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THE PREVALENCE OF DRY EYE DISEASE AND ITS ASSOCIATED RISK FACTORS AMONG UNIVERSITY STUDENTS IN SAUDI ARABIA

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Abstract

Introduction: Dry eye disease (DED), also known as dry eye syndrome or keratoconjunctivitis sicca, is characterized by the hyperosmolarity of the tear film, affecting the tears and the surface of the eye. The overall incidence of DED varies from 5-50%. Symptoms of DED include ocular pain, light sensitivity, foreign body sensation, and visual disturbances such as fluctuating or blurred vision, intermittent visual disruption, dryness, and eye fatigue. This research aims on estimating the prevalence and risk factors of dry eye disease among university students in Saudi Arabia.

Methodology: A cross-sectional survey was conducted in 2024, involving a sample size of 385 university students, calculated using the Raosoft sample size calculator with a margin of error of 5% and a confidence interval (CI) of 95%. Participants were recruited without restrictions on age, gender, or field of study. Data were collected through a structured questionnaire, consisting of two parts and 20 questions, and a pilot study was conducted to refine the survey instrument. The collected data were analyzed using Microsoft Excel and SPSS version 20.

Results: The study included 527 participants. Our study found a significant prevalence of DED among university students in Saudi Arabia (36.3%), particularly affecting female students and those aged 21 to 22 years. Notably, 84.4% of participants reported spending four or more hours daily on screens, correlating with increased DED symptoms. The demographic analysis revealed a predominance of female participants (72.9%), aligning with existing literature on gender-related DED prevalence.

Conclusion: Finally, this study adds to the increasing body of knowledge relating to the prevalence of DED amongst university students and the association of demographic and lifestyle factors. These

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findings show that DED is a very prevalent condition in young adults and show the need to recognize DED as a prevalent condition as suggested by the rising digital device multiplies.

Keywords: Dry eye disease, DED, Risk Factors, Prevalence.

Introduction:

Dry eye disease (DED), also known as dry eye syndrome or keratoconjunctivitis sicca [1]. is a condition affecting the tears and the surface of the lens of the eye leading to hyperosmolarity of the tear film [2]. Symptoms of DED include ocular pain, often accompanied by light sensitivity, foreign body sensation, and visual symptoms, notably fluctuating, blurred vision [3]. Also, intermittent visual disruption, dryness, and fatigued eyes [4].

According to the criteria, gender, years of age, and population under investigation, the overall incidence of DED varies from 5-50% [5]. DED has a substantial socioeconomic effect increasing healthcare expenses and it harmfully impacts vision-related quality of life, such as in reading, driving, using computers, and psychological well-being in general [6]. Particularly noteworthy risk factors for DED include female gender, age above 56, current smoking, and history of diabetes mellitus [7].

A study, published in 2024, found that, despite their high exposure to risk factors such as prolonged digital device usage and increasing study hours, research on DED prevalence and severity among Romanian medical students has been limited [8]. A study, which was released in 2024, found that research on DED gaps, particularly among university students, is restricted due to a lack of comprehensive assessment of student demographics and unequal coverage of environmental and cultural factors [9]. The study was published in 2024, and its findings highlighted a huge research gap in terms of DED prevalence and risk factors in certain places, such as the Gaza Strip. This study intends to close this gap by measuring the prevalence of DED and identifying risk factors in the Gaza Strip population using the Arab-OSDI questionnaire and clinical assessments [10]. . The incidence of DED in general data has been studied extensively, there are still few and far between research on the topic in particular populations, such as medical students, who frequently read and study for extended periods [12].

Due to insufficient research conducted on dry eye diseases in Saudi Arabia. This research focuses on estimating the prevalence and risk factors of dry eye disease among university students in Saudi Arabia.

Methodology:

Study design:

The research being conducted was a cross-sectional survey based on a structured questionnaire that was developed by the authors. It was done among university students in 2024 in Saudi Arabia without consideration of their subject of study or study level. Participation in this study was to all Saudi Arabian university students, regardless of age or gender.

Sample size:

Calculation of sample size was done to ensure the minimum number of respondents needed to be a representative sample for the whole population. The sample size was determined using the" Raosoft sample" size calculator. Keeping an indicator percentage of (0.50), a margin of error of 5%, and a

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confidence interval (CI) of 95%, the calculated sample size was 385.

n = P(1-P) * Zα 2 / d 2 with a 95% confidence level.

n: Calculated sample size.

Z: The z-value for the selected level of confidence (1- a) = 1.96.

P: An estimated prevalence of knowledge.

Q: (1 – 0.50) = 50%, i.e., 0.50.

D: The maximum acceptable error = 0.05.

Therefore, the calculated minimum sample size was: n = (1.96)2 X 0.50 X 0.50/(0.05) 2 = 384.

Method for data collection and instrument (*Data collection Technique and Tools)*:

A tool was prepared to collect data from several studies related to eye diseases. The questionnaire consists of three parts and 20 questions [13,14]. The first part is about the research topic and the expected time to answer the questionnaire and obtain approval to participate, as the questionnaire is confidential. The second part deals with personal information, gender, age, marital status, residential area, and whether there has been any previous diagnosis of eye disease. The third part deals with risk factors for eye diseases.

Pilot test:

As part of a pilot study, fifteen participants answered the questionnaire to determine its clarity. This was done to test the feasibility of the study and the questionnaire's simplicity; any misunderstandings were cleared up based on the participants' responses.

Analyzes and entry method:

We entered data into the computer using the "Microsoft Office Excel Software" (2016) Windows program. After that, data was moved to be statistically analyzed using the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0; Armonk, NY: IBM Corp.).

Results:

Table (1) displays various demographic parameters of the participants with a total number of (527). The mean age was 22.6 years and about 62.2 % of the participants were below 22 years old, indicating a young participants' predominance in the sample. Gender distribution shows a very large group of females of 72.9% possibly arising because of enrollment in certain types of studies. What stands out is that nearly all, or a massive 90.7%, declared themselves single, giving the study a very young look. The academic landscape in which the participants (60.7%) predominately specialize in health-related fields and a small, but significant amount from engineering and literary studies. GPA's show high academic performance with more than half of the person (56.2%) having scored in excellent grades. For health, half or more of the participants reported having been diagnosed with eye diseases, specifically eye dryness (36.3%).

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Table (1): Sociodemographic characteristics of participants (n=527)

Parameter		***No.***	***Percent (%)***
Age (Mean:22.6, STD:5.0)	20 or less	153	29.0
	21 to 22	175	33.2
	23 to 24	127	24.1
	25 or more	72	13.7
Gender	Female	384	72.9
	Male	143	27.1
Marital status	Single	478	90.7
	Married	42	8.0
	Divorced	3	.6
	Widowed	4	.8
Residential region	Northern region	36	6.8
	Southern region	125	23.7
	Central region	84	15.9
	Eastern region	49	9.3
	Western region	233	44.2
University specialization	Literary	56	10.6
	Health	320	60.7
	Scientific	105	19.9
	Engineering	46	8.7
Academic year	First year	46	8.7
	Second year	75	14.2
	Third year	57	10.8
	Fourth year	142	26.9
	Fifth year	67	12.7
	Sixth year	71	13.5
	Internship year	69	13.1
GPA	Excellent (no less than 3.50 out of 4.00) OR (no less than 4.50 out of 5.00)	296	56.2
	Very good (from 2.75 to 3.49 out of 4.00) OR (from 3.75 to 4.49 out of 5.00)	187	35.5
	Good (from 1.75 to 2.74 out of 4.00) OR (from 2.75 to 3.74 out of 5.00)	39	7.4
	Satisfactory (from 1.00 to 1.74 out of 4.00) OR (from 2.00 to 2.74 out of 5.00)	5	.9
Have you ever been diagnosed with any eye diseases?	No	224	42.5
	Yes	303	57.5
eye diseases (n=303)	Eye sensitivity	30	9.9
	Strabismus	142	46.9
	Eye dryness	110	36.3
	Corneal inflammation	4	1.3
	Glaucoma	3	0.9

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	Cataract	4	1.3
	Keratoconus	5	1.7
	Others	90	29.7
Did you have any history of chronic disease?	No	473	89.8
	Yes	54	10.2
chronic disease *	Hypertension	6	1.1
	Hyperlipidemia	3	0.6
	Asthma	32	6.1
	Diabetes	16	3.0
	Not applicable	475	90.1

****Results may overlap***

As shown in figure 1, The study distinguishes itself from other research due to the data collected from a total sample of 527 respondents which provides really significant insights into daily screen time habits. What is striking is, however, that only 1.5 percent of participants did not use digital devices for more than two hours per day and therefore engaged with technology on a minimal level. However, a massive 14.0 % of respondents spent 2 to 4 hours per day on their devices, and a big majority, here at 45.9 %, spent 4 to 8 hours on the devices every day. Somewhat alarmingly, a large proportion of the sample—39.5%—was in fact using their screens for more than eight hours per day.

Figure (1): **Illustrates time spent on smartphone, computer, or a tablet among participants.**

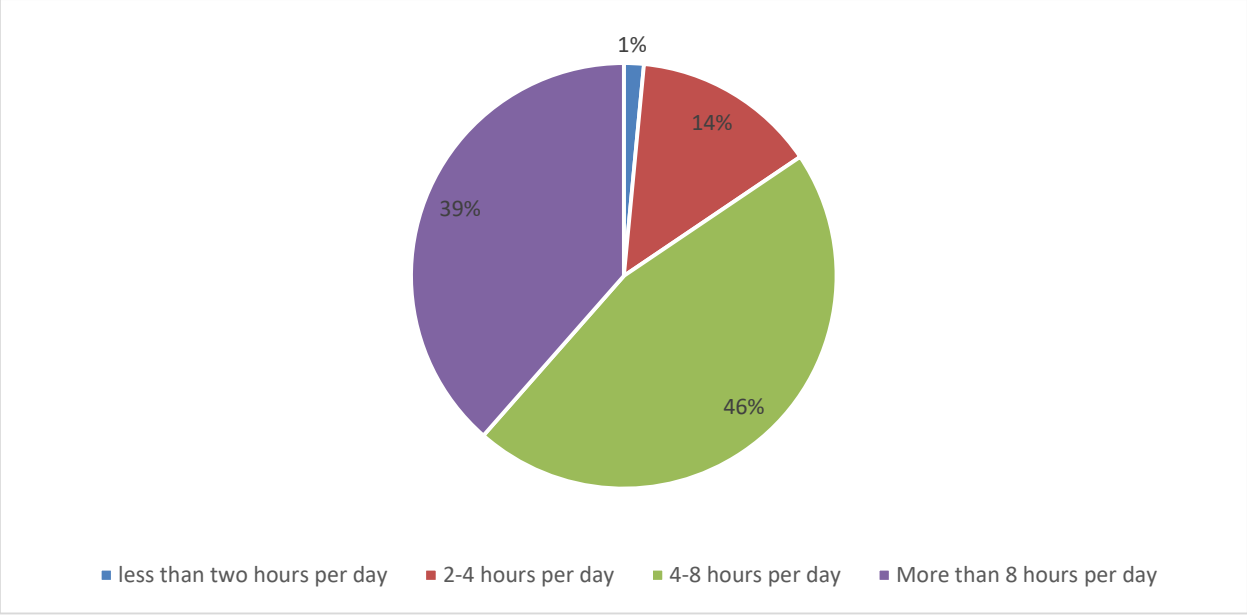

Table 2 shows the comprehensive data of the risk factors of dry eye disease among a cohort of university students (n=527). Interestingly, the majority of participants reported to be nonsmokers (89.8 %) and this potentially could represent a lower risk factor of dry eye disease associated with smoking. Nevertheless, 26.8 percent of smokers said they smoked 20 or more cigarettes a day, a subgroup that might be particularly at risk. Further, the data shows a great amount of screen time: 84.4 percent of respondents are spending four or more hours per day on digital devices, known bug zappers of dry eye symptoms. Additionally, only 6.8 percent of the participants had worn contact lenses every day,

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exacerbating dry eye diseases. We noted seasonal variations on symptoms, with 22.6% of respondents showing specific symptoms during summer. There were also difficulties of reading, driving at night, and attention for prolonged periods that characterised significant impacts on regular activities and life.

Table (2): Parameters related to* risk factors of dry eye disease among university students *(n=527).

Parameter		***No.***	***Percent (%)***
Are You a smoker?	No	473	89.8
	Yes	27	5.1
	Ex-smoker	27	5.1
If yes, how many cigarettes do you smoke per day? (n=41)	5	15	36.6
	10	7	17.1
	15	8	19.5
	20 or more	11	26.8
How much time do you spend on a smartphone, computer, or tablet?	less than two hours per day	8	1.5
	2-4 hours per day	74	14.0
	4-8 hours per day	242	45.9
	More than 8 hours per day	203	38.5
Do you use contact lenses?	No	323	61.3
	Sometimes	168	31.9
	Daily	36	6.8
In which season of the year does your dry eye problem get worse?	Summer	119	22.6
	Spring	12	2.3
	Winter	78	14.8
	Fall	19	3.6
	Not applicable	299	56.7
Did you undergo any ophthalmic procedure to correct refractive defect or corneal transplantation?	No	509	96.6
	Yes	18	3.4
Did any of your family members tell you that your eyes were open during your sleep?	No	452	85.8
	Yes	29	5.5
	Maybe	46	8.7
How much difficulty do you have reading ordinary print in newspapers?	No difficulty at all	312	59.2
	A little difficulty	128	24.3
	Moderate difficulty	66	12.5
	Extreme difficulty	5	.9
	Stopped doing this because of your eyesight	7	1.3
	Stopped doing this for other reasons	9	1.7
How much difficulty do you have driving at night?	No difficulty at all	286	54.3
	A little difficulty	136	25.8

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	Moderate difficulty	55	10.4
	Extreme difficulty	16	3.0
	Stopped doing this because of your eyesight	4	.8
	Stopped doing this for other reasons	30	5.7
How difficult is it to open your eyes after sleep?	No difficulty at all	329	62.4
	A little difficulty	145	27.5
	Moderate difficulty	42	8.0
	Extreme difficulty	11	2.1
How difficult is it to concentrate for long hours while working?	No difficulty at all	145	27.5
	A little difficulty	192	36.4
	Moderate difficulty	156	29.6
	Extreme difficulty	34	6.5
How much difficulty do you have noticing objects off to the side while you are walking along?	No difficulty at all	344	65.3
	A little difficulty	122	23.1
	Moderate difficulty	54	10.2
	Extreme difficulty	7	1.3

As shown in figure (2), Particularly intriguing about the data on how many people experience difficulty paying attention to objects on the side while walking is an insight into sensory perception and cognitive attention of the sample population of 527. Almost two third (65.2%) who constitute of people report that they had no trouble at all. On the other hand, around 23.2% (122 people) who have a little trouble are such who have a moderate distraction or attentional issue. In addition, those that report moderate and severe difficulty between the subset of respondents add up to 11.4% or 54 respondents (10.3%) experiencing moderate difficulty and a small fraction of 1.3 or 7 respondents, respectively, suffering from extreme difficulty.

Figure (2): Illustrates difficulty in noticing objects off to the side among participants.

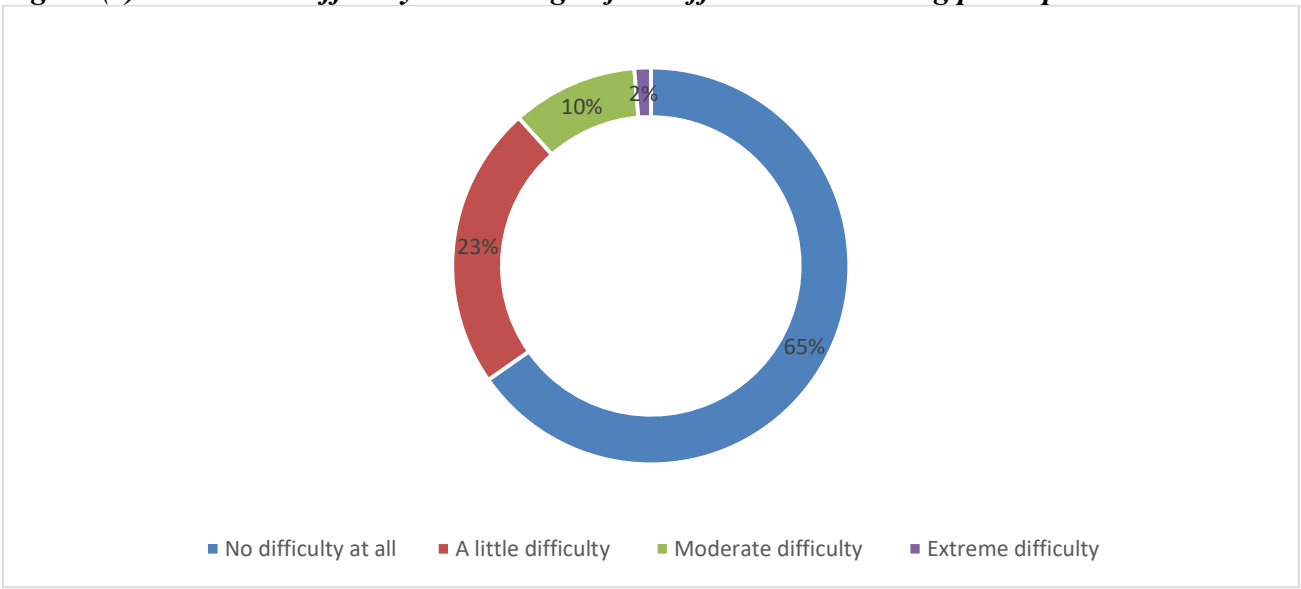

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Table (3) shows that being diagnosed with eye dryness has statistically significant relation to gender (P value=0.0001), age (P value=0.002), residential region (P value=0.037), and being diagnosed with eye disorders (P value=0.0001). It also shows statistically insignificant relation to marital status, university specialization, academic year, GPA, history of chronic diseases, and smoking. Participants of female gender, aged 21 to 22, from western region were found to be medically diagnosed with eye dryness.

Table (3): Relation between being diagnosed with eye dryness and sociodemographic characteristics.

Parameters		***Medically diagnosed with eye dryness?***		***Total (N=527)***	***P value****
		No	**Yes**		
Gender	Female	290	94	384	0.0001
		69.4%	86.2%	72.9%	
	Male	128	15	143	
		30.6%	13.8%	27.1%	
Age	20 or less	135	18	153	0.002
		32.3%	16.5%	29.0%	
	21 to 22	125	50	175	
		29.9%	45.9%	33.2%	
	23 to 24	103	24	127	
		24.6%	22.0%	24.1%	
	25 or more	55	17	72	
		13.2%	15.6%	13.7%	
Marital status	Single	384	94	478	0.125
		91.9%	86.2%	90.7%	
	Married	28	14	42	
		6.7%	12.8%	8.0%	
	Divorced	2	1	3	
		0.5%	0.9%	0.6%	
	Widowed	4	0	4	
		1.0%	0.0%	0.8%	
Residential region	Northern region	27	9	36	0.037
		6.5%	8.3%	6.8%	
	Southern region	108	17	125	
		25.8%	15.6%	23.7%	
	Central region	72	12	84	
		17.2%	11.0%	15.9%	
	Eastern region	35	14	49	
		8.4%	12.8%	9.3%	
	Western region	176	57	233	
		42.1%	52.3%	44.2%	
University specialization	Literary	42	14	56	0.173
		10.0%	12.8%	10.6%	
	Health	247	73	320	
		59.1%	67.0%	60.7%	

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	Scientific	90	15	105	
		21.5%	13.8%	19.9%	
	Engineering	39	7	46	
		9.3%	6.4%	8.7%	
Academic year	First year	42	4	46	0.052
		10.0%	3.7%	8.7%	
	Second year	61	14	75	
		14.6%	12.8%	14.2%	
	Third year	41	16	57	
		9.8%	14.7%	10.8%	
	Fourth year	111	31	142	
		26.6%	28.4%	26.9%	
	Fifth year	46	21	67	
		11.0%	19.3%	12.7%	
	Sixth year	60	11	71	
		14.4%	10.1%	13.5%	
	Internship year	57	12	69	
		13.6%	11.0%	13.1%	
GPA	Excellent	238	58	296	0.546
		56.9%	53.2%	56.2%	
	Very good	144	43	187	
		34.4%	39.4%	35.5%	
	Good	31	8	39	
		7.4%	7.3%	7.4%	
	Satisfactory	5	0	5	
		1.2%	0.0%	0.9%	
Have you ever been diagnosed with any eye diseases?	No	224	0	224	0.0001
		53.6%	0.0%	42.5%	
	Yes	194	109	303	
		46.4%	100.0%	57.5%	
Did you have any history of chronic disease?	No	374	99	473	0.678
		89.5%	90.8%	89.8%	
	Yes	44	10	54	
		10.5%	9.2%	10.2%	
Are You a smoker?	No	370	103	473	0.149
		88.5%	94.5%	89.8%	
	Yes	25	2	27	
		6.0%	1.8%	5.1%	
	Ex-smoker	23	4	27	
		5.5%	3.7%	5.1%	

****P value was considered significant if ≤ 0.05.***

Table (4) shows that difficulty concentrating while working has statistically significant relation to gender (P value=0.0001), age (P value=0.030), residential region (P value=0.008), and being diagnosed with any eye disorders. It also shows statistically insignificant relation to marital status, university

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specialisation, academic year, GPA, history of chronic diseases, and smoking. Participants of female gender, aged between 21 to 22, and being diagnosed with any eye disorders were found to have more difficulty concentrating for long hours while working.

Table (4): Difficulty concentrating while working in association with sociodemographic characteristics.

Parameters		***How difficult is it to concentrate for long hours while working?***		***Total (N=527)***	***P value****
		Little to no difficulty	**Moderate to extreme**		
Gender	Female	221	163	384	0.0001
		65.6%	85.8%	72.9%	
	Male	116	27	143	
		34.4%	14.2%	27.1%	
Age	20 or less	91	62	153	0.030
		27.0%	32.6%	29.0%	
	21 to 22	105	70	175	
		31.2%	36.8%	33.2%	
	23 to 24	85	42	127	
		25.2%	22.1%	24.1%	
	25 or more	56	16	72	
		16.6%	8.4%	13.7%	
Marital status	Single	299	179	478	0.106
		88.7%	94.2%	90.7%	
	Married	31	11	42	
		9.2%	5.8%	8.0%	
	Divorced	3	0	3	
		0.9%	0.0%	0.6%	
	Widowed	4	0	4	
		1.2%	0.0%	0.8%	
Residential region	Northern region	14	22	36	0.008
		4.2%	11.6%	6.8%	
	Southern region	76	49	125	
		22.6%	25.8%	23.7%	
	Central region	60	24	84	
		17.8%	12.6%	15.9%	
	Eastern region	30	19	49	
		8.9%	10.0%	9.3%	
	Western region	157	76	233	
		46.6%	40.0%	44.2%	
University specialization	Literary	40	16	56	0.070
		11.9%	8.4%	10.6%	

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	Health	203	117	320	
		60.2%	61.6%	60.7%	
	Scientific	59	46	105	
		17.5%	24.2%	19.9%	
	Engineering	35	11	46	
		10.4%	5.8%	8.7%	
Academic year	First year	31	15	46	0.075
		9.2%	7.9%	8.7%	
	Second year	43	32	75	
		12.8%	16.8%	14.2%	
	Third year	28	29	57	
		8.3%	15.3%	10.8%	
	Fourth year	91	51	142	
		27.0%	26.8%	26.9%	
	Fifth year	45	22	67	
		13.4%	11.6%	12.7%	
	Sixth year	47	24	71	
		13.9%	12.6%	13.5%	
	Internship year	52	17	69	
		15.4%	8.9%	13.1%	
GPA	Excellent	193	103	296	0.659
		57.3%	54.2%	56.2%	
	Very good	118	69	187	
		35.0%	36.3%	35.5%	
	Good	24	15	39	
		7.1%	7.9%	7.4%	
	Satisfactory	2	3	5	
		0.6%	1.6%	0.9%	
Have you ever been diagnosed with any eye diseases?	No	159	65	224	0.004
		47.2%	34.2%	42.5%	
	Yes	178	125	303	
		52.8%	65.8%	57.5%	
Did you have any history of chronic disease?	No	306	167	473	0.291
		90.8%	87.9%	89.8%	
	Yes	31	23	54	
		9.2%	12.1%	10.2%	
Are You a smoker?	No	304	169	473	0.330
		90.2%	88.9%	89.8%	
	Yes	19	8	27	
		5.6%	4.2%	5.1%	
	Ex-smoker	14	13	27	
		4.2%	6.8%	5.1%	

P value was considered significant if ≤ 0.05.

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Table (5) shows diagnosis with dry eye diseases has statistically significant relation to using contact lenses (P value=0.002), and season of the year with worse dry eyes (P value=0.0001). It also shows statistically insignificant relation to screen time, undergoing ophthalmological procedure, and sleeping with eyes open as observed by family members. Participants using contact lenses and winter season were found to be associated with being diagnosed with dry eye disease.

Table (5): Diagnosis with dry eye diseases in association with possible risk factors.

Parameters		***Medically diagnosed with eye dryness?***		***Total (N=527)***	***P value****
		No	**Yes**		
How much time do you spend on a smartphone, computer, or tablet?	less than two hours per day	7	1	8	0.260
		1.7%	0.9%	1.5%	
	2-4 hours per day	63	11	74	
		15.1%	10.1%	14.0%	
	4-8 hours per day	195	47	242	
		46.7%	43.1%	45.9%	
	More than 8 hours per day	153	50	203	
		36.6%	45.9%	38.5%	
Do you use contact lenses?	No	272	51	323	0.002
		65.1%	46.8%	61.3%	
	Sometimes	121	47	168	
		28.9%	43.1%	31.9%	
	Daily	25	11	36	
		6.0%	10.1%	6.8%	
In which season of the year does your dry eye problem get worse?	Summer	77	42	119	0.0001
		18.4%	38.5%	22.6%	
	Spring	10	2	12	
		2.4%	1.8%	2.3%	
	Winter	49	29	78	
		11.7%	26.6%	14.8%	
	Fall	15	4	19	
		3.6%	3.7%	3.6%	
	Not applicable	267	32	299	
		63.9%	29.4%	56.7%	
Did you undergo any ophthalmic procedure to correct refractive defect or corneal transplantation?	No	404	105	509	0.870
		96.7%	96.3%	96.6%	
	Yes	14	4	18	
		3.3%	3.7%	3.4%	
Did any of your family members tell you that your eyes were open during your sleep?	No	361	91	452	0.166
		86.4%	83.5%	85.8%	
	Yes	25	4	29	
		6.0%	3.7%	5.5%	
	Maybe	32	14	46	
		7.7%	12.8%	8.7%	

P value was considered significant if ≤ 0.05.

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Discussion:

The present study was conducted to assess the prevalence and risk factor of dry eye disease (DED) among university students of Saudi Arabia. Findings show prevalence of DED (36.3) was high and was higher in female students and in those aged 21 to 22 years. The findings correspond with previous studies that found varying prevalence rate of DED in different population which is a disease of multifactorial in nature. For instance, in the study of Ystenæs et al. nearly half of the participants reported symptoms or signs of DED, which is consistent with the finding of our study [15]. Our research was also similar to the research by Castelyn et al who indicated that symptom questionnaires can be used to screen for undiagnosed cases of DED reinforcing the use of subjective assessment we used in our study [16].

As is consistent with literature regarding the prevalence and sex of those with DED, our study's demographic data showed that there were 72.9% women who participated in our study. This has been shown by a good number of studies in particular one by Kim et al., who pointed that there is a significant association of DED symptoms with gender, especially in younger people [17]. The high academic performance of our participants with more than half having excellent grades may be influenced by the restrictions of academic life, as in the work of Al-Mohtaseb et al. [18], which was related to increased screen time and eye strain.

The study also showed how digital device usage affects the prevalence of DED. According to the findings of O'Brien and Collum, one of whom is author of the current paper, 84.4 percent of participants spent more than four hours per day on screens, a finding consistent with those leading DED as an increase in screen time is a major risk factor. Overall, it supports our hypothesis that long screen exposure may change blinking dynamics, resulting in moisture loss from eyelids [18]. Furthermore, the relatively limited use of contact lenses amongst participants (6.8% reported daily use) coupled with the finding that contact lens wear is a known risk factor for DED [12, 20] suggests that contact lens wear may not be as prevalent in this population as other studies find [20]. Additionally, in line with this extant literature, our results regarding seasonal variation in symptoms (with 22.6% reporting increased symptoms in the summer) indicate that environmental factors (e.g. humidity and temperature) also have a highly significant impact on DED prevalence. It is important as they underscore the importance of efforts during selected periods of the year, as symptoms could be more pronounced during the season. Several studies including Purba's have documented a relationship between DED and environmental factors [21]. Our data were statistically analysed, and we found significant associations between DED and a number of demographic variables such as gender, age and previous diagnosis of eye disorders. These findings are concordant with Wirta et al. who had similar associations in their study on treatments for DED [22]. As a result, female gender and younger age are identified as important risk factors indicating that awareness and preventive measures should be targeted to those groups, who might be more exposed to the impacts of DED.

But this study has limitations. The identified risk factors and DED are not causally linked in the cross-sectional design. Furthermore, there is reliance on self-reported data which may be biased due to sensitive nature of soft tissue injury and as such subjects may under report or over report their symptoms as per their perception. Yu et al. pointed out discrepancies between patient reported symptoms and physician assessment in past studies [20].

Conclusion:

Finally, this study adds to the increasing body of knowledge relating to the prevalence of DED amongst university students and the association of demographic and lifestyle factors. These findings show that DED is a very prevalent condition in young adults and show the need to recognize DED as a prevalent

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condition as suggested by the rising digital device multiplies. Future research should involve longitudinal data to fully understand the causal relationships among risk factors and DED and to evaluate the effectiveness of specific treatment targeted interventions in this population.

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Ethical approval:

After fully explaining the study and emphasizing that participation is optional, each participant gave their informed consent. The information gathered was safely stored and utilized exclusively for study.

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Conflict of interests:

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability:

All data associated with this study are present in the paper.

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