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Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

Comparative analysis of severity of dry eye disease among smokers in tertiary care hospital of rural area of Panipat

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ARTICLE INFO

Article history:
Received 26-04-2023
Accepted 19-05-2023
Available online 29-09-2023

Keywords:
Dry eye disease
Smoker
Fagerstrom scale
Schirmer test
TBUT 1

ABSTRACT

Aim: This study aims to evaluate the correlation between smoking dependence and severity of dry eye.
Materials and Methods: This was a cross-sectional study conducted for a period of 3 months November 2022 to January 2023. 150 smokers were included in the study and their nicotine dependence was assessed using Fagerstrom scale. Patients were classified into mild and significant dependence groups. The severity of dry eye among subjects were assessed using ocular surface disease index (OSDI), tear film breakup time (TBUT) and Schirmer's test. Also, analysis was done using STATA and SPSS software.
Findings: Out of 150 smokers 44 showed low dependence and 106 showed significant dependence. In patients with low dependence average OSDI was 18.8, TBUT was 4.70 and Schirmer's was 10.22. Patients with severe dependence had an average OSDI 29.12, TBUT 3.43 and Schirmer's value of 7.30. There was a direct correlation between degree of smoking and severity of dry eye disease (r= 0.72, p=0.03).
Conclusion: The degree of dependence correlates directly to the severity of dry eye among smokers.

1. Introduction

One of the most common problems people have when they visit the ophthalmology OPD is dry eye. The dry eye itself is not a disease rather, it is a collection of symptoms brought on by inadequate or irregular tear film.[1,2]

An unstable tear film and ocular surface disease ensue from inadequate tear volume or function in dry eye.[3] According to Dry Eye Workshop, dry eye disease (DED) is a multifactorial disease that affects the tears and ocular surface. It causes discomfort, visual disturbance, and instability of the tear film, which damages the ocular surface. It is also accompanied by increased tear film osmolarity and ocular surface inflammation.[4,5] Between 5% and 50% of people around the world have dry eye condition.[6]

Age, sex, environment, past drug use, screen time, and many systemic disorders are all risk factors for dry eye disease, but lifestyle is one of the most important ones.[7] Although the link between smoking and dry eye illness is not entirely obvious, smoking is a highly common risk factor for many chronic diseases.[7]

Three layers make up the tear film: an outside lipid layer, an aqueous layer, and an interior mucin layer. Smoking is a well-known irritant of the ocular surface.[8] Smoking damages the mucin layer.[9] Conjunctival goblet cells as well as the Crypts of Henle and Manz glands all secrete the proximal mucin layer.[10] Additionally, the apical corneal cells express these mucins to create glycocalyx. The glycocalyx shields the cornea from physical and chemical harm. Dry eyes are a result of the goblet cells being damaged by the irritant in smoke, which reduces the amount of tears produced and can cause corneal damage.[4]

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https://doi.org/10.18231/j.ijceo.2023.057

The problem of cigarette smoking is widespread. According to a 2018 World Health Organization report, 12% of the world's smokers live in India, where there are an estimated 120 million smokers. By 2015, 108 million males were tobacco users in India, a 36% rise from 1998 to 2015.[11]

Patients with DED typically complain of pain and heaviness in the eyes as well as other symptoms like a feeling of a foreign body in the eye, redness, photophobia, and watering of the eyes as a result of corneal irritation.[12] Other signs of dry eye illness include difficulty with near work, reading newspapers, watching television, and driving. It significantly affects social interactions and psychological health.[13] Untreated severe cases can result into complications like corneal scarring, infectious keratitis, and blindness.[14]

From earlier investigations, it is not entirely obvious how smoking contributes to the development of DED. Determining correlation between smoking dependence and severity of dry eye was the goal of this study.

2. Materials and Methods

Study done was a cross-sectional study which was conducted on the patients who were smokers and attended Ophthalmology OPD of NC Medical College and Hospital, Israna after obtaining ethical clearance and informed consent. Study was conducted for a duration of 3 months from Feb 2023 to April 2023. 150 patients were taken for the study.

2.1. Inclusion criteria

All patients who showed nicotine dependence were taken.

2.2. Exclusion criteria

1. Patients with previous history of ocular trauma
2. Patients with previous history of ocular surgery
3. Patients who had ocular surface disorders
4. Patients who were on any long-term topical medications
5. Patients who were on any medication that can predispose to dry eye
6. Patients who had a history of wearing contact lens
7. Patients with any type of systemic disease which is known to cause dry eye
8. Patients who were former smokers but have stopped now
9. Women who have attained menopause

A detailed history of patient including dry eye symptoms, systemic illness and personal history was taken from all the patients. Patients were divided into 2 groups based on Fagerstrom nicotine dependence scale a score of 4 or less indicating mild dependence were taken in one group and those with score 5 or more indicating significant dependence were taken in another group and the severity of DED was compared in both groups.

As DED is a subjective diagnosis in most of the patients so firstly Ocular surface disease index (OSDI) questionnaire was filled for every subject participating in the study. OSDI was used to quickly assess the symptoms of dry eyes like ocular irritation and how these symptoms were affecting the patient's day-to-day activities. It consists of 12-item questions which were used to assesses symptoms.

This questionnaire has 3 subscales: first one includes ocular symptoms, second one includes vision-related function, and third one is environmental triggers. Patients were asked to fill the questionnaire and mark their responses on a scale of 0 to 4 in which 0 corresponds to symptom is present "none of the time" and 4 corresponds to symptom present "all of the time."

Then final score ranging from 0-100 was calculated where scores 0-12 corresponds normal, 13-22 corresponds mild DED, 23-32 corresponding moderate DED, and greater than 33 corresponding severe DED.

After this the subjects underwent visual acuity examination, slit lamp examination and the other tests for evaluation of dry eye like Tear film breakup time and Schirmer's test.

TBUT was determined after the instillation of fluorescein 2% moistened with saline applied to the inferior fornix. The patient was asked to blink many times and was examined under broad beam using the cobalt blue filter. The interval between the last blink and the appearance of first randomly distributed dry spot is noted. Time less than 10 seconds is taken positive.

To conduct Schirmer's test, Schirmer's strip was inserted in lower lid at the junction of middle and outer third of both eyes and patients were advised to gently close their eyes. After 5 minutes, the filter paper was removed. The test was said positive when less than 10 mm of the strip is wet after 5 minutes without anaesthesia.

At the end of the data collection, the data was tabulated using Microsoft excel database and then subsequently exported to statistical package for social science (SPSS) windows software program for analysis. Statistical analysis was performed accordingly.

Patients were advised for treatment of dry eye disease accordingly.

3. Results

Chart 1 showing dependence among 150 smokers.

It shows that among 150 smokers divided on the basis of Fagerstrom nicotine dependence scale 44 showed to have low dependence that is a score of <5 and 106 had significant dependence that is a score of =>5.

Figure 1 depicts that among low dependence group the average OSDI score was 18.8 and that among significant

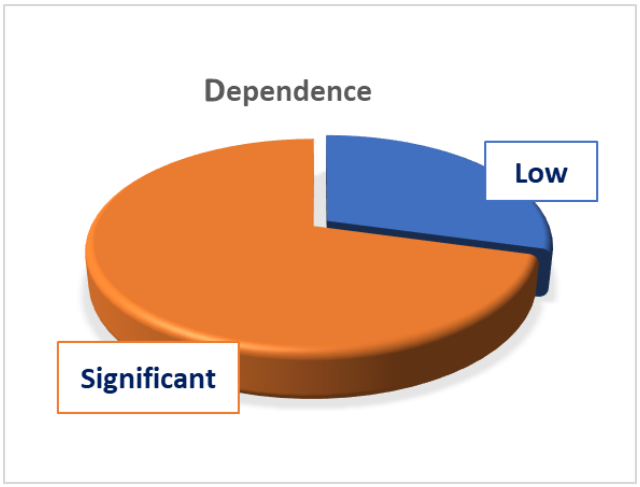

Chart 1: Showing average OSDI among low and significant dependence groups

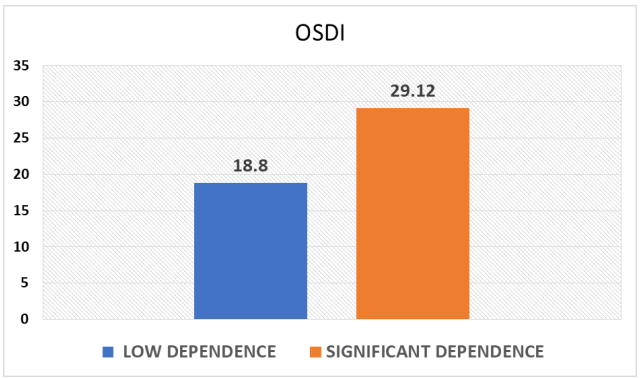

Fig. 1: Showing average OSDI among low and significant dependence groups

dependence group was 29.12. It shows that with increasing dependence OSDI score increases. Hence, a positive relation is present.

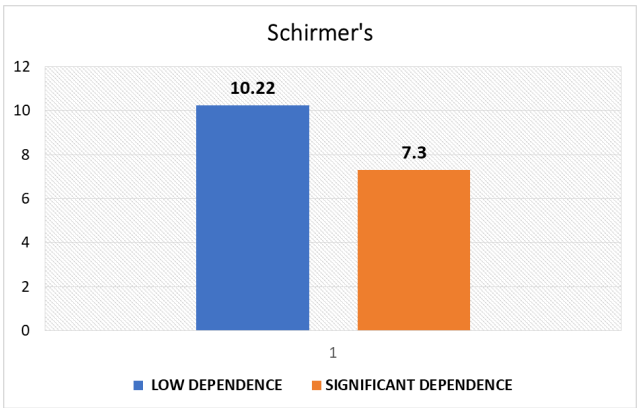

Fig. 2: Showing average Schirmer test results among low and significant dependence groups

Figure 2 depicts that among low dependence group the average Schirmer's result was 10.22 and that among significant dependence group was 7.3. It states that with increasing dependence the severity of DED increases.

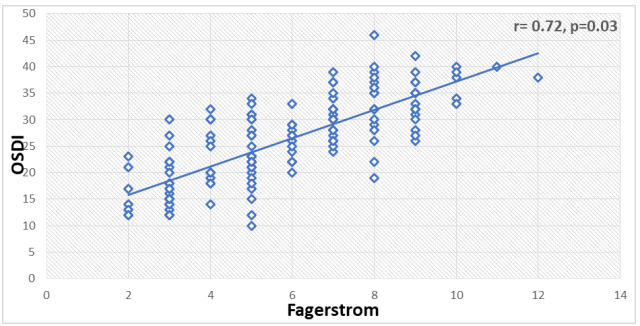

Fig. 3: Showing relation among Fagerstrom scale and OSDI score

Figure 3 depicts that there is a positive correlation among Fagerstrom scale and OSDI score. As the dependence increases the OSDI score showing severity of dry eye also increases.

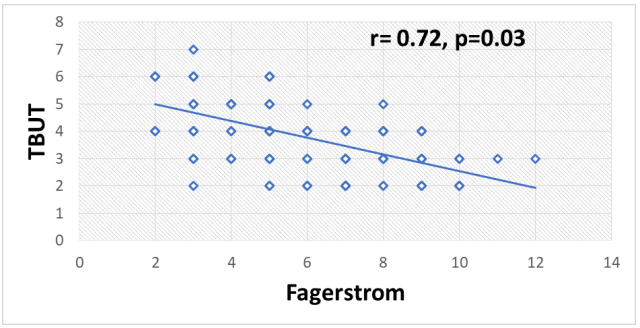

Fig. 4: Showing relation among Fagerstrom scale and TBUT score

Figure 4 depicts that there is a negative correlation among Fagerstrom scale and TBUT score. As the dependence increases the TBUT time decreases showing increasing severity of dry eye.

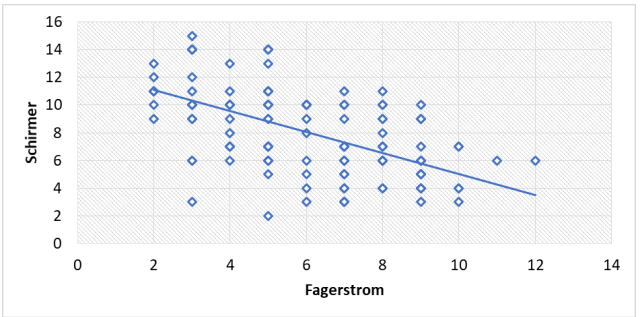

Fig. 5: Showing relation among Fagerstrom scale and Schirmer's test scores

Figure 5 depicts that there is a positive correlation among Fagerstrom scale and Schirmer's test scores. As the dependence increases the Schirmer's score decreases showing that wetting of strip decreases which indicates increasing severity of dry eye.

4. Discussion

DED is one of the most common complaints with which patients present to Ophthalmology OPD. DED is a condition which is often under diagnosed or overlooked.[15] No well-defined criteria have been described for diagnosis of DED. The diagnosis of DED is mostly subjective. Different studies have used different criteria for diagnosis. Some used only symptoms and some both signs and symptoms.[16]

For subjective diagnosis OSDI questionnaire was used. This questionnaire was simple and used uncomplicated numeric interpretation.[17] Clinical evaluation was done using TBUT and Schirmer's test as these are backbone for ocular surface assessment. Schirmer's assess aqueous tear secretion and TBUT quantify stability of tear film.[18]

Cigarette smoking is widespread. Smoke has complex composition and has radicals and oxidants.[19] These radicals damage lipid layer of tear film and affects TBUT.[19–21] It was also seen that smoking decreases tear film stability and sensitivity of cornea and conjunctiva and decreased TBUT.[22–24]

In our study, we found an increase in mean OSDI scores form 18.8 in low dependence group to 29.12 in significant dependence group. Similar results were found by Mal et al. where mean OSDI increased from Group A with low dependence to Group C showing more dependence, implying worsening of dry eye symptom as the number of cigarette intake increased. They also found that as 79.6% of Group C patients had an OSDI score greater than 12, implying majority of smokers suffered from dry symptoms.[10] Matsumoto et al also found that 80% of their study subjects who were smokers suffered from dry eye symptoms.[25]

We also found that smokers had shorter TBUT value, progressive worsening was seen with increased dependence. The mean TBUT value in low dependence group was 4.7 sec and in significant dependence was 3.43 sec. Mal et al showed that Group B TBUT was 7.9 seconds and in Group C was 4.7 seconds. Matsumoto et al. showed a TBUT (3.2 seconds).

It was seen that smoking has an effect on tear film and produces DED.[26] The more the intake of irritant in smoke the more the severity of DED. For betterment of patients, they were advised to reduce smoking. They were also advised to reduce screen time and to wear sunglasses in sun. Patients were counselled to reduce triggers and were also given treatment according to the severity of DED.

5. Conclusion

We found that the severity of DED increases with increasing dependence on nicotine among smokers the severity of symptoms and signs also increases with increasing dependence. Smoking is a well-known ocular surface irritant leading to impairment in mucin layer of tear film by affecting the conjunctival goblet cells. This leads to decreased production of tears and can harm the corneal surface. The early detection and counselling the patient can prevent complications.

6. Limitation

Study was done in a small geographical area with limited number of participants.

7. Source of Funding

None.

8. Conflicts of Interest

Nil.

Acknowledgments

Nil.

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Cite this article: Garg K, Gupta K, Gupta BK, Vashistha V. Comparative analysis of severity of dry eye disease among smokers in tertiary care hospital of rural area of Panipat. *Indian J Clin Exp Ophthalmol* 2023;9(3):302-306.