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Association of Dry Eye, Sleep Quality, Anxiety and Depression among Young Pakistani Adults: A Cross-Sectional Study

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ABSTRACT

Tear film instability is a hallmark of dry eye disease, a multifactorial disorder which is affected by several variables such as sleep quality, depression and anxiety. **Objectives:** To examine the connections between anxiety, depression, dry eye and sleep quality. **Methods:** A cross-sectional study was carried out at Madinah Teaching Hospital, Faisalabad. Prerequisites for inclusion were being between the ages of 20-35 years and not having any clinically significant eye disorders or reported sleep disorders. Patients who were taking medication or who had undergone surgery in the six months prior were not included. Descriptive statistics, Pearson correlation and multiple linear regression were used to assess the results of the HADS, OSDI and PSQI, which were used to measure symptoms of anxiety and depression, dry eye and sleep quality, respectively. **Results:** Multiple linear regression revealed a significant ($p<0.001$) relationship between the OSDI and PSQI subscales (sleep latency, sleep disturbances and use of sleep medications). Other indicators that did not show statistically significant relationships with the regression model included subjective sleep quality, sleep duration, habitual sleep efficiency, and dysfunction during the day ($p>0.001$). Multiple linear regression analysis revealed that the OSDI and the other variables HADS-A, HADS-D and PSQI total score were related to the following values: $p=0.29$, $p=0.001$and $p<0.001$, respectively. **Conclusions:** Dry eye was closely associated with depression and disturbed sleep, although it did not significantly correlate with anxiety. The OSDI scores and the PSQI subscale showed significant associations, suggesting a link between dry eye and sleep quality.

INTRODUCTION

Dry eye disease (DED) is a complicated disorder that affects the ocular surface and tear film [1]. Millions of people worldwide are impacted by prevalence estimates that vary from 5% to 50%, depending on the population being studied [2]. DED presents a significant financial burden due to both direct treatment expenses and reduced productivity at work [3]. Common symptoms include burning in the eyes, light sensitivity, ocular discomfort and blurred vision [4]. Because they make it more difficult to work, socialize and perform everyday activities, these symptoms have the potential to drastically reduce quality of life [5, 6]. Dry eye disease pertains to two varieties: chronic and episodic. Episodes of DED are frequently caused by factors such as prolonged visual demands that reduce blinking. If these underlying causes persist over time, episodic DED may gradually give way to the chronic type of DED [7-9]. Anxiety and depression are two of the most prevalent mood disorders, and dry eye may severely impact a patient's mental health and quality of life [10]. The phrase sleep disorders encompass a range of ailments, including insomnia and obstructive sleep apnea, that impair the quality of sleep. In recent years, these anomalies have increased in frequency [11, 12]. Reduced tear production and elevated tear osmolarity could be the cause of the link between sleep deprivation and DED [13]. The link between sleep quality and dry eye disease (DED) has been

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the subject of numerous studies conducted in nations such as the United States, South Korea, Japan and Turkey [14–17]. No previous study has examined the connections between sleep disturbances, anxiety, depression and dry eye disease (DED) in the Pakistani population, despite the growing recognition of these connections. It was hypothesized that people with DED would experience more psychological distress and have worse sleep than people without DED.

This study aims to assess the association between dry eye disease, anxiety, depression and sleep quality among adults in Faisalabad, Pakistan, given the rising incidence of DED and mental health issues, particularly in urban areas.

METHODS

The cross-sectional study has 370 individuals who were recruited at the Madina Teaching Hospital in Faisalabad, Pakistan, between March and May 2025. TUF/IRB/19/25 was the reference number of the ethical approval letter for this study received from the University of Faisalabad's Ethical Institutional Review Board. The procedure employed in this investigation adhered to the principles of the Helsinki Declaration. Every participant in the study provided their informed consent. Using the Rao-Soft software, the study's sample size was determined to be 370 participants. A 95% confidence level, a population size of 10,000 and a 5% margin of error were among the parameters employed in the computation. To find study participants, a method of non-probability purposive sampling was used. Participants in the study had to be 20 -35 years of age, university-educated adults of both genders, with a clinically verified diagnosis of dry eye disease, good general health, sufficient cognitive ability, and enough English proficiency to understand and fill out the study questionnaires on their own. Individuals with anterior segment ocular problems, bilateral cataracts, severe glaucoma or a history of ocular surgery within the last three months were not included. People with systemic conditions such as serious heart diseases, autoimmune diseases, neurological or behavioural disorders and allergic diseases were also not included. Individuals who were on hormonal contraceptives, antidepressants, anti-anxiety medications or had a history of anxiety or depression were not allowed to participate. Additionally, excluded were women who were lactating or pregnant. Medical and demographic data were collected from each participant. The Ocular Surface Disease Index (OSDI), a self-administered questionnaire intended to identify the severity of self-reported dry eye disease (DED), was filled out by each participant. Participants were divided into normal (0–12), mild (13–22), moderate (23–32), and severe (33–100) based on their sum of OSDI scores. A DED score of 13 or higher was considered indicative. The Ocular Surface Disease Index (OSDI)© is used to quantify the particular impacts of dry eye [18]. The Pittsburgh Sleep Quality Index (PSQI) was used to evaluate the quality of sleep during the previous month [19]. Subjective sleep quality, sleep latency, length, habitual sleep efficiency, sleep interruptions, use of sleep aids, and dysfunction throughout the day are the seven factors assessed by this questionnaire. The overall score ranges from 0 to 21, with each PSQI component having a value between 0 and 3. Poorer sleep quality is implied by higher scores. Poor sleep was indicated by a total score higher than 7. Snaith and Zigmond developed the Hospital Anxiety and Depression Scale (HADS) to evaluate patients for symptoms of anxiety and depression in normal hospital settings [20]. The 14 items are divided into two subscales, one for depression and one for anxiety, each containing seven items. Anxiety or despair may be present if the total score is 8 or above. A four-point Likert scale (0–3) is used to provide a score to each item. The extensive usage of HADS is explained by its exceptional reliability and accuracy in clinical and research settings. Data were collected using the English versions of the OSDI, PSQI and HADS questionnaires because there were no verified Urdu translations available at the time of the study. To ensure that participants could consistently complete these tools, English language proficiency had been added to the inclusion criteria. Statistical analysis was conducted using IBM SPSS software (Version 23.0). While mean ± standard deviation (SD) is used to demonstrate continuous variables like age, frequency distributions were utilized to highlight categorical data like gender and the frequency of dry eyes. The associations between psychological stress (assessed by the HADS), sleep quality (assessed by the PSQI), and dry eye symptoms (assessed by the OSDI) were examined using Pearson correlation analysis. Multiple linear regression models were also used to investigate the potential mediating effects of total PSQI and HADS scores on the relationship between OSDI scores. The relationship between particular PSQI subscale scores and OSDI scores was examined using both multiple linear regression analysis and Pearson correlation. Standardized regression coefficients (Beta) were used to reflect the quantity of the direct and indirect effects, while unstandardized regression coefficients (B) were used to determine their significance. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

The demographic data collected for this study included age and gender. The sample size was 370 individuals in total. For statistical analysis, frequency distribution and descriptive statistics were applied. Participants' mean age was 22.10 ± 1.94 years. There were 110 male (29.7%) and 260 female (70.3%) among the participants. The frequency

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distribution of DED severity in the study population showed that 255 participants (68.91%) did not have DED. Of the people diagnosed with DED, 24 (6.48%) had severe DED, 50 (13.51%) had moderate DED, and 41 (11.08%) had mild DED, respectively (Table 1).

Table 1: Frequency of Non-DED and DED Grades

Demographic Variables		Frequency (%)
Age (Years)	Mean ± SD	22.10 ± 1.94
Gender	Male	110 (29.7%)
	Female	260 (70.3%)
Non-DED	–	255 (68.91%)
DED	Mild	41 (11.08%)
	Moderate	50 (13.51%)
	Severe	24 (6.48%)

Both the OSDI and PSQI subscale components underwent descriptive analysis. The sample had a comparatively low level of dry eye symptoms, as indicated by the mean OSDI score of 15.03 ± 18.78. Sleep latency was 0.78 ± 0.76, sleep duration was 0.89 ± 0.87, habitual sleep efficiency was 0.42 ± 0.68, sleep disturbance was 0.72 ± 0.73, use of sleep medication was 0.34 ± 0.57, subjective sleep quality was 0.94 ± 0.67, and daytime dysfunction was 0.62 ± 0.73 among the PSQI components. Pearson correlation coefficients were used to assess the relationships between OSDI and metrics for sleep quality. Significant positive correlations were found between the OSDI score and sleep disturbance ($r=0.398$, $p<0.001$), sleep medication use ($r=0.235$, $p<0.001$), daytime dysfunction ($r=0.242$, $p<0.001$), sleep latency ($r=0.284$, $p<0.001$), subjective sleep quality ($r=0.186$, $p<0.001$) and sleep duration ($r=0.164$, $p=0.001$). These findings suggest that poorer sleep quality is associated with higher levels of dry eye complaints (Table 2).

Table 2: Descriptive statistics and Correlation Matrix Analysis for OSDI and PSQI Subscales

Variable	Mean ± SD	Pearson correlation coefficient (r) with OSDI	p-Value (1-tailed)
OSDI	15.03 ± 18.78	-	-
Subjective Sleep Quality	0.94 ± 0.67	0.186	p<0.001
Sleep Latency	0.78 ± 0.76	0.284	p<0.001
Sleep Duration	0.89 ± 0.87	0.164	p<0.001
Habitual Sleep Efficiency	0.42 ± 0.68	0.157	p<0.001
Sleep Disturbance	0.72 ± 0.73	0.398	p<0.001
Use of Sleep Medication	0.34 ± 0.57	0.235	p<0.001
Day Time Dysfunction	0.62 ± 0.73	0.242	p<0.001

To ascertain which elements of sleep quality are predictive of OSDI scores, a multiple linear regression analysis was employed. The model was statistically significant ($F(7,362) = 14.47$, $p<0.001$) and accounted for over 22% of the variation in OSDI values ($R2=0.219$, Adjusted $R2 =0.203$). The variables that were shown to be substantially linked with higher OSDI scores were sleep disturbance ($B=7.19$, $p<0.001$), sleep latency ($B=3.30$, $p=0.011$) and the use of sleep medication ($B=4.48$, $p=0.006$). Other characteristics such as subjective sleep quality, duration of sleep, habitual sleep efficiency and dysfunction during the day did not show statistically significant relationships in the regression model (Table 3).

Table 3: Multiple Linear Regression Analysis Between OSDI and PSQI Subscale

Predictors	B	SE	Beta	t	p-Value	95% CI (Lower, Upper)
(Constant)	2.49	1.76	–	1.416	0.158	-0.97, 5.95
Subjective Sleep Quality	0.72	1.44	0.026	0.498	0.619	-2.12, 3.55
Sleep Latency	3.30	1.29	0.134	2.562	0.011	0.77, 5.83
Sleep Duration	0.82	1.09	0.038	0.755	0.451	-1.32, 2.95
Habitual Sleep Efficiency	2.25	1.36	0.081	1.660	0.098	-0.42, 4.92
Sleep Disturbance	7.19	1.39	0.278	5.155	p<0.001	4.45, 9.93
Use of Sleep Medication	4.48	1.62	0.137	2.770	0.006	1.30, 7.67
Daytime Dysfunction	1.48	1.36	0.058	1.095	0.274	-1.18, 4.1

Model Summary: $R = 0.468$, $R^2 = 0.219$, Adjusted $R^2 = 0.203$, $F(7,362) = 14.47$, $p<0.001$

Descriptive and correlation analyses were performed, including the OSDI, PSQI and HADS. The HADS-Depression subscale had a mean of 7.73 ± 2.89, while the HADS-Anxiety subscale had a mean of 8.23 ± 3.08. A sleep disturbance was suggested by a total average PSQI score of 4.71 ± 2.81. To investigate relationships between OSDI, HADS and PSQI total scores, Pearson correlation coefficients were computed. OSDI and HADS-A ($r=0.189$, $p<0.001$), HADS-D ($r=0.251$, $p<0.001$), and PSQI total score ($r=0.422$, $p<0.001$) showed significant positive relationships. Furthermore, both anxiety and depression showed significant relationships with PSQI scores and a moderate correlation with one another ($r=0.332$, $p<0.001$), suggesting a connection between emotional distress, sleep quality and symptoms of dry eyes (Table 4).

Table 4: Descriptive Statistics and Correlation Matrix Analysis for OSDI, PSQI, HADS-A and HADS-D

Variables	Mean ± SD	Pearson correlation coefficient (r) with OSDI	p-Value
OSDI	15.03 ± 18.78	–	–
HADS-A	8.23 ± 3.08	0.189	p<0.001
HADS-D	7.73 ± 2.89	0.251	p<0.001
PSQI Total	4.71 ± 2.81	0.422	p<0.001

A multiple linear regression analysis was performed to determine if anxiety (HADS-A), depression (HADS-D), and sleep quality (PSQI) significantly predicted dry eye symptoms (OSDI). The model was significant ($F(3,366) = 32.45$, $p<0.001$) and explained nearly 21.0% of the variation in OSDI values ($R2=0.210$). The adjusted R2 of.204 indicated a very good model fit. Regression coefficients showed that the two best predictors of OSDI were PSQI ($B=2.54$, $p<0.001$)

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and HADS-D (B=1.04, p=0.001). PSQI_TOTAL (B=2.540, p<0.001): Sleep quality had the strongest and most significant correlation with OSDI. For every unit rise in PSQI (worsening sleep), OSDI increased by 2.54 units. B=0.32, p=0.299, however, indicates that HADS-A was not a statistically significant predictor. These results suggest that poor sleep, depression and anxiety are important factors that contribute to the severity of dry eye symptoms, even while anxiety alone does not predict OSDI scores. Higher anxiety levels are somewhat linked to more dry eye symptoms, according to the findings, which showed a small but statistically significant positive correlation between HADS-A (anxiety) scores and OSDI. In contrast to anxiety, depressive symptoms as assessed by the HADS-D showed a somewhat higher connection with OSDI, indicating a more significant association between depression and dry eye. The PSQI total score, which measures overall sleep quality, showed the largest and most significant positive connection with the severity of dry eye symptoms among the three components. This implies that the development of dry eye symptoms is significantly influenced by sleep disturbances (Table 5).

Table 5: Multiple Linear Regression Analysis Between OSDI, PSQI, HADS-A and HADS-D

Predictors	B	SE	β	t	P	95% CI for B
Intercept	-7.60	3.08	—	-2.46	0.014	-13.66, -1.53
PSQI	2.54	0.32	0.379	7.90	<0.001	1.91, 3.17
HADS-A	0.32	0.31	0.052	1.04	0.299	-0.28, 0.92
HADS-D	1.04	0.32	0.160	3.23	0.001	0.41, 1.68

Model fit: $F(3,366) = 32.45$, $p<0.001$, $R^2 = 0.210$, Adjusted $R^2 = 0.204$
The results show that both poor sleep quality and elevated depression levels are significantly correlated with the severity of dry eye symptoms. In the multivariate model, anxiety did not function as an independent predictor. This implies that treating depression and sleep deprivation may help reduce dry eye symptoms, particularly in groups with borderline psychological distress.

DISCUSSION

This study examined the moderating effect of sleep on the relationships among anxiety, depression, and dry eye disease (DED). The results showed that subjective sleep quality and sleep latency appeared as mediators in the connection between DED and depression. These findings are consistent with those of Wu *et al.* who found that anxiety and depression were more common in people with DED and problems with sleep [21]. Symptoms of dry eye disease (DED) might negatively impact mood and mental health [22, 23]. Many theories have been put up to explain the association between DED and depression, even though its exact genesis is still unknown. First, it is believed that depression and DED are comorbid conditions [10, 24] with comparable risk factors such as female sex and menopause, indicating that sex hormones may contribute to the pathophysiology of both conditions. The second factor that may exacerbate DED symptoms is somatization, which is present in more than 80% of depressed individuals [25]. Furthermore, this study proposes two potential pathways, sleep latency and subjective sleep quality that could help clarify the connection between DED and psychological discomfort, such as anxiety and depression. He *et al.* conducted a cross-sectional study in 2022 in which they evaluated 321 clinic-based DED patients in China during the COVID-19 pandemic for anxiety, depression and sleep disturbance using the OSDI, HADS, and PSQI. The majority of participants reported both anxiety (26.8%) and depression (26.5%), and there was a significant correlation between mood and sleep measures and the severity of DED symptoms [26]. However, present research only found a significant association between sleep and depression, not anxiety, despite including a wide age range of community-based, university-educated Pakistanis. Variations in the environment, cultural background, and the recruitment of younger and generally healthier adults could all account for this discrepancy. These methodological and demographic differences strengthen the interpretation of our findings in the specific context of Pakistan. Magno *et al.* reported that even after treating additional relevant conditions, patients with dry eye had significantly lower sleep quality across all demographic categories [27]. Ayaki *et al.* further validated the effect of DED on sleep by finding that initiating dry eye treatment significantly improved the quality of sleep for newly diagnosed DED patients [28]. These results are consistent with our observations. This study emphasizes the connections between anxiety, depression, bad sleep quality and dry eye disease (DED), highlighting the necessity of managing DED with a multidisciplinary approach. Practitioners are encouraged to screen for psychological and sleep disorders and take into consideration early referrals to sleep or mental health specialists because DED can significantly impair quality of life. Incorporating validated diagnostic tools into clinical evaluations can help guide focused interventions. This cross-sectional study clarifies the relationship between psychological stress, sleep issues and dry eye, although it does not establish causation. It is more difficult to understand the long-term effects in the absence of follow-up. This study suggests that future longitudinal studies should look into the possible long-term impacts of these factors.

CONCLUSIONS

It was concluded that there was no significant association between dry eye disease and anxiety, although it was significantly associated with depression and poor sleep quality. Therefore, when a patient present with DED, it is advised that eye care providers carefully screen for anxiety, depression and sleep problems as part of a comprehensive therapy approach.

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Authors Contribution

Conceptualization: SB
Methodology: AH, HW, MS
Formal analysis: AA, SRB
Writing review and editing: MJ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Hakim FE and Farooq AV. Dry Eye Disease: An Update in 2022. Journal of the American Medical Association. 2022 Feb; 327(5): 478-9. doi: 10.1001/jama.2021.19963.

[2] Papas EB. The Global Prevalence of Dry Eye Disease: A Bayesian View. Ophthalmic and Physiological Optics. 2021 Nov; 41(6): 1254-66. doi: 10.1111/opo.12888.

[3] Chan C, Ziai S, Myageri V, Burns JG, Prokopich CL. Economic Burden and Loss of Quality of Life from Dry Eye Disease in Canada. British Medical Journal Open Ophthalmology. 2021 Sep; 6(1). doi: 10.1136/bmjophth-2021-000709.

[4] Tsubota K, Pflugfelder SC, Liu Z, Baudouin C, Kim HM, Messmer EM *et al.* Defining Dry Eye from A Clinical Perspective. International Journal of Molecular Sciences. 2020 Dec; 21(23): 9271. doi: 10.3390/ijms21239271.

[5] Pan H, Pan X, Gu D, Wang X. Effects of Social Support on Vision-Related Quality of Life in Older Adults with Dry Eye Disease: The Chain Mediating Role of Illness Perception and Coping Style. Frontiers in Psychology. 2024 Jul; 15: 1411661. doi: 10.3389/fpsyg.2024.1411661.

[6] Cutrupi F, De Luca A, Di Zazzo A, Micera A, Coassin M, Bonini S. Real Life Impact of Dry Eye Disease. In Seminars in Ophthalmology. 2023 Nov; 38(8): 690-702. doi: 10.1080/08820538.2023.2204931.

[7] Liu M, Kumar A, Bukkapatnam S, Kuttolamadom M. A Review of the Anomalies in Directed Energy Deposition (DED) Processes and Potential Solutions-Part Quality and Defects. Procedia Manufacturing. 2021 Jan; 53: 507-18. doi: 10.1016/j.promfg.2021.06.093.

[8] Oganov A, Yazdanpanah G, Jabbehdari S, Belamkar A, Pflugfelder S. Dry Eye Disease and Blinking Behaviors: A Narrative Review of Methodologies for Measuring Blink Dynamics and Inducing Blink Response. The Ocular Surface. 2023 Jul; 29: 166-74. doi: 10.1016/j.jtos.2023.05.011.

[9] Sabucedo-Villamarin B, Garcia-Queiruga J, Cacabelos-Torres L, Giraldez MJ, Yebra-Pimentel E, Pena-Verdeal H. Short-Term Changes in Tear Film Stability and Tear Volume Following the Application of Various DED Management Options in a Healthy Young Population. Journal of Personalized Medicine. 2025 Apr; 15(5): 173. doi: 10.3390/jpm15050173.

[10] Morthen MK, Magno MS, Utheim TP, Snieder H, Hammond CJ, Vehof J. The Physical and Mental Burden of Dry Eye Disease: A Large Population-Based Study Investigating the Relationship with Health-Related Quality of Life and Its Determinants. The Ocular Surface. 2021 Jul; 21: 107-17. doi: 10.1016/j.jtos.2021.05.006.

[11] Bijwadia J. Current Classification of Sleep Disorders. In Dental Sleep Medicine: A Clinical Guide. 2022 Sep: 71-101. doi: 10.1007/978-3-031-10646-0_3.

[12] Anghel L, Ciubară A, Nechita A, Nechita L, Manole C, Baroiu L *et al.* Sleep Disorders Associated with Neurodegenerative Diseases. Diagnostics. 2023 Sep; 13(18): 2898. doi: 10.3390/diagnostics13182898.

[13] Li A, Zhang X, Guo Y, Wang J, Hao Y, Gu Y *et al.* The Association Between Dry Eye and Sleep Disorders: The Evidence and Possible Mechanisms. Nature and Science of Sleep. 2022 Dec: 2203-12. doi: 10.2147/NSS.S378751.

[14] Sariyeva İsmayılov A and Aydin Guclu O. The Effect of OSAS Risk, Excessive Daytime Sleepiness, Insomnia Severity and Sleep Quality on Dry Eye Syndrome. Sleep and Biological Rhythms. 2020 Jul; 18(3): 259-65. doi: 10.1007/s41105-020-00267-9.

[15] An Y and Kim H. Sleep Disorders, Mental Health, and Dry Eye Disease in South Korea. Scientific Reports. 2022 Jun; 12(1): 11046. doi: 10.1038/s41598-022-14167-0.

[16] Citradewi AA, Widiana IG, Susila NK, Djelantik AA. Correlation of Depression, Anxiety and Stress Level on Dry Eye Disease Severity. International Journal of Health Sciences. 2022 Sep; 6(S9): 1733-44. doi: 10.53730/ijhs.v6nS9.12747.

[17] McCann P, Abraham AG, Mukhopadhyay A, Panagiotopoulou K, Chen H, Rittiphairoj T *et al.* Prevalence and Incidence of Dry Eye And Meibomian Gland Dysfunction in the United States: A Systematic Review and Meta-Analysis. Journal of the American Medical Association Ophthalmology. 2022 Dec; 140(12): 1181-92. doi: 10.1001/jamaophthalmol.2022.4394.

[18] Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and Validity of the Ocular

DOI: https://doi.org/10.54393/pbmj.v8i7.1267

Surface Disease Index. Archives of Ophthalmology. 2000 May; 118(5): 615-21. doi: 10.1001/archopht.118.5.615.

[19] Zarrabi H, Novin MH, Soleimani R, Shirkhan Maleki B, Speily SK. The Psychometric Properties of the Persian Version of the Smoking Urge Questionnaire in the General Population. Caspian Journal of Neurological Sciences. 2024 Jul; 10(3): 218-24. doi: 10.32598/CJNS.10.38.488.1.

[20] Snaith RP and Zigmond AS. The Hospital Anxiety and Depression Scale. British Medical Journal (Clinical research ed.). 1986 Feb; 292(6516): 344. doi: 10.1136/bmj.292.6516.344.

[21] Wu M, Liu X, Han J, Shao T, Wang Y. Association Between Sleep Quality, Mood Status, and Ocular Surface Characteristics in Patients with Dry Eye Disease. Cornea. 2019 Mar; 38(3): 311-7.

[22] He Q, Chen Z, Xie C, Liu L, Yang H, Wei R. Relationship Between Dry Eye Disease and Emotional Disorder: The Mediating Effect of Health Anxiety. Frontiers in Public Health. 2022 Feb; 10: 771554. doi: 10.3389/fpubh.2022.771554.

[23] Zhou Y, Murrough J, Yu Y, Roy N, Sayegh R, Asbell P et al. Association Between Depression and Severity of Dry Eye Symptoms, Signs, and Inflammatory Markers in the DREAM Study. Journal of the American Medical Association Ophthalmology. 2022 Apr; 140(4): 392-9. doi: 10.1001/jamaophthalmol.2022.0140.

[24] Nuzzi R and Caselgrandi P. Sex Hormones and Their Effects on Ocular Disorders and Pathophysiology: Current Aspects and Our Experience. International Journal of Molecular Sciences. 2022 Mar; 23(6): 3269. doi: 10.3390/ijms23063269.

[25] Basilious A, Xu CY, Malvankar-Mehta MS. Dry Eye Disease and Psychiatric Disorders: A Systematic Review and Meta-Analysis. European Journal of Ophthalmology. 2022 Jul; 32(4): 1872-89. doi: 10.1177/11206721211060963.

[26] He Q, Chen Z, Xie C, Liu L, Wei R. The Association Between Dry Eye Disease with Depression, Anxiety and Sleep Disturbance During COVID-19. Frontiers in Psychiatry. 2022 Jan; 12: 802302. doi: 10.3389/fpsyt.2021.802302

[27] Magno MS, Utheim TP, Snieder H, Hammond CJ, Vehof J. The Relationship Between Dry Eye and Sleep Quality. The Ocular Surface. 2021 Apr; 20: 13-9. doi: 10.1016/j.jtos.2020.12.009.

[28] Ayaki M, Toda I, Tachi N, Negishi K, Tsubota K. Preliminary Report of Improved Sleep Quality in Patients with Dry Eye Disease After Initiation of Topical Therapy. Neuropsychiatric Disease and Treatment. 2016 Feb: 329-37.