, lid-parallel conjunctival folds (LIPCOF), (OSDI), (TBUT), and ocular surface staining were among the diagnostic procedures. More than half of the HT patients (27/50) had DED, according to the results, and 48.15% of them had severe symptoms. The HT DED group had considerably higher IL-6 levels ($p=0.010$), indicating a particular connection to HT-related DED-MMP-9 had little selectivity for HT but was increased in both DED groups ($p<0.001$). (16). The investigation aimed to evaluate the tear function tests for the diagnosis of dry eye in patients with hypothyroidism. The study, which was carried out at the ophthalmic technology centre in Bogota from May to December 2019, had 59 individuals who had hypothyroidism and Dry Eye Disease (DED). OSDI, Schirmer type I, tear meniscus height, NiBUT, osmolarity, Ferning, and Lissamine Green staining were among the tests that were employed. According to the results, meniscometry and Lissamine Green staining were more in line with normal, although Schirmer type I and NiBUT tests had the highest severity. (15)Moreover, in the current investigation, the Schirmer test also shows a statistically significant association with symptom severity in both eyes, with the increased symptom scores observed in patients with severe dry eye. Hao Zhe Yu et al in 2022 the effect of hypothyroidism (HT) on the ocular surface in patients with primary Sjogren's syndrome-related DED (pSS-DED) was examined in this study. A control group of 24 subjects with basic (DED) and 36 individuals with pSS-DED were included, 12 of whom had HT. The findings suggested a more severe impairment in tear film stability and secretion, as patients with both pSS-DED and HT had significantly lower TBUT, Schirmer scores, and TMH than those with only pSS-DED or DED. (17) In contrast to this research, TBUT values shows a trend toward higher symptom scores in patients with shorter tear film break-up times, but the differences were not statistically significant. This may be attributed to the multifactorial nature of tear film instability, where evaporative dry eye symptoms do not always correlate linearly with TBUT values. Additionally, TBUT can be more variable and less sensitive compared to Schirmer test results in identifying aqueous-deficient dry eye in hypothyroid populations.

Muhammad Zubair et al in 2018 determining the frequency was the goal of this cross-sectional study, which was carried out at the University of Lahore Teaching Hospital between February and May 2017. Using the Schirmer test on a slit lamp, 44 individuals (aged 20-65) had their tear film breakup time (TBUT) evaluated. The findings shows that people with hyperthyroidism had a greater predominance of DE. According to TBUT analysis, only 13.6% of the right and left eyes had normal TBUT, 20.4% had moderate TBUT decrease, and 65.95% had substantially reduced tear breakdown time. Sugni was confirmed by statistical analysis utilizing the Chi-Square test ($p=0.00002$). (18) In comparison to subjects, hypothyroid patients had significantly lower TBUT and Schirmer I scores, higher OSDI scores, increased corneal staining, and meibomian gland dysfunction, confirming both aqueous and evaporative components of dry eye in HT. (19) Dry eye symptoms were highly prevalent in hypothyroid patients, with Schirmer type I and NiBUT exhibiting the most abnormalities, indicating severe aqueous deficit and tear film instability. (20)). Numerous ocular characteristics were evaluated, such as the Schirmer test, corneal fluorescein staining (CFS), (NITBUT), (OSDI), and Meibomian gland function. Significant variations between active and inactive TED were found in the results. Additionally, they shows more severe corneal staining ($p=0.0001$) and decreased tear secretion ($p=0.012$).(21)

Conclusion:

This study revealed that hypothyroidism is strongly associated with increased dry eye symptoms, significantly impacting patients' daily activities and comfort. Regular ocular evaluation and timely management are essential to prevent chronic ocular surface complications in these patients.

References:

[1] Chaker L, Razvi S, Bensenor IM, Azizi F, Pearce EN, Peeters RP. Hypothyroidism. Nat Rev Dis Primers. 2022;8(1):30.

[2] Bereda G. Definition, Causes, Pathophysiology, and Management of

[3] Hypothyroidism. Mathews Journal of Pharmaceutical Science. 2022;7(1).

[4] Rubina; S, Haleema Y, Nasira T, Zohra; K, Sachdeve PS. The Prevalence of Subclinical Hypothyroidism During Early Pregnancy in Pakistan: A Cross-Sectional Study. Palo Alto: Cureus Inc. 2021;13(12).

[5] Zamwar UM, Muneshwar KN. Epidemiology, Types, Causes, Clinical Presentation, Diagnosis, and Treatment of Hypothyroidism. Cureus. 2023;15(9):e46241.

[6] Persani L. Clinical review: Central hypothyroidism: pathogenic, diagnostic, and therapeutic challenges. J Clin Endocrinol Metab. 2012;97(9):3068-78.

[7] Huang SA, Tu HM, Harney JW, Venihaki M, Butte AJ, Kozakewich HP, et al. Severe hypothyroidism caused by type 3 iodothyronine deiodinase in infantile hemangiomas. N Engl J Med. 2000;343(3):185-9.

[8] Feldt-Rasmussen U, Effraimidis G, Bliddal S, Klose M. Consequences of undertreatment of hypothyroidism. Endocrine. 2024;84(2):301-8.

[9] Rath L, Seltman W. Dry Eyes and Thyroid Disorders. eye health guide 2024.

[10] Sawicka-Gutaj N, Ziolkowska P, Wojciechowska K, Shawkat S, Czarnywojtek A, Warchol W, et al. Eye symptoms in patients with benign thyroid diseases. Sci Rep. 2021;11(1):18706.

[11] Pflugfelder SC, Stern ME. Biological functions of tear film. Exp Eye Res. 2020.

[12] Chang AY, Purt B. Biochemistry, Tear Film. StatPearls. Treasure Island (FL)2025.

[13] Haeringen NJV. Clinical biochemistry of tears. survey ophthalmology. 1981;26(2).

[14] Shah SS, Patel BC. Thyroid Eye Disease. StatPearls. Treasure Island (FL)2025.

[15] Gorimanipalli B, Khamar P, Sethu S, Shetty R. Hormones and dry eye disease. Indian J Ophthalmol. 2023;71(4):1276-84.

[16] Caycedo Lozano AR, Arias Ortiz WA, Martin V, Ramirez S, Medina Siervo CA. Analysis of diagnostic tests in patients with dry eye and hypothyroidism: an observational study. Arch Soc Esp Oftalmol (Engl Ed). 2023;98(3):163-9.

[17] KR, Jukić T, Tešija Kuna A, Sušić T, Hanžek M, Štajduhar A, et al. Hashimoto's Thyroiditis and Dry Eye Disease. journal of clinical medicine 2025;14(5).

[18] Yu HZ, Zeng WZ, Wu WY, Yao ZQ, Feng Y. [Evaluation of ocular surface status and function in primary Sjogren's syndrome with hypothyroidism]. Beijing Da Xue Xue Bao Yi Xue Ban. 2022;54(4):705-11.

[19] Zubair M, Jamshed M. Frequency of Dry Eyes in Patients of

[20] Hyperthyroidism. Pakistan Journal of Ophthalmology. 2018;34(3).

[21] Altin Ekin M, Ugurlu SK, Egrilmez ED, Oruk GG. Ocular Surface Changes in Hashimoto's Thyroiditis Without Thyroid Ophthalmopathy. eye Contact Lens. 2021;47(1).

[22] Zemba M, Ionescu M-A, Pîrvulescu RA, Dumitrescu O-M, Daniel-Constantin B, Radu M, et al. Biomarkers of ocular allergy and dry eye disease. Rom J Ophthalmol. 2023;67(3).

[23] Allam IY, Lazreg S, Shafik Shaheen M, Doheim MF, Mohammed MA. Ocular Surface Changes in Patients with Thyroid Eye Disease: An Observational Clinical Study. Clin Ophthalmol. 2021;15:2481-8.