Association Between Dry Eye Symptoms and Insomnia

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ABSTRACT

The objective of our study was to determine the significant correlation between patients with dry eye symptoms and insomnia. The study was conducted among 150 persons at Saveetha medical college and hospital. An evaluation was performed using self-reported structured questionnaires regarding symptoms of insomnia and dry eye, including ocular pain and duration of time they spend on TV/mobile. Then dry eye patients were confirmed by Tear break up time (TBUT), Schirmer test 1, and 2. The Control group (no symptom of dry eye) was chosen randomly and evaluated using the same self-reporting questionnaires. The study was conducted on 150 persons with a mean age of 32 years in Tamil Nadu, India. On analyzing the data collected we have shown that there is a significant association between Dry eye and insomnia using chi-square (44.977), P-value (<0.00001), and “r” value (0.6741). Also, we have shown a significant association between co-morbidity among dry eye patients and poor sleep quality. After analyzing the data collected, we show that there is a positive association between dry eye symptoms and insomnia.

INTRODUCTION

Dry eye is a condition in which the eyes don't produce enough tears. Symptoms can range from mild and occasional to severe and continuous. It is a common condition reported to affect 15% of the general population (Smith et al., 2007). Usually, the lacrimal gland above the eyeball produces tears that keep the eyes wet. Dry eyes mean glands don't produce enough tear or tear dry up too fast or tear don't work well to keep the eyes wet (National Institutes of Health, 2019).

Both men and women can get dry eye; however, it is common in women, especially after menopause. Dry eye can be due to certain diseases like Rheumatoid arthritis, Sjogren's syndrome, thyroid diseases, and lupus, being in smoke, wind, and cold climate, using contact lenses for a long time; following refractive surgeries such as LASIK, etc. Symptoms of the dry eye range from burning sensation and dryness to soreness in the eyes. Other common symptoms include redness of the eye, pain, visual complaints, watery tearing, or stringy mucus in eyes, feeling of having sand in the eye, blurred vision being common, and discomfort on wearing contact lens (Medical News Today, 2018). Patients who are newly diagnosed found to have more significant improvement in sleep after initiation of topical therapy compared to those with long-standing dry eye symptoms (Ayaki et al., 2016b), the latter of which may have had more chronically entrenched insomnia.

Many studies have focused on the link between DE and mental health, one of which is a population-
A based Korean study found that there is an increased risk of DE in those with mild and severe sleep disturbance as compared to a control group (Lee et al., 2015). Another hospital-based Japanese study found a positive correlation between Pittsburgh sleep quality index and severity of Dry eye (Ayaki et al., 2016a). In our study, we are aiming to re-evaluate the co-relation between Insomnia and Dry eye symptoms.

**MATERIALS AND METHODS**

The Institutional Ethics Committee duly approved the study.

**Study design and duration**

This was a prospective observational study conducted between Jan 2020 to Mar 2020 in the department of Ophthalmology, Saveetha Medical College, Chennai, Tamil Nadu.

**Inclusion criteria**

The General Indian population of age 20-50 was the study population taken under our study.

**Exclusion criteria**

Patients with a history of glaucoma, retinal surgery, LASIK, and cataract surgery, history of HIV, Sarcoïdosis, and history of any use of ocular medications.

**Data collection**

The study was conducted on patients after the approval from the Institutional research board (IRB), Saveetha medical college, Thandalam. For every individual, demographic information, past ocular and medical history were collected via a self-reported structured questionnaire and confirmed by the individual’s medical records. Patients with clinical symptoms of dry eye were confirmed using the Tear break up time (TBUT), Schirmer test I and II. The Charlson co-morbidity weighted index was assessed based on a review of the medical records (Charlson et al., 1987). The data were entered into the standardized database, and statistic analysis was done to find the significant association between the dry eye and insomnia.

**Statistic analysis**

Data were entered on to the standardized database. The significant associations between the variables were determined using the Chi-square test ($\chi^2$) and coefficient of correlation (r-value) calculation.

**Comparison of the patient with dry eye syndrome and quality of sleep**

**Chi-square ($\chi^2$) calculation**

Assuming the Null hypothesis is true, which states that there is no association between patients with Dry eye and insomnia, chi-square ($\chi^2$) was calculated.

The chi-square statistic is 44.9775. The P-value is <0.00001. The test is significant at <0.05.

Since the P-value <0.05, the Null hypothesis is rejected. It implies that there is a significant relationship between Dry eye symptoms and insomnia.

**Table 1**

**Figure 1**

Comparison of the patient with dry eye symptoms and quality of sleep

**R (Co-efficient of correlation) Calculation**

1. It is calculated to find out whether there is a significant association between dry eye symptoms and insomnia.

2. The sum of deviation squared value $\frac{\sum(X-M_X)^2}{SS_X}$ of patient with dry eye symptoms is 493.493

3. The sum of deviation squared value $\frac{\sum(Y-M_Y)^2}{SS_Y}$ of patient with poor sleep quality is 401.26

4. The R-value is 0.6741. This is a moderate positive correlation, which means there is a tendency for an increase in the severity of dry eye symptoms with an increase in the severity of insomnia and vice versa.

**Comparison of dry eye patient with co-morbid condition and quality of sleep**

**Chi-square ($\chi^2$) calculation**

Assuming the Null hypothesis is true, which states that there is no association between Dry eye patients with the co-morbid condition and insomnia, chi-square ($\chi^2$) was calculated.

The chi-square statistic is 10.429. The P-value is 0.00124. The test is significant at <0.05.

Since the P-value <0.05, the Null hypothesis is rejected. It implies that there is a significant relationship between Dry eye patients with co-morbid condition and quality of sleep.
Table 1: Comparison of the patient with dry eye syndrome and quality of sleep

|                      | Population with poor sleep quality | Population with normal sleep quality | Total |
|----------------------|-----------------------------------|-------------------------------------|-------|
| Dry eye positive cases | 49                                | 26                                  | 75    |
| Dry eye negative cases | 9                                 | 66                                  | 75    |
| Total                | 58                                | 92                                  | 150   |

Table 2: Comparison of dry eye patient with co-morbid condition and quality of sleep

|                      | Population with poor sleep quality | Population with normal sleep quality | Total |
|----------------------|-----------------------------------|-------------------------------------|-------|
| No. of Dry eye patients with co-morbid condition | 13                                | 10                                  | 23    |
| No. of Dry eye patients without co-morbid condition | 10                                | 42                                  | 52    |
| Total                | 23                                | 52                                  | 75    |

conditions and insomnia. [Table 2]

R (Co-efficient of correlation) Calculation

1. The sum of deviation squared value $\sum(X - M_X)^2/SS_X$ of patient with the co-morbid condition is 117.793
2. The sum of deviation squared value $\sum(Y - M_Y)^2/SS_Y$ of patient with poor sleep quality is 401.26
3. The R-value is 0.2674.
4. Although technically, there is a positive correlation, the relationship between these variables is weak.

RESULTS

The study was conducted on 150 persons with a mean age of 32 years in Tamil Nadu, India. On analyzing the data collected we have shown that there is a significant association between Dry eye and insomnia using chi-square (44.977), P-value (<0.00001), and R-value (0.6741), this correlation is moderate that is there is a tendency for an increase in the severity of dry eye symptoms with an increase in the severity of insomnia and vice versa.

Also, we have shown a significant association between co-morbidity among dry eye patients and poor sleep quality, but this correlation is weak.

DISCUSSION

From the above data collected, and the statistical analysis, we have found that Dry eye symptoms are predominantly correlated with poor sleep quality. Our data was under Ayaki et al., who have shown that DE severity is correlated with the Pittsburgh Sleep Quality Index (Buysse et al., 1989), in which more than half of their eye clinical sample reported poor sleep quality, 65% of our patients with DE have a poor sleep quality.

Association between DE and insomnia has many potential explanations. DE and ocular pain may precipitate insomnia. Individuals predisposed to insomnia can have an intolerance to stress and eye discomfort compared to healthy sleepers. It is seen that insomnia leads to a change in tear physiology and DE symptoms. Studies have shown that tear physiology differs during sleep and wakefulness when the eye is actively blinking (Sack et al., 2000). Over some time, the prolonged incidence of insomnia can lead to psychological and behavioural changes. Insomnia in individuals has an association with reduced tear secretions and tears hyperosmolality leading to irritation of eye and dryness (Lee et al., 2014). Concerning newly diagnose DE symptoms promptly treated with Dry topical eye, therapy showed marked improvement in sleep compared to long-standing DE. There can be an association between DE and insomnia based on underlying factors as genetic susceptibility and somatosensory dysfunction. Both insomnia and DE are highly co-morbid with depression and anxiety (Fernandez et al., 2013).

As in other studies, our study also had limitations, one of which was that we only included a specific group of populations that may not represent a larger population. Despite these limitations, this study is essential as it highlights that patients with DE symptoms may have co-morbidities, such as insomnia, that need to be evaluated and addressed using a
multidisciplinary approach.

CONCLUSIONS

After analyzing the data we collected, we have shown that there is a positive association between dry eye symptoms and insomnia. We also showed that the severity of the insomnia is high when the patient is associated with severe ocular pain or intense burning/itching sensation. Also, there is a significant association between co-morbidity among dry eye patients and poor sleep quality.

Conflict of interest

The authors declare that they have no conflict of interest for this study.

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