Jordan Journal of Nursing Research, Volume **4**, No. **1**, **2025**
DOI: https://doi.org/10.14525/JJNR.v4i1.01

Jordan Journal of Nursing Research

www.jjnr.just.edu.jo

Academic Demands and Eye Health: Prevalence and Quality of Life Effects of Dry Eye Disease among University Students

Jamal A.S. Qaddumi [1]; Asmaa Faraj Qaddumi, MSc[1]; Shahd Ibrahim Abusalha1; Hiba Hussam Qutieneh[1]; Arwa Mohammad Nimer [1]; Muath Abdelrahem Fuad Assi [1]; Essa Ismael Nassar [2]; Nisser Alhroub, PhD [3]; Bayan ALBashtawy, MD [4]; Abdullah Alkhawaldeh, PhD [5]; Omar Al Omari, PhD [6]; Mohammed ALBashtawy, PhD [5]; Salam Bani Hani, RN, MSN, PhD [7*]; Sa'd ALbashtawy, MD [8]; Asem Abdalrahim, PhD [5]; Zaid ALBashtawy [9]

1 *Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine.*
2 *Nablus, Palestine.*
3 *Faculty of Nursing, Jerash University, Jerash, Jordan.*
4 *Jordan Ministry of Health (MOH), Irbid, Jordan.*
5 *Department of Community and Mental Health, Princess Salma Faculty of Nursing, Al al-Bayt University, Al-Mafraq, Jordan.*
6 *Faculty of Nursing, Sultan Qaboos University, Muscat, Oman.*
7 *Faculty of Nursing, Nursing Departmen, Irbid National University, Irbid, Jordan.*
** Corresponding Author. Emails: banihani.salam@yahoo.com; s.banihani@inu.edu.jo*
8 *Irbid, Jordan.*
9 *Faculty of Medicine, Yarmouk University, Irbid, Jordan.*

ARTICLE INFO

Article History:
Received: September 30, 2024
Accepted: November 13, 2024

ABSTRACT

Background: Dry Eye Disease (DED) is a common disease in the ophthalmic world, characterized by eye irritation, foreign body sensation, stinging, photophobia, and blurred vision. **Purpose**: This study aimed to measure the quality of life (QOL) for dry eye participants among An-Najah University students. ***Methods*:** A cross-sectional study was used. Students aged between 17 years and 24 years were selected based on a convenient selection; the total number of research subjects was 481. Data was collected in two steps at the same time: the first step includes giving the students the Ocular Surface Disease Index (OSDI) questionnaire to diagnose whether they have a dry eye disease or not. Then, they were asked to fill out the Visual Function Questionnaire (VFQ-25) to know how DED affects their QOL. ***Results***: The prevalence of dry eyes in Palestine was 69.4%. Also, it was revealed that dry eyes are significantly associated with QOL, with an impact on students' daily life activities. ***Conclusion***: Our results have shown that quality of life is inversely proportioned with dry eye severity, showing that dry eye affects a person's daily life activities. ***Implications for Nursing*:** The findings of this study may increase nurses' awareness regarding DED and offer appreciated data for public health promotion in adolescents. Additional investigation is vital to have a better understanding of additional probable parameters linked to DED.

Keywords: Dry eye disease (DED), Ocular surface disease, Index questionnaire (OSDI), Quality of life, Visual function questionnaire (VFQ-25).

What does this paper add?

1. University students are an under-studied population at risk for dry eye disease (DED) due to a variety of environmental and lifestyle stressors, such as prolonged screen use, irregular sleep schedules, and exposure to a variety of weather conditions.

2. Finding out how common DED is in this group can serve as a springboard for additional research.
3. In Palestine, 69.4% of people had dry eyes. Furthermore, the data demonstrated a strong correlation between QOL and dry eyes, a factor that significantly impacts students' daily life activities.

Introduction

Dry eye disease (DED) is a serious public health issue and one of the common reasons for people seeking medical help (Seen & Tong, 2018). It has many symptoms that cause discomfort, including eye irritation, fatigue, and fluctuation in vision disturbances (Tsubota et al., 2020).

Dry eye disease is found to be prevalent in 5% to 50% of people worldwide, according to epidemiological studies (Findlay & Reid, 2018; Stapleton et al., 2017). In the United States, it is prevalent in 5% to 15% (Dana et al., 2019). Similarly, China had a low incidence of dry eyes reaching 17% (Song et al., 2018), and in Spain, the prevalence of dry eyes was 11% (Millán et al., 2018), compared to northern India with 32% (Titiyal et al., 2018), and Palestine 69% (Shanti et al., 2020). Sex, age intervals, and other factors all contribute to the differences in DED proportions (Song et al., 2018), different diagnostic criteria (Stapleton et al., 2017), different populations and definitions of dry eye (Vehof et al., 2021), and geographical areas (Stapleton et al., 2017). Dry eye disease costs vary from $687 per person per year for a minor condition to $1,267 per person per year for a severe condition. It was anticipated that the overall direct costs to the United States' economic system could be $3.8 billion (Farrand et al., 2016). Self-medications, prescription drugs, and punctual plug installation are all included in these costs.

To date, there has been little research regarding DED prevalence among young people (Supiyaphun et al., 2021). A study conducted by Supiyaphun et al. (2021) reported that among Thai university students, (8.15%) had DED. About 868 students (21.1%) and 2101 students (51.1%) indicated a history of contact lens use and excessive screen use (> 8 hours per day), respectively.

Dry eye disease is becoming more common around the world, and it demands ophthalmologists' attention, since it affects patients' quality of life (QOL) in a variety of ways (Uchino & Schaumberg, 2013). There is increasing data that DED significantly impairs the QOL in the affected population (Cutrupi et al., 2023). Quality of life mostly involves physical, psychological, social, and cognitive functioning perceptions. QOL assesses patient-informed data, which cannot always be acquired through unbiased methods (Muhammad, 2019). Generally, vision-related QOL is a significant result in the assessment of therapy options along with the financial and public health effects of any ocular ailment (Fenwick et al., 2022).

University students may be more susceptible to eye strain and DED due to high scholastic demands, extended screen time, a lack of resources, and, in certain situations, environmental contaminants (Rabie et al., 2024). Since dry eye disease frequently results in symptoms including irritation, eye tiredness, and difficulty in concentrating, it has an impact on students' general well-being and QOL, in addition to their visual comfort and academic productivity. By addressing these gaps, the study offers useful information that may be used to develop better healthcare policies, programs, and materials to promote eye health among Palestinian university students, thereby enhancing their academic performance and general quality of life.

Dry eyes can signal the presence of systemic disorders, such as Sjogren's syndrome, rheumatoid arthritis, and systemic lupus erythematosus; hence, early detection is critical (Findlay & Reid, 2018). To recommend future primary health interventions that can promote awareness and research strategies to relieve dry eyes, it is critical to describe the prevalence and severity of dry eyes. So, this study estimates the DED prevalence and the influence of dry eyes on QOL among patients aged between 17 years and 24 years at An-Najah University, Nablus, Palestine.

This study aims to answer the following research questions:

1- What is the prevalence of dry eye disease among university students at An-Najah University?
2- What are the average scores for each sub-scale and the composite score of OSDI in all subjects?
3- What is the correlation between dry eye and demographic and personal characteristics of students, such as color vision, eye vision, social function, independence, and general health?

Methods

Study Design

Using a cross-sectional design, the present study assesses the QOL for DED patients aged between 17 years and 24 years at An-Najah University.

Study Setting

The study was conducted at An-Najah University which is located in the city of Nablus in the northern part of Palestine.

Study Sample and Sampling

Students of An-Najah University, who are between 17 years and 24 years old, were invited to participate in the study, as they are representatives of An-Najah University students who represent the accessible population. However, university students, aged between 17 years and 24 years, who are experiencing prolonged screen exposure and other academic stressors that may influence eye health, were the target population of this study. In this study, 481 students were involved, aged between 17 years and 24 years, from different colleges at Al-Najah University, which is located in the city of Nablus in the northern part of Palestine. The study was conducted between September 2021 and October 2021. A convenienient sample of 481university students was selected from courses of university requirements to represent all colleges with different specialties. The inclusion criteria were: (a) aged between 17 years and 24 years. The exclusion criteria were: (a) the participant has any ocular disease that affects the quality of tear film, (b) the participant has had any ocular surgery. In-person screening for students was carried out to rule out any previous ocular surgery. Using the G*power, the minimum sample is participants with a confidence level set at 95% and a margin of error set at ±5% (Faul et al., 2009). The minimum required sample size was 420. Moreover, 61 students were added to avoid incomplete questionnaires and participants' withdrawal. Therefore, a total of 481 respondents were recruited in the current study.

Data Collection

A self-reported questionnaire was presented to students by the primary investigators in this study, and it consists of the following parts:

Part One: Demographic data (age, and sex).

Part Two: to evaluate the DED degree of severity.

The Ocular Surface Disease Index (OSDI) Scale

It was used to assess symptoms associated with DED and its effects. The OSDI was used to determine the severity of DED. It contains 12 questions ranging from 0 to 4 and is graded on a scale of 0 to 100 based on the OSDI formula: OSDI = (sum of scores) x 25/(sum of questions answered) to demonstrate sensitivity in distinguishing between dry eye and non-dry eye patients, as well as the impact on visual functioning. The scale runs from 0 to 100, with 0 signifying normal and 100 demonstrating very severe dry eyes. The 12 OSDI questions have a score range from 0 to 4, with 0 indicating "none of the time" and 4 indicating "all of the time." The participants were defined as having dry eyes if their OSDI score was greater than 12. The OSDI score was used to categorize dry eye severity; a score between 13 and 22 is considered as mild, 23-32 is considered as moderate, and 33-100 is perceived as severe (Walt et al.,1997).

Visual Function Questionnaire (VFQ-25)

The NEI VFQ-25 is a popular survey that has been translated into a variety of languages. This survey has been verified and used to show that persons with ocular disease and related visual impairment had lower scores than those in a comparison group who do not have an ocular disease or visual impairment. The questions in the NEI-VFQ-25 are gathered into 12 sub-scales (including general health, general vision, ocular pain, near activities, distance activities, social functioning, mental health, role difficulties, dependency, driving, color vision, and peripheral vision), besides a combined total score. All sub-scales were estimated using the NEI-VFQ researchers' techniques and scores may vary from 0 to 100, with 0 representing the worst case and 100 signifying no visual loss (Coleman, 2002). In clinical research, for different eye disorders, it is an effective instrument for comparisons of group-level vision-targeted, and health-related QOL (Mizuno et al., 2010).

Ethical Considerations

The Research Ethics Committee at An-Najah University gave its consent to this project under the number of (# 8 Sep. 2022). A written informed consent was obtained from the students. There were no individual identifiers gathered, and data was saved privately and anonymously. Forced-answer questions were included in the survey to verify the absence of missing data that would distort the calculation of the OSDI score. The survey began with an orientation page emphasizing the importance of voluntary participation.

Statistical Analysis

Demographics of the students and the factors associated with them were defined through descriptive statistics (i.e., mean, percentage, and standard deviation). The DED prevalence and corresponding 95% confidence interval (CI) were calculated. Visual function health-related QOL with the DED was estimated using bivariate analysis of person-product moment correlation. A p-value of less than 0.05 was measured as statistically significant. All statistics were calculated using SPSS, version 26.0 (SPSS, Inc., Chicago, IL, USA).

Results

Table 1 sums up the demographics of the 481 students. Most of the students 67.4% were within the age group (17-19 years), which is considered the dominant group of participants in the research, out of whom 78.8% were females. However, it should be clear that 29.1% of the sample was from the Health Sciences and the Faculty of Medicine.

Table 1. Demographic data of enrolled participants (n=481)

Variable	Category	Total	None	Dry eye	*p*
Age (years)	17-19	323	100 (31.0%)	223 (69%)	0.17
	20-22	144	44 (30.6%)	100 (69.4%)	
	22-24	8	0 (0.00%)	8 (100%)	
Gender	Male	99	36 (36.4%)	63(63.6%)	0.133
	Female	378	108 (28.6%)	270 (71.4%)	

Regarding average age and gender, there is no significant difference between students with dry eyes and those who do not have dry eyes. The mean scores for each OSDI sub-scale are recorded in Table 2; they extend from 0.56 for gritty eyes to 1.79 for discomfort in windy conditions. The mean total OSDI score was 25.79 ± 19.09.

Table 2. The mean scores for each sub-scale and the composite score of OSDI in all subjects

Sub-scale	Mean ±SD
Eyes that are sensitive to light?	1.08± 1.10
Eyes that feel gritty?	0.56 ± 0.95
Painful or sore eyes?	1.19 ± 1.16
Blurred vision?	1.08 ± 1.16
Poor vision?	0.92 ± 1.28
Reading?	1.12 ± 1.19
Driving at night?	0.60 ± 1.09
Working with a computer or ATM?	1.24 ± 1.22
Watching TV?	1.03 ± 1.14
Windy conditions?	1.79 ± 1.33
Places with low humidity (very dry)?	1.22 ± 1.25
Total	25.79

The overall OSDI score revealed that 68.7% of the students had dry eyes. Of those students who have dry eyes, 17.9% are considered to have mild eye dryness, 20% are considered to have moderate eye dryness, and 30.8% of these students are considered to have severe eye dryness. The percentage of the total score was 99.8% (See Table 3).

Table 3. The percentages of eye dryness degrees

Variable	Category of eye	Frequency	Percent
OSDI	None	146	30.4%
	Mild	86	17.9%
	Moderate	100	20.8%
	Severe	148	30.8%
	Total	**480**	**99.8%**

There is a statistically significant low to moderate (r = -0.29, -0.12, p = 0.001) correlation between general vision and dry eyes, and a negative correlation between color vision and dry eyes (r = -0.29, p=0.005). Also, a statistically significant negative moderate correlation (r = -0.32, p = 0.001) (r= -0.3, p= 0.000) was found between general health, peripheral vision, and dry eyes. Moreover, social function, dependence, and driving have negative, statistically significant, moderate correlations (r = -0.36, p= 0.001), (r= -0.35, p= 0.001), and (r= -0.38 p = 0.001) with dry eyes. In addition, statistically significant (r= -0.54, p= 0.001), (r= -0.51, p=0.001), (r= -0.48, p= 0.001) and (r=-0.49 p = 0.001) high negative correlations were found between dry eyes

with distance activity, near activity, role difficulties, and mental health, respectively. Furthermore, a statistically significant negative correlation is found between ocular pain and dry eyes. Finally, there is a statistically significant (r= -0.57, p = 0.001) high negative correlation between total QOL and dry eyes (See Table 4).

Table 4. The scores for each subscale and the composite score of VFQ-25 in all subjects

Variable	Category	Total OSDI		
		N	**R**	***P***
VFQ-25	General Health	467	-0.32	0.001*
	General Vision	414	-0.29	0.001*
	Ocular Pain	472	-0.57	0.001*
	Near Activity	364	-0.54	0.001*
	Distance Activity	437	-0.51	0.001*
	Social Function	455	-0.36	0.001*
	Mental Health	457	-0.48	0.001*
	Role Difficulties	462	-0.49	0.001*
	Dependency	465	-0.35	0.001*
	Driving	115	-0.38	0.001*
	Color Vision	467	-0.12	0.005*
	Peripheral Vision	465	-0.31	0.000*
	Total QOL	313	-0.59	0.000*

** Correlation is statistically significant at the 0.01 level (2-tailed).

Discussion

The DED prevalence has not been widely considered in the works of literature, especially in An-Najah University. Therefore, the current study is intended to measure the prevalence and QOL among dry eye students at An-Najah University. In this study, the prevalence was (69.4%), which is very similar to the study that was recently carried out in Palestine by Shanti et al. (2020), which showed that 69% of the study participants stated symptoms and manifested DED clinical signs. In Arab and neighboring countries, the DED prevalence in the present study was nearly similar to that in Jordan (59%) (Bakkar et al., 2016), lower than the prevalence in Saudi Arabia (Jeddah) (93.2%) (Bukhari et al., 2009), and higher than in Iran 8.7%, as reported by Aghaie et al. (2023). The discrepancy in DED prevalence between the studies could be due to differences in research time and participants, the effects of diagnostic criteria used, and patients' demographics.

There was no significant difference between age and dry eyes compared to the previous study (de Paiva, 2017). This was related to the narrow diversity of ages between the students. In contrast with the previous study, which found a statistically significant difference between gender and dry eyes due to the sex hormone ratio, which is generally higher in men compared to women (Borrelli et al., 2021), no significant difference was found in the current study. The reason behind this result is that dry-eyed females were more affected than males.

Recently, many researchers are tending to give their attention to estimating the QOL. This is the first study to look into the QOL of An-Najah University dry eye students. This evaluation is critical, because it can provide a better understanding of the dry eye disease and its influence on QOL among An-Najah University students aged between 17 years and 24 years. In this study, the VFQ-25 (comprising general vision, ocular pain, near vision, distance vision, social functioning, mental health, role functioning, dependency, driving, color vision, and peripheral vision) composite score of the participants with DED reported a significant variance identified in ocular pain between VFQ-25 and dry eyes. Mental health and dry eyes have a significant

difference in the present study, which coincides with a previous study performed by Mandell et al. (2020). The reasons behind these results are that dry eye disease not only affects mental health, but also physiological health. In contrast, a past study revealed no significant difference between mental health and dry eyes. In this study, a significant correlation was established among social functioning, role-emotional limitations, physical functioning, and dry eyes, which coincides with research results reported by Morthen et al. (2021). An explanation for this might be the severity of DED and a person's ability to overcome or adapt to dry eye symptoms; symptoms of mild dry eyes can be adapted more easily than symptoms of severe dry eyes (Roy et al., 2017).

In a previous study conducted by Nuthmann and Malcolm (2016), no significant correlation was found in both color and peripheral vision. They explained that dry eye disease has a slight effect on the fundus, and this is dissimilar to a recent study in which a statistically significant difference was found. This might be due to the high percentage of students with severe dry eyes.

Limitations

This study has demonstrated some limitations. One limitation is related to the OSDI questionnaire itself; it mentioned several dry eye symptoms; for instance, pain, grittiness, and sensitivity to light, nevertheless didn't mention further symptoms, such as tearing and foreign body sensation (Bron et al., 2022). Other risk factors include the use of antihistamines, tricyclic antidepressants, and isotretinoin, as well as contact lens use and prior eye surgery, all of which should be considered exclusion criteria for future research. Also, the participants who were addressed in this study were from the youth group, who spend many hours on electronic devices, which may affect the blinking rate, causing high evaporation of tear film, which might cause dry eyes.

A thorough examination of students' academic screen usage, including the amount of time they spend on computers, phones, and tablets, should be included in the study given the connection between screen exposure and DED. Furthermore, documenting certain academic demands (such as tests and assignments) could help shed light on how DED symptoms and quality of life are impacted by periods of intense study. Future studies should support the results obtained from the questionnaire with clinical evaluations, such as the Schirmer test, meibomian gland assessment, and tear breakup time. It's also necessary to examine whether the environmental conditions have an impact on the answers of participants to the questionnaires. It may be important to enhance the population's awareness through educational activities and events to ensure the importance of primary eye care.

Strengths and Weaknesses

University students constitute a relevant group to investigate DED because of their demanding academic schedules and excessive screen use. A population at higher risk is directly addressed in the study, which could boost the findings' applicability. Besides, the study emphasizes the wider effects of DED beyond clinical symptoms, such as effects on academic performance and mental health, by using quality-of-life measures. Presenting DED as a public health issue affecting the school body, benefits educators and medical professionals. However, the sample was not representative of the whole population, as only one university was investigated in this study. Furthermore, academic demands contribute to stress and mental health issues, which may independently influence DED symptoms. Disentangling the direct impact of DED on quality of life from stress-related factors might be challenging without additional controls or assessments.

Implications for Nursing

The current study could provide crucial insight for nursing in several ways; namely, estimating the prevalence of dry eye disease among students at An-Najah National University, enabling targeted eye health activities to be promoted; DED affects daily functioning, comfort, and productivity, potentially affecting students' academic engagement, clinical placement participation, and learning outcomes, especially in nursing education, requiring further investigation; nursing programs should incorporate DED awareness into their curriculum, as nursing students can educate and advocate for eye health among patients. Furthermore, studying An-Najah National University has the potential to have a big influence on future nursing practices and student well-being by placing more focus on eye health in occupational health programs and healthcare education.

Conclusion

DED among university students is not unusual. Dry eye disease was strongly associated with the QOL, where the QOL is inversely proportional to the dry eye severity, indicating that dry eyedisease affects a person's activities of daily living. The findings in this study may increase awareness of DED in adolescents and offer data for public health promotion among adolescents. However, additional research is vital to recognize other possible elements associated with DED, comprising the drug use effect of an arid environment, anxiety, and systemic illnesses. The findings of the current study could serve as the basis for awareness and education programs about DED for students, faculty, and university health centers, emphasizing preventive measures, symptoms, and treatments to support both eye health and academic performance.

Ethical Approval and Consent to Participate

Ethical approval was obtained from An-Najah University before starting the study. Written informed consent was obtained from the students.

Availability of Data and Material

The dataset used will be made available upon reasonable request from the corresponding author.

Acknowledgements

The authors would like to thank the participants for their support in this work.

Conflict of Interests

The authors have no conflict of interests to declare.

Funding or Sources of Financial Support

No direct funding was received for this work.

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