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Prevalence of Dry Eye Syndrome and Associated Factors Among University Students

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Abstract

Objective: To investigate the prevalence of dry eye syndrome (DES) and its association with risk factors among university students.

Methods: This cross-sectional study was conducted between May and November 2019 with 400 students at a foundation university. Data were collected face-to-face using a personal information form, the Ocular Surface Disease Index (OSDI), and the Young Internet Addiction Test-Short Form (YIAT-SF). Non-parametric tests, Spearman correlation, and median regression analysis were applied.

Results: Mild, moderate, and severe DES were observed in 19.7%, 15.6%, and 40.0% of students, respectively. The mean YIAT-SF score was 28.27 ± 8.29, indicating moderate to high levels of internet addiction. OSDI scores differed significantly by gender, class level, eye complaints, eye disease diagnosis, and use of glasses/contact lenses ($p<.05$). A positive, weak but significant correlation was found between OSDI and internet addiction scores (rho = 0.227; $p<.01$). Median regression analysis identified internet addiction, female gender, upper class level, and presence of eye complaints as significant predictors of OSDI scores.

Conclusion: DES is prevalent among university students. Internet addiction, female gender, higher class level, and eye complaints were associated with higher OSDI scores. From a public health nursing perspective, strengthening education and awareness efforts to prevent dry eyes in university students at the primary prevention level, supporting behavioral change programs to reduce screen time, identifying at-risk groups, planning targeted interventions, and expanding eye health screenings are crucial.

Keywords: Dry Eye Syndrome, Ocular Surface Disease Index, Internet Addiction, University Students

Öz

Üniversite Öğrencilerinde Göz Kuruluğu Sendromunun Görülme Sıklığı ve İlişkili Faktörler

Amaç: Üniversite öğrencileri arasında göz kuruluğu sendromu (DES) prevalansının ve risk faktörleri ile olan ilişkisinin incelenmesidir.

Yöntem: Bu kesitsel çalışma, Mayıs-Kasım 2019 tarihleri arasında bir vakıf üniversitesinde öğrenim gören 400 öğrenciyle yürütülmüştür. Veriler, kişisel bilgi formu, Oküler Yüzey Hastalıkları İndeksi (OSDI) ve Young İnternet Bağımlılığı Testi-Kısa Formu (YIAT-SF) kullanılarak yüz yüze görüşme yöntemiyle toplanmıştır. Verilerin analizinde non-parametrik testler kullanılmış, spearman korelasyon katsayısı ve Medyan regresyon analizi kullanılmıştır.

Bulgular: Öğrencilerin %19.7'sinde hafif, %15.6'sında orta ve %40'ında şiddetli kuru göz sendromu saptanmıştır. Young İnternet Bağımlılığı Testi Kısa Formu sonucuna göre öğrencilerin puan ortalaması 28.27±8.29 olarak belirlenmiştir. OSDI puanları cinsiyete, sınıf düzeyine, gözle ilgili şikâyetlere, göz hastalığı tanısına ve gözlük/lens kullanımına göre anlamlı farklılık göstermiştir ($p<.05$). OSDI puanı ile internet bağımlılığı arasında anlamlı ve pozitif bir korelasyon saptanmıştır (rho = 0.227, $p<.01$). Medyan regresyon analizinde internet bağımlılığı düzeyi, kadın cinsiyeti, üst sınıf düzeyi ve göz şikâyeti varlığı OSDI için anlamlı yordayıcılar olarak belirlenmiştir.

Sonuç: Üniversite öğrencilerinde kuru göz sendromunun yaygın olduğu belirlenmiştir. İnternet bağımlılığı, kadın cinsiyeti, ileri sınıf düzeyi ve gözle ilgili sağlık öyküsünün öğrencilerde OSDI puanlarını artıran önemli etkenler olduğu görülmüştür. Halk sağlığı hemşireliği açısından birincil koruma düzeyinde üniversite öğrencilerinde göz kuruluğunu önlemeye yönelik eğitim ve farkındalık çalışmalarını güçlendirilmesi, ekran süresini azaltmaya ve göz kırpmaya yönelik davranış değişikliği programlarının desteklenmesi ve riskli grupların belirlenerek hedefli müdahalelerin planlanması, göz sağlığı taramalarının yaygınlaştırılması önem taşımaktadır.

Anahtar Kelimeler: Kuru Göz Sendromu, Oküler Yüzey Hastalığı İndeksi, İnternet Bağımlılığı, Üniversite Öğrencisi

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INTRODUCTION

Dry eye syndrome (DES) is a common health problem that arises from the multifactorial disruption of the tear film and ocular surface, leading to impaired ocular surface homeostasis. The pathophysiology of DES is characterized by a self-perpetuating cycle involving tear hyperosmolarity, inflammation, and epithelial damage (Gayton, 2009; Colligris et al., 2014; Zhang et al., 2017; Stapleton et al., 2017). In recent years, a marked increase in DES prevalence among young adults has been reported, and this trend is largely attributed to the rise in digital screen use (Awasthi, 2020).

Numerous studies have demonstrated that digital screen exposure reduces blink rate, increases tear evaporation, and elevates ocular surface stress (Phadatare et al., 2015; Kırağ & Temel, 2016; Patel et al., 2023; Sheppard et al., 2018). During the Covid-19 pandemic, DES symptoms increased significantly in parallel with extended screen time (Prescott, 2021). Studies conducted among university students report DES prevalence rates ranging from 30% to 50%, indicating that younger populations are now at considerable risk (Hasan, 2022). Another study conducted with medical students reported a prevalence of DED of 74.08% (Abu-Ismail et al., 2023). According to the Turkish Statistical Institute, internet use among young individuals exceeds 87% (Turkish Statistical Institute, 2024). However, research examining the relationship between internet addiction and DES in this population remains limited (Sağlan et al., 2017; Kaya, 2019).

DES risk factors are classified as non-modifiable (age, sex, autoimmune diseases) and modifiable (screen time, contact lens use, smoking) (Stapleton et al., 2017). A recent study shows the female gender's prolonged use of electronic devices for more than six hours is significantly associated with symptomatic DES (Abu-Ismail et al., 2023). Internet addiction has also been identified as an emerging behavioral risk factor due to prolonged screen exposure, particularly because reduced blink frequency exacerbates DES symptoms (Gowrisankaran & Sheedy, 2015; Sağlan et al., 2017; Hasan, 2022).

Lifestyle-based strategies such as the 20-20-20 rule, intentional blinking exercises, optimizing ambient humidity and lighting, and limiting prolonged screen use are recommended for DES prevention and symptom management (Coles-Brennan et al., 2019; Savur et al., 2024).

From a nursing perspective, the inclusion of "Risk for dry eye" and "Ineffective dry eye self-management" in the NANDA-I taxonomy highlights nurses' professional responsibility in DES risk assessment, symptom monitoring, and self-management education (Carpenito, 2024). Recent evidence indicates that nursing-led education and self-care interventions reduce DES symptom severity and promote behavioral change (Rabie et al., 2024; de Medeiros-Araújo et al., 2024). Therefore, examining DES in young adults is important for strengthening the preventive and educational dimensions of nursing care.

From a public health nursing standpoint, this growing burden is particularly relevant, as nurses play a critical role in early identification of risk factors, health education, preventive strategies, and the promotion of healthy digital behaviors among young populations. Consequently, determining the prevalence of DES and its associated factors among university students is crucial for informing preventive nursing practices and developing evidence-based health promotion programs.

This study aims to investigate the prevalence of dry eye syndrome (DES) and its association with risk factors among university students.

Research questions

1. What is the prevalence of dry eye syndrome (DES) among university students?
2. Which factors are associated with DES in university students?
3. Is there an association between DES and internet addiction?

METHODS

Design

This study is a descriptive and analytical cross-sectional study designed to investigate the prevalence of dry eye syndrome (DES) and its association with risk factors among university students.

The Variables of the Research

Independent Variables: Socio-demographic characteristics of the students, vision problems and health problems, internet usage time, Young Internet Addiction Test Short Form score.

Dependent Variables: Ocular Surface Disease Index (OSDI) score

Setting of the Study

This study was conducted at a foundation university in Ankara, Türkiye, between May and November 2019. The study population comprised students enrolled in 11 faculties and 3 vocational schools at the university during the period of data collection.

Sample

The population of the study consisted of 12,961 students enrolled at the university during the data collection period. A stratified random sampling method was used, in which strata were formed based on faculty size, and the number of participants selected from each stratum was proportional to its share within the total population. The minimum required sample size was calculated using the formula for finite populations:

$$n = (N * t^2 * p * q) / (d^2 * (N - 1) + t^2 * p * q)$$

A 95% confidence level (t = 1.96), a margin of error of 0.05, and p = .5, q = 0.5 were used to ensure maximum variance. The calculation yielded a minimum sample size of 374. To account for potential data loss due to incomplete responses, a total of 400 students were invited to participate. The final sample consisted of students who voluntarily agreed to participate and provided informed consent. A stratified proportional sampling method was used to ensure that the sample accurately reflected the distribution of students across academic units. Each faculty and vocational school was treated as an individual stratum. The minimum number of students to be selected from each stratum was determined proportionally based on the total number of students enrolled in that unit. The sample size for each stratum was determined by multiplying the proportion of students in that stratum relative to the total student population by the minimum required sample size for the study. This approach ensured that each faculty or vocational school was represented in the sample according to its weight within the overall population.

To evaluate the adequacy of the sample size, a post-hoc power analysis was conducted for the Mann–Whitney U test comparing OSDI scores between students with a diagnosed eye disease (n = 205) and those without (n = 195). The analysis indicated a medium-to-large effect size (r = 0.35) and demonstrated 99% statistical power at α = 0.05. These findings confirm that the sample size was more than sufficient to detect the significant difference observed between the groups (U = 11,876.50, Z = −7.023, p < .001), with virtually no risk of a Type II error (IBM Corp., 2020).

Inclusion Criteria for the Study

- Being a student at the university where the study was conducted
- Being a volunteer

Exclusion Criteria for the Study

- Incomplete data form

Data Collection Procedure

A pilot test was conducted with 30 students to evaluate clarity and feasibility; these data were excluded from the final sample.

Data collection forms were distributed to students who volunteered to participate in the study, taking into account the number of students to be taken from the faculties, between classes, and the filled forms were then collected. The data were checked, and the data obtained from 400 students were included in the analysis.

Data Collection Tools

In this study, data collection was carried out through a structured questionnaire consisting of three sections. The first section included a personal information form that gathered data on participants' demographic details and health-related factors (Simavlı et al., 2014; Kırağ, & Temel, 2016; Sağlan et al., 2017; Kaya, 2019; Muntz et al., 2022). The second section used the Ocular Surface Disease Index (OSDI) to assess symptoms related to ocular surface conditions. The third section used the Short Form of the Young Internet Addiction Test (YIAT-SF) to assess the level of internet addiction.

The OSDI measures dry eye symptoms across 12 items related to ocular discomfort, visual function, and environmental triggers. The scale is a 5 point Likert scale (0-4). The Ocular Surface Disease Index score is obtained by multiplying the sum of the scores given to 12 questions by 25 and dividing by the number of questions answered, as stated in the original questionnaire. Scores range from 0 to 100. According to the Ocular Surface Disease Index score; 0-12 points are considered normal, 13-22 points are considered mild, 23-32 points are considered moderate and 33-100 points are considered severe dry eye syndrome (Grubbs et al., 2014). The Turkish version of the OSDI has a Cronbach's α value of 0.85 (Sağlan et al., 2017). OSDI in our study Cronbach's Alpha (α) value was found to be 0.85.

The YIAT-SF is a 12-item self-report instrument adapted from Young's original Internet Addiction Test (Young, 1998; Pawlikowski et al., 2013). The scale is a 5 point Likert scale (1=never to 5=always). The scores obtained from the scale range from 12 to 60, and there are no reverse-scored items. Higher scores indicate a higher level of internet addiction. The Turkish version was validated in university students and demonstrated high reliability (Cronbach's α = 0.85) (Kutlu et al., 2016). The YIAT-SF in our study Cronbach's Alpha (α) value was found to be 0.84.

Ethical Considerations

Approval for the study was obtained from the Medical and Health Sciences Research Ethics Committee of the Foundation University where the research was conducted (Approval No: KA19/178, Date: 24.05.2019). Permission to conduct the study was also obtained from the University Rectorate, and informed consent was secured from the students who agreed to participate, both in written and verbal form. In addition, authorization to use the scales employed in the study was obtained from the original authors who had established their validity and reliability. All data were stored securely.

Data Analysis

All data analyses were performed using IBM SPSS 27.0 (IBM Corp., 2020). Continuous variables were reported by mean (standard deviation) and median (interquartile range); categorical variables were reported by number and percent. In the study, the normality of the dependent variables (OSDI Score) was first evaluated using the Shapiro-Wilk test, and the assumption of normality was rejected ($p < .001$) (Shapiro & Wilk, 1965). Non-parametric tests (Mann-Whitney U and Kruskal-Wallis H) were used. Spearman's rank correlation coefficient was used to assess the association between OSDI scores and internet addiction levels.

Regression analysis was applied to examine the effect of the independent variables on the dependent variable. Median regression was preferred because the dependent variable, the OSDI score, did not show a normal distribution (Khajoei Nejad et al., 2023). Statistical significance was set at $p<.05$.

Limitations and Generalizability of the Research

The data collection phase of the study was conducted during the students' final examination period. During this time, students tend to use computers and the internet more frequently due to thesis and project work, and they may also experience sleep deprivation while studying. These factors could have contributed to an increase in eye-related complaints and are therefore considered a limitation of the study. Furthermore, as the study was conducted at a single university, the findings may not be generalizable to all university students.

RESULTS

The mean age of the students was 21.00 ± 2.28 years (min:18, max:29), and 89.8% of them were under 25 years old. The majority of participants were female (62.0%), and 54.5% reported an above-average family income level. Most students (64.8%) were in their first or second year, 89.2% lived with their families, and approximately half were non-smokers.

Table 1 presents students' knowledge about chronic diseases, eye health, and their internet usage habits. Overall, 4.8% of participants reported having a chronic disease, while 95.2% indicated they had no chronic health problems. Among students with chronic diseases (n = 19), 52.6% had diabetes and 47.4% had thyroid disorders.

Regarding ocular health, 32.0% of participants reported visiting a doctor for eye-related complaints. More than half (51.0%) had received at least one diagnosis of an eye disease, with myopia/hyperopia (63.1%) and astigmatism (35.1%) being the most common, whereas cataract (1.1%) and ocular hypertension (0.7%) were less frequently reported.

In terms of corrective vision use, 53.0% of students did not use glasses or contact lenses, 26.0% used glasses, 10.2% used contact lenses, and 6.8% used both. A small proportion (4.0%) had previously used corrective devices but were not current users. Only 3.5% of students had undergone eye surgery, all of which were LASIK procedures.

Almost all participants (99.5%) reported using the internet, with an average daily usage of 4.71 ± 2.90 hours. Social media (92.9%) and educational purposes (63.3%) were the most common reasons for internet use. The mean score on the Young's Internet Addiction Test–Short Form (YIAT-SF) was 28.27 ± 8.29, indicating a generally moderate level of internet addiction among participants (Table 1).

The mean OSDI value is 28.13 ± 18.13. This value is greater than the defined cut-off point (OSDI scores > 12) for diagnosis of DES. According to the OSDI questionnaire, the prevalence of DES among students is 75.3%. According to the OSDI score classification, it was determined that one-fourth of the students had a normal ocular surface (24.7%, n = 99), but 19.7% (n = 79) had mild, 15.6% (n = 62) moderate, and 40.0% (n = 160) severe ocular surface disease (Table 2).

The OSDI scores differed significantly by gender. Female students had higher scores (Mean Rank = 221.09) compared with male students (Mean Rank = 166.91) ($U = 13742$, $Z = -4.553$, $p < .001$). A significant difference was observed between class levels ($\chi^2 = 9.152$, $df = 3$, $p = .027$). Post hoc comparisons indicated that second-, third-, and fourth-year students (Median = 25.00, 29.16, and 33.33, respectively) had higher OSDI scores than first-year students (Median = 21.87). No statistically significant differences were found according to smoking status ($p = .590$) or chronic disease status ($p = .477$). Students who reported visiting a doctor due to eye-related complaints had higher scores (Mean Rank = 265.84) than those who did not (Mean Rank = 169.75) ($U = 9044$, $Z = -7.760$, $p < .001$).

Table 1. Students' knowledge about chronic diseases, eye health and they status internet usage (n=400)

Chronic disease status	n	%
Yes	19	4.8
No	381	95.2
Types of chronic disease (n=19)		
Diabetes	10	52.6
Thyroid	9	47.4
Going to the doctor with eye complaints		
Yes	128	32.0
No	272	68.0
Diagnosis of eye disease		
Yes	205	51.0
No	195	49.0
Eye disease diagnosis *		
Myopia/hyperopia	185	63.1
Astigmatism	103	35.1
Cataract	3	1.1
Eye pressure	2	0.7
Glasses/lens usage status		
Does not use	212	53.0
Glasses	104	26.0
Contact lenses	41	10.2
Uses both glasses and contact lenses	27	6.8
Previously used	16	4.0
Eye surgery status		
Yes	14	3.5
No	386	96.5
Eye surgery (n=14)		
Lasik	14	100.0
Internet usage		
Yes	398	99.5
No	2	0.5
Time spent on the internet (n=398) (x̄±ss; 4.71±2.90)		
0-5 hours	278	69,8
6 hours and above	120	30,2
YIAT-SF score x̄±sd; 28.27 ± 8.29		

*x=Mean, sd=standart deviation. *The participant marked more than one option in this question.*

Table 2. Distribution of dry eye syndrome according to students' OSDI

OSDI (x̄±sd; 28.13±18.13)	N	%
Normally	99	24.7
Mild	79	19.7
Moderate	62	15.6
Severe	160	40.0

x=Mean, sd=standart deviation, OSDI= Ocular Surface Disease Index.

Participants with a diagnosis of eye disease also had higher OSDI scores (Mean Rank = 240.07) than those without such a diagnosis (Mean Rank = 158.91) (U = 11876.5, Z = –7.023, p < .001). There was a significant difference in OSDI scores across glasses/lens usage groups (χ^2 = 46.426, df = 4, p < .001). Post hoc analysis showed that individuals who used glasses (Mean Rank = 224.46), contact lenses (Mean Rank = 254.06), or both (Mean Rank = 276.69) had higher OSDI scores compared to those who did not use any visual aids (Mean Rank = 165.58). Participants who had previously used glasses or lenses (Mean Rank = 241.66) had intermediate scores between the two groups (Table 3).

A statistically significant positive correlation was observed between the OSDI total score and Young's Internet Addiction score (Spearman's rho = 0.227, *p* < .01, *n* = 400). This finding suggests that students with higher levels of internet addiction tend to experience more severe dry eye symptoms. Although the correlation coefficient indicates a weak but meaningful association, the result highlights the potential ocular health risks associated with prolonged screen exposure and excessive internet use among young adults (Table 4).

To identify the predictors of OSDI (Ocular Surface Disease Index) scores, a median regression analysis was conducted including the Young Internet Addiction Test (YIAT) score, time spent on the internet, gender, class level, use of glasses or contact lenses, presence of eye disease, and presence of eye complaints. In Table 5 the results indicated that the Young score was a significant and positive predictor of OSDI scores (B = 0.426, SE = 0.116, t = 3.661, p < .001, 95% CI [0.197, 0.654]); therefore, higher levels of internet addiction were associated with increased ocular surface disease symptoms. Gender was also found to be a significant factor, with female students having significantly higher OSDI scores than male students (B = 4.076, SE = 1.989, t = 2.049, p = .041, 95% CI [0.165, 7.987]). Compared to fourth-year students, first – and second-year students had significantly lower OSDI scores (B = – 10.652, p < .001; B = – 10.163, p < .001), while the difference for third-year students was not significant (p = .250). Regarding the use of glasses or contact lenses, participants who reported that they no longer used either had significantly lower OSDI scores than those who currently used both glasses and contact lenses (B = – 11.676, SE = 5.839, t = – 2.000, p = .046, 95% CI [-23.156, – 0.195]); no significant differences were found among the other categories. The presence of eye disease was not a significant predictor of OSDI scores (p = .135), whereas participants reporting eye complaints had significantly higher OSDI scores compared to those without complaints (B = 11.630, SE = 2.139, t = 5.437, p < .001, 95% CI [7.425, 15.836]). Significant predictors of OSDI scores were the Young score, gender (female), class level (first and second year), previous use of glasses or contact lenses, and the presence of eye complaints.

Table 3. Mean OSDI scores according to some sociodemographic and other characteristic

Gender	N	Average Rank	Med	Q3-Q1	U	Z	p
Female	248	221.09	31.25	16.66-43.75	13742	-4.553	**0.000***
Male	152	166.91	20.83	10.41 – 33.33			
Class					**Sd**	**X^2**	**p**
1st class	132	178.16	21.87[b]	10.41-35.41			
2nd class	127	202.36	25.00[a]	14.58-38.54	**3**	9.152	**0.027***
3rd class	75	215.00	29.16[a]	14.58-42.70			
4th class	66	225.13	33.33[a]	14.58-43.75			
Smoking status	**N**	**Average Rank**			**U**	**Z**	**p**
Yes	200	203.61	27.08	12.50-41.66	19378.00	-0.538	0.590
No	200	197.39	25.00	14.58-39.58			
Chronic disease status	**N**	**Average Rank**			**U**	**Z**	**p**
Yes	19	218.89	27.08	11.45-50.00	3270	-0.711	0.477
No	381	199.58	27.08	14.58-39.58			
Going to the doctor with eye complaints	**N**	**Average Rank**			**U**	**Z**	**p**
Yes	128	265.84	39.58	25.00-52.08	9044	-7.76	**0.000***
No	272	169.75	21.87	10.41-33.33			
Diagnosis of eye disease	**N**	**Average Rank**			**U**	**Z**	**p**
Yes	205	240.07	33.33	22.91-45.83	11876.5	-7.023	**0.000***
No	195	158.91	18.75	8.33-33.33			
Glasses/lens usage status	**N**	**Average Rank**			**Sd**	**X^2**	**p**
Does not use	212	165.58	18.75[b]	10.41-34.37			
Glasses	104	224.46	31.25[a]	17.70-41.66	4	46.426	**0.000***
Contact lenses	41	254.06	35.41[a]	27.08-45.83			
Uses both glasses and contact lenses	27	276.69	35.41[a]	28.12-54.16			
Previously used	16	241.66	37.50[a]	18.75-52.08			

*sd=standard deviation, U=Mann-Whitney U test, z= standardized test statistic, p: level of significance, x^2=Chi-square test statistic. *p<.05*

Table 4. Correlation Between OSDI Total Score and Young's Internet Addiction Score

Variables	Young's Internet Addiction Score r	p
OSDI (Ocular Surface Disease Index) Total Score	0.227**	0.000

r: Spearman correlation, p < 0.01

Table 5. Median regression analysis results for variables predicting OSDI scores

Parameter	B	SE	t	p	95% CI (LB–UP)
(Intercept)	19.864	6.4450	3.082	0.002	7.192 – 32.537
Young score	0.426	0.1160	3.661	**<0.001**	0.197 – 0.654
Time spent on the internet	-0.018	0.3280	-0.055	0.956	-0.664 – 0.628
Gender					
Female	4.076	1.9890	2.049	**0.041**	0.165 – 7.987
Ref = Male	0[c]				
Class level					
1st year	-10.652	2.8130	-3.787	**<0.001**	-16.182 – – 5.122
2nd year	-10.163	2.8500	-3.566	**<0.001**	-15.766 – – 4.560
3rd year	-3.596	3.1220	-1.152	0.250	-9.734 – 2.542
Ref = 4th year	0[c]				
Use of glasses/contact lenses					
Does not use either	-8.496	5.2010	-1.634	0.103	-18.722 – 1.729
Uses glasses	-2.853	4.0070	-0.712	0.477	-10.731 – 5.024
Uses contact lenses	-7.600	4.6300	-1.642	0.102	-16.702 – 1.503
Previously used glasses or contact lenses	-11.676	5.8390	-2.000	**0.046**	-23.156 – – 0.195
Ref = Uses both glasses and contact lenses	0[c]				
Presence of eye disease					
Yes	6.196	4.1360	1.498	0.135	-1.936 – 14.327
Ref = No	0[c]				
Eye complaints					
Yes	11.630	2.1390	5.437	**<0.001**	7.425 – 15.836
Ref = No	0[c]				

Note. *B: Regression coefficient; SE: Standard error; CI: Confidence interval; LB: Lower bound; UP: Upper bound.*

DISCUSSION

Recent studies conducted in recent years have revealed that the prevalence of dry eye disease (DED) has increased significantly among university students. For example, a study conducted in Poland reported mild (24.7%), moderate (14.4%), and severe (18%) levels of DED symptoms among a considerable proportion of students (Wróbel-Dudzińska et al., 2023). In another study conducted to determine the severity of dry eye syndrome in medical students, the prevalence of symptomatic dry eye was reported to be 41% (28% mild, 11% moderate, and 2% severe) according to OSDI scoring (Tripathi et al., 2022). In our study, the high prevalence of DED also indicates that the increased symptom burden in the young adult population is consistent with the literature. Although DED is known to increase with age, it has been noted that the predictive value of age may remain limited in young adult groups due to the narrow age distribution (Al-Dossary et al., 2024). In line with this literature, the fact that the sample of our study consisted of a young age group and the age range was relatively homogeneous showed that there was no significant difference in Ocular Surface Disease Index (OSDI) scores according to categorical age variables. This suggests that DED in young populations is more influenced by environmental and behavioral factors, and that the increasing trend of DED among university students may be closely related to digital exposure, academic workload, and lifestyle characteristics.

Gender continues to stand out as one of the strongest predictors of DED in current literature. It has been reported that hormonal dynamics and physiological differences in tear film components in women affect ocular surface integrity and increase susceptibility to DED (Jiang et al., 2024). Studies conducted among university students indicate that female students have a higher risk of DED compared to males (Wróbel-Dudzińska et al., 2023). In our study, higher OSDI scores among female participants are consistent with the existing evidence and show that gender continues to be a determining factor in the young adult population as well.

Among medical conditions associated with DED are autoimmune diseases, thyroid dysfunctions, and various metabolic disorders; however, the relatively low prevalence of chronic diseases in young populations may limit the predictive value of this variable. Indeed, some studies have not detected a significant relationship between chronic disease presence and DED (Aljammaz et al., 2023; Al-Dossary et al., 2024). Similarly, the low prevalence of chronic diseases (4.8%) among participants in our study and the absence of significant differences in mean OSDI scores according to chronic disease presence suggest that the role of chronic medical conditions in the emergence of DED is relatively limited in young adults, and that the condition is shaped primarily by behavioral and lifestyle-related factors.

Contact lens use has been defined in the current literature as one of the strongest risk factors for DED. Lens use has been reported to reduce tear film stability and adversely affect ocular surface integrity. This finding is supported by recent studies showing a close relationship between contact lens use and dry eye symptoms among university students (Abdulmannan et al., 2022; Wróbel-Dudzińska et al., 2023). In our study, students who used contact lenses or glasses were found to have higher OSDI scores. This finding indicates that young individuals who require optical correction may experience more symptoms on the ocular surface and that this group should be evaluated more carefully in terms of DED.

During ocular surgeries, the transection of corneal nerves can impair the corneal reflex arc and reduce tear production, and therefore, DED may develop even after successful surgeries (Tamimi et al., 2023). The TFOS DEWS II report also emphasizes that corneal nerve damage after LASIK is an important mechanism in the pathophysiology of dry eye (TFOS, 2017). However, only 3.5% of the students in our study had undergone eye surgery, indicating that the effect of surgery-related dry eye in the young population is expectedly limited. This suggests that, due to the age characteristics of the sample, DED in this group is more associated with lifestyle and behavioral factors rather than ocular surface changes following surgery.

Moreover, the fact that 32.0% of students had previously consulted a doctor due to complaints such as dryness or burning and that this group had higher OSDI scores indicates that the symptoms constitute a significant burden at the level of clinical consultation. Studies reporting high rates of irritation and dryness among high school students (Zhang et al., 2012) support the prevalence of ocular surface complaints in young age groups. When these findings are evaluated together, it can be said that DED symptoms are frequently observed in young adults independently of surgical history and are more influenced by environmental and behavioral factors.

The effect of digital screen use on DED has been strongly demonstrated by numerous studies in recent years. The increase in screen-based learning and social media use leads to a decrease in blink rate, deterioration of tear film stability, and an increase in ocular surface stress, thereby facilitating the development of DED (Zarban et al., 2024; Phadatare et al., 2015). Studies have also shown that the marked increase in screen time during the pandemic increased the risk of DED (Ji et al., 2023; Bahkir et al., 2020). In our study, it was determined that almost all students (99.5%) were internet users and had high daily usage durations; however, no significant difference was found in OSDI scores based on internet usage duration. This may

be due to insufficient variance because digital exposure was widespread and homogeneous in the sample. In the literature, however, it is reported that DED symptoms increase significantly when daily screen time exceeds five hours (Simavlı et al., 2014; Ji et al., 2023). In addition to the time spent using digital screens, the device type, location, content, and blinking dynamics can influence dry eye syndrome (Muntz et al., 2022).

The mean YIAT-SF score of 28.27±8.29 in our study indicates that internet use in the sample generally reflects a moderately profile. The positive but weak significant correlation between OSDI and YIAT-SF scores indicates that internet use patterns contribute—albeit to a limited extent—to ocular surface symptoms. Similarly, studies conducted among both adolescents and university students have reported that problematic internet use is significantly associated with DED or digital eye strain (Sağlan et al., 2017; Condori-Meza et al., 2021; Aykutlu, 2024). Overall, significant predictors of OSDI scores were the Young score, gender (female), class level (first and second year), previous use of glasses or contact lenses, and the presence of eye complaints. In a cross-sectional study conducted among health sciences students at a university, female gender, year of study, and prolonged screen time on electronic devices were found to be associated with increased DED symptom severity and risk (Allwihan et al., 2024).

When these findings are considered together, it is understood that internet addiction and digital behavior patterns may affect DED risk not only through screen time but also through behavioral factors such as continuous use, low tendency to take breaks, and high visual load. However, the weak relationship suggests that problematic internet use is not a sole determinant in the development of DED and that it is a multidimensional component that should be evaluated together with additional factors such as ergonomics, environmental conditions, and individual susceptibility.

CONCLUSIONS

Although dry eye syndrome is reported to increase with age, the prevalence of DES was found to be high in this study conducted with university students. It was observed that one out of every 4 students experienced symptoms and signs of dry eye syndrome. DES is prevalent among university students. Internet addiction, female gender, higher class level, and eye complaints were associated with higher OSDI scores. In addition, there was a weak significant positive correlation between the OSDI score and the YIAT-SF score. These results suggest that risk factors for dry eye should be considered and that education on modifiable risk factors will be important. From a public health nursing perspective, it is recommended that education and awareness efforts to prevent dry eyes syndrome among university students at the primary prevention level be strengthened, behavioral change programs to reduce screen time be supported, and the relationship between internet addiction and eye health be included in follow-ups. In addition, within the scope of secondary protection, Eye screenings should be performed for early diagnosis. it is important to identify risk groups (female students, upper grades, those reporting eye complaints and those using glasses/lenses), plan targeted interventions and expand eye health screenings to reduce the risks, university students should be counseled and written materials about dry eye syndrome should be created to raise awareness.

Standards of Reporting
STROBE guidelines were followed.

Declaration of generative AI and AI assisted technologies in the writing process
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