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Research Article

Evaluation of Tear Secretion with and without Refractive Error Using by Schirmer's Test in Pediatric Department of AIEH, Karachi

Muhammad Asif Memon[1]*, Sana Naz[2], Neha Memon[2], Rimsha[2], Kainat Sheikh[2], Salman[2], Mehak Nazir[3], Nabila Noor[4] and Noor-ul-Huda[5]

1Assistant Professor, M.Phil. Optometry, Isra School of Optometry, Al-Ibrahim Eye Hospital, Karachi, Sindh, Pakistan

2Internee, Peadiatric Department, Al-Ibrahim Eye Hospital, Karachi, Pakistan

3MS-Public Health, Isra School of Optometry, Al-Ibrahim Eye Hospital, Karachi, Pakistan

4Optometrist, Isra School of Optometry, Al-Ibrahim Eye Hospital, Karachi, Pakistan

5Optometrist, Sindh Institute of Ophthalmology and Vision Science, Hyderabad, Pakistan

***Corresponding Author:** Muhammad Asif Memon, Assistant Professor, M.Phil. Optometry, Isra School of Optometry, Al-Ibrahim Eye Hospital, Karachi, Sindh, Pakistan.

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Abstract

Purpose: To evaluate the tear secretion in children with and without refractive error from 5 - 15 years.

Methodology: A case control, non-probability convenient study was carried out 150 individual patients with and without refractive error divided into two equal groups. Objectively assessment include Schirmer's test-1 without anesthesia (ST-1) were performed on visit at hospital.

Results: Total 150 patients, 111 participant's age between 10-15 years, and 86 of the participants were female and 64 were male. 75 Emmetropic children's visual acuity was 6/6 and 75 patients' vision was 6/9 to 6/60. 75 refractive error 36 (23.6%) myopia, Astigmatism 31 (20.3%) and Hypermetropia 8 (6.1%). Degree of ST-1; normal 26 (76.8%), mild 8 (20.3%), moderate 01 (1.4%) and severe 01 (1.4%) in Myopia, and normal 4 (60.0%), mild 01 (10.3%), moderate 01 (10.3%) and severe 02 (19.4%) in Hypermetropia, finally normal 24 (79.0%), mild 04 (12.0%), moderate 02 (6.0%) and severe 01 (3.0%) in Astigmatism. Degree of ST-1; normal 48 (58.3%), mild 10 (15.0%), moderate 13 (20.3%) and severe 04 (6.4%) in Emmetropia. The P-value between refractive error and without refractive error was 0.005, respectively.

Conclusion: Both children (with refractive error and without refractive error) had dry eyes but emmetropic children had greater effect of dryness rather than patients had refractive correction. Whereas in refractive error patients' myopia had greater effect on dry eye than hypermetropia and astigmatism.

Keywords: Refractive Error; Dry Eye Disease; Tear Secretion; Schirmer's Test-1; Emmetropia; Myopia; Hypermetropia and Astigmatism

Introduction

Tear film is a unique thin fluid layer which plays vital role in the protection and lubrication of the outer mucosal surface of the eye. It provides the interface between ocular surface and the environment. To fulfill the demands of ocular surface tear production, distribution and clearance is regulated by the lacrimal functional unit (LFU) [1].

Figure 1: Tear film of the eye.

There are three layers of tear film

- **Lipid Layer:** It is the outer main layer of tear film which is lipid-based layer. It provides the oil covering to the tear film which helps to decrease evaporation of natural tears from the surface [2].

- **Aqueous Layer:** The middle layer contains 90% of the water. It provides lubrication to the eye and flushes out foreign particles [3].

- **Mucin Layer:** The mucin layer is the deepest layer of the tear film. It plays a vital role in tear film stability and allows the aqueous layer to adhere to the epithelial cells of the cornea [4].

Prevalence

In epidemiological studies performed globally, the prevalence of dry eye disease (DED) ranges from 5 to 50 percent. Based on data from the National Health and Wellness Survey, the prevalence increased with age (2.7 percent in those 18 to 34 years old versus 18.6 percent in those ≥75 years old) and was higher in women than men (8.8 versus 4.5 percent). Prevalence was not affected by education or location of residence [5].

A proper eye examination can help to diagnose the purpose of dry eyes. A clinical test will be performed to measure the volume of tears, using the Schirmer test. In this test, blotting strips (Schirmer strip) of paper are placed under lower eyelids without anesthesia. After five minutes the eye professional measures the amount of strip soaked by tears in mm [6].

Materials and Methods

Study design

Case control.

Sample size

150 patients (divided into two equal groups), 75 without refractive error and 75 with refractive error children.

Duration of research

From June 2022 to December 2022.

Sampling selection

Inclusion criteria

- Age between 5-15 years
- Refractive error
- Emmetropia
- Patient/parents who give consent.

Exclusion criteria

- < 5 and > 15 years
- Vit-A deficiency
- Already dry eyes patients
- Trauma
- Squint
- Using of any drops/medication
- Other disease.

Data collection procedure

A written informed consent (English and Urdu) was taken from each patient/Parents than pre-luminary screening test was done include visual acuity examination, Objective refraction and subjective refraction, and slit lamp examination by ophthalmologist.

Schirmer's test-1 (ST-1) without anesthesia

A Schirmer's test determines whether a person's eye produces enough tears to keep their eye moist and health. To conduct a Schirmer's, a doctor places a piece of filter paper inside the lower eyelid of both eyes and the person closes their eyes. In general, the smaller amount of moisture on the paper, the fewer tears that person had produced. Wetting of the Schirmer's strip ≤10 mm was considered dry eye and these patients were excluded from the study. Schirmer's test was performed only once.

Procedure of ST-1

- The eye was gently dried of excess tears
- The Schirmer's strip was folded up to 5 mm from one end and kept in the lower fornix at the junction of lateral 1/3 and medical 2/3 (do not touch the cornea or lashes)
- The patient was asked to close the eyes.
- Tears in the conjunctival sac cause progressive wetting of the paper strip.
- After 5 minutes, the filter paper was removed and the distance between the leading edge of wetness and the initial fold was measured, using a millimeter rule.

Clinical Grading of ST-1

The Schirmer's test was graded as: >10 mm, normal (grade 0); 5-10 mm, mild (grade 1); 3-4 mm, moderate (grade 2); 0-2 mm, severe (grade 3).

Results

- A total number of 150 patients participated in study. Most of the patients age from 5 to 15 years.
- A total number of 150 patients participated in study. 64 (42.3%) were male and 86 (57.7%) were female respectively.
- A total number of 150 patients participated in study. Emmetropic patients has 6/6 and refractive error patient's visual acuity was 6/9-6/60.

Refractive error	5-9 years	10-15 years	Total patients	Frequency
Myopia	07	29	36	23.6%
Hypermetropia	06	02	8	6.1%
Astigmatism	11	20	31	20.3%
Without refractive error	15	60	75	50.0%
Total	39	111	150	100%

Table 1: Distribution of patients with and without Refractive error with two age groups.

Schirmer test Without Anesthesia	Refractive error					
	Myopia		Hypermetropia		Astigmatism	
	Patients	Frequency	Patients	Frequency	Patients	Frequency
Normal	26	76.8%	4	60.0%	24	79.0%
Mild	8	20.3%	1	10.3%	4	12.0%
Moderate	1	1.4%	1	10.3%	2	6.0%
Severe	1	1.4%	2	19.4%	1	3.0%
Total	36	100.0%	8	100.0%	31	100.0%

Table 2: Degrees of Schirmer test without anesthesia in different refractive error.

Schirmer test	Emmetropia	
	Patients	Frequency
Normal	48	58.3%
Mild	10	15.0%
Moderate	13	20.3%
Severe	4	6.4%
Total	75	100.0%

Table 3: Degrees of Schirmer test without anesthesia in Emmetropia.

Schirmer test	With Refractive Error		Without Refractive Error		p-value
	Patients	Frequency	Patients	Frequency	
Normal	54	66.9%	48	58.3%	0.005
Mild	13	20.3%	10	15.0%	
Moderate	04	6.4%	13	20.3%	
Severe	04	6.4%	04	6.4%	
Total	75	100%	75	100%	

Table 4: Degrees of Schirmer test without anesthesia in with refractive error and without refractive error.

Discussion

Total of 150 patients were selected from pediatric department during study period, out if which 21 patients (34.1%) with refractive error were found dry eyes disease and 27 patient (31.7%) without refractive error found dry eyes disease and a previous study was conducted in South Sinai (Egypt) from 2009 through 2010, this study shows 90.32% of refractive errors (mainly astigmatism) which were significantly corrected with eyeglasses and ophthalmic examination revealed dry eye disease (4.74%).

Whereas another study was conducted in Shandong province China in August 2012, where children with other ocular pathologies were excluded in whom 23.7% of dry eyes were found. Another study was conducted in Beichen District, China in January 2016. Which shows the prevalence of dry eye in myopic children is 18.95%. In another study which was conducted in Australia in September 2020, revealed that most common ocular condition diagnosed at initial presentation were refractive error (n = 104, 20.1 per cent) and dry eyes (n = 57, 11.0 per cent).

In this study total 150 participant's, 75 were found with refractive error in which 36 were myopic with 10 having dry eyes, 8 were hypermetropic with 04 having dry eyes, 31 were astigmatic with 07 having dry eyes and 75 of patients were found without refractive error (emmetropic) in which 27 patients having dry eyes disease. A previous study which was conducted in Taiwan in September 2020, shows significant analysis of tear film spatial instability for pediatric myopia under treatment. Whereas another study which was conducted in Japan in June 2022, showed significant correlation between dry eyes disease and refractive error.

In with refractive error patients, myopia 26 were normal, 8 were mild, 1 was moderate, and 1 was severe. In hypermetropia, 4 were normal, 1 were mild, 1 were moderate, and 2 were severe. In astigmatism, 24 were normal, 4 were mild, 2 were moderate, and 1 were severe. Where as in without refractive error patients (emmetropic), 48 were normal, 10 were mild, 13 were moderate and 4 were severe. It shows the significant association between dry eyes disease in refractive error patients and without refractive error patients as with refractive correction there were slightly less ratio of dry eyes in children. In previous study which was conducted in China in January 2016 showed the myopic significance with dry eyes disease. Another previous study which was conducted in Taiwan in September 2020, shows significant analysis of tear film spatial instability for pediatric myopia under treatment which shows the significant relationship between myopic refractive error and dry eyes diseases. Whereas another study which was conducted in Japan in June 2022, it also shows significant correlation between dry eyes disease and refractive error.

Conclusion

This study concluded that emmetropic patients has greater effect of dry eyes rather than patients having refractive correction. Whereas in refractive error patients' myopia has greater effect on dry eye disease rather than hypermetropia and astigmatism.

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