

Original Research Article

Awareness of the Practice and Use of Contact Lenses Amongst Students of the Health Faculty at Jazan University During the COVID-19 Pandemic

ABSTRACT

Background: Contact lenses are medical devices which are used as an alternative to spectacles to correct problems with eyesight. Poor hygienic handling of these lenses poses an ocular health risk. Increased popularity and usage of contact lenses in combination with insufficient cleanliness results in increased bacterial infections of the eye, even resulting in blindness.

Materials and Methods: We employed a quantitative cross-sectional study, where we used questionnaires to gather data. We conducted the study among students of the Health Faculty at Jazan University where we recruited 361 participants. Using the questionnaires, we assessed the use of contact lenses and the hygiene practice when handling them among the participants.

Results: We found that 52.6% of the participants use contact lenses. Among those it is predominantly females who use contact lenses, and their motivation is primarily for cosmetic reasons. We further found that the majority of contact lens users exhibit good hygiene practices when handling contact lenses. However, there remains more than a quarter of participants for whom the hygiene practice is poor to moderately good.

Conclusion: Considering the significant fraction of participants who showed inadequate hygiene practice, we recommend better information and training for those who use contact lenses. This information and training should be predominantly made available on the internet or through contact lens vendors, as these are the most common information channels among the participants.

Keywords: [Awareness, Practice, Contact Lenses, Health faculty, University Students, Jazan University, Jazan, Saudi Arabia }

1. INTRODUCTION

Contact lenses are medical devices (lenses), which are placed on the surface of the cornea to correct refractive errors [1]. People who wear contact lenses are 60 times more likely to develop ocular disorders compared to people who do not wear contact lenses [1]. An estimated 1 out of 2500 people per year who use daily wear contact lenses and 1 out of 500 people per year who use extended wear contact lenses will develop presumed microbial keratitis [1]. This shows that contact lenses incur certain risks, with an estimated 6% of users developing complications [1]. Ametropic disorders of vision affect between 800 million to 2.3 billion individuals globally. Around 140 million users worldwide, including 3.3 million in the United Kingdom, wear contact lenses for the correction of refractive errors. The British contact lens market value has increased significantly from £33 million in 1992 to £198 million in 2009 [1]. Contact lenses are becoming increasingly popular due to clearer vision, for cosmetic reasons, for use during sports and for convenience [1]. Epidemiological studies of contact lens related complications provide information on their frequency and distribution and on their associated risk factors [1]. Estimates of the entire number of contact lens wearers worldwide were as high as 140 million in 2005, so that even complications with a small incidence may affect a significant number of people [1]. As a practitioner being aware of the incidence and risk factors of individual contact lens complications will help to accurately inform the patient of the risks of developing these complications [2]. This information can also guide the management and help the understanding of the pathogenesis of contact lens related diseases [2]. Contact lens related complications are becoming a greater health concern as increasing numbers of people are using them as an alternative to spectacles [1]. Contact lenses alter the natural ocular environment by introducing a bioburden of microorganisms to the ocular surface from contaminated hands and lenses as well as lens care solutions and reduce the efficacy of the innate defense [1]. Although severe complications are rare, microbial keratitis is potentially blinding, and therefore suspected cases should be diagnosed as early as possible and referred to an ophthalmologist for treatment [1]. Several risk factors are identified with extended wear, poor hand hygiene, inadequate lenses and lenses case care being the most significant [1]. Promotion of proper contact lens hygiene and practices are essential to decrease the adverse effects of contact lens wear [1]. The corneal surface is under a continuous threat of infection from a barrage of pathogens and at any instance up to 63% of contact lenses yield a positive culture consisting of normal commensals. Reduced efficacy of the natural defense mechanisms combined with the change in concentration and different kinds of bacteria can contribute towards pathogenic processes. With the natural barriers threatened, damage to the intact cornea allows bacteria to stick to the cell membrane; an important step within the infectious process as it facilitates the colonisation of bacteria [1]. Therefore, the main objective of this study is to investigate the awareness of the practice and use of contact lenses amongst students of the Health Faculty at Jazan University during the COVID-19 pandemic in 2021.

2. Methods

2.1 Study design and participants

This is a cross-sectional study based on questionnaires. The study was conducted among all students of the health faculty at Jazan University, including males, females, Saudis, and non-Saudis, aged 18 years and older, who were willing to participate in the study.

The sample size of this study was calculated by using the following formula for random sampling:

$$n = \frac{z^2 * \hat{p}(1 - \hat{p})}{\epsilon^2}$$

Where:

- 1) n = sample size.
- 2) z = the z score (1.96 to a confidence level of 95%)
- 3) \hat{p} = population proportion (20%)
- 4) ϵ = margin of error (5%)

According to this formula, the required sample size is 246. The actual, collected sample of this study was 361 participants and therefore exceeds this lower limit. The study sampling applied in this study is multistage sampling; the sample was taken from the Health Faculty of the University of Jazan. The colleges of Medicine, Pharmacy, Nursing, Dentistry, Public health, and Applied Medical Sciences were included. The sample was

randomly selected from each college. Probability proportional to size sampling (PPS) was used to determine the number of students in each of the selected colleges.

2.2 Study setting

The study was carried out at Jazan university, Jizan city, Kingdom of Saudi Arabia in 2021.

2.3 Data collection tools and instruments

A pre-tested questionnaire was used for the data collection. The questionnaire includes questions about sociodemographic factors, awareness of the practice and use of contact lenses amongst students of the Health Faculty at Jazan university. The questionnaire was first validated through a pilot study. A scoring system consisting of 6 questions was established to assess the practice of the participants towards wearing contact lenses. Those who reported positive practice in these questions were given 2 points, while those who reported negative practice were given 0 points. The good practice scores were then summed up, and a total positive score was calculated (The lowest possible score was 0, and the highest score was 12). The level of practice was then constructed for the participants based on the positive practice score: those who achieved a total score of less than 75% (8 and less) were considered to have a poor to moderately good practice, while those who achieved a total score of 75% and higher (9 – 12) were considered to have a good practice.

2.4 Data entry and statistical analysis

The data analysis was performed using the Statistical Package for the Social Sciences (SPSS, version 23). Frequency and percentages were used to display categorical variables. Minimum, maximum, mean, and standard deviation were used to present continuous variables. A two sample t-test and ANOVA were used to examine the mean difference of the good practice score among the different groups. Additionally, Chi-square was used to test for categorical factors associated with wearing contact lenses. The level of significance was set to 0.05 throughout.

2.5 Ethical consideration

This study was submitted for review and has been ethically approved by the Research Ethics Committee (REC) at Jazan University (approval number REC-43/02/007, dated September 09, 2021). We conducted our study in accordance with the ethical standards within the political borders of the Kingdom of Saudi Arabia. Permission was obtained from each participant. No name or other personal details were collected for this study as all the questionnaires were anonymous. All information collected was kept confidential and used only for scientific purposes.

3. RESULTS

3.1 Socio-demographic and academic profiles of the participants

A total of 361 participants took part in this study. Table 1 displays the sociodemographic profile of the participants. As for the age, 70 (19.4%) of the participants were between 18 – 20 years old, 283 (78.4%) were between 21 – 26 years old, and 8 (2.2%) were between 27 – 30 years old. As for the gender, 145 (40.2%) were males, and 216 (59.8%) were females. As for the marital status, 318 (88.1%) were single, 41 (11.4%) were married, and 2 (0.6%) were divorced. As for the colleges, 39 (10.8%) were from the dentistry college, 69 (19.1%) were from the pharmacy college, 82 (22.7%) were from the applied medical sciences college, 101 (28%) were from the medical college, 45 (12.5%) were from the nursing college, and 25 (6.9%) were from the public health college. As for the academic year of the participants, 24 (6.6%) were from the first academic year, 41 (11.4%) were from the second academic year, 71 (19.7%) were from the third academic year, 53 (14.7%) were from the fourth academic year, 89 (24.7%) were from the fifth academic year, and 83 (23%) were from the sixth academic year.

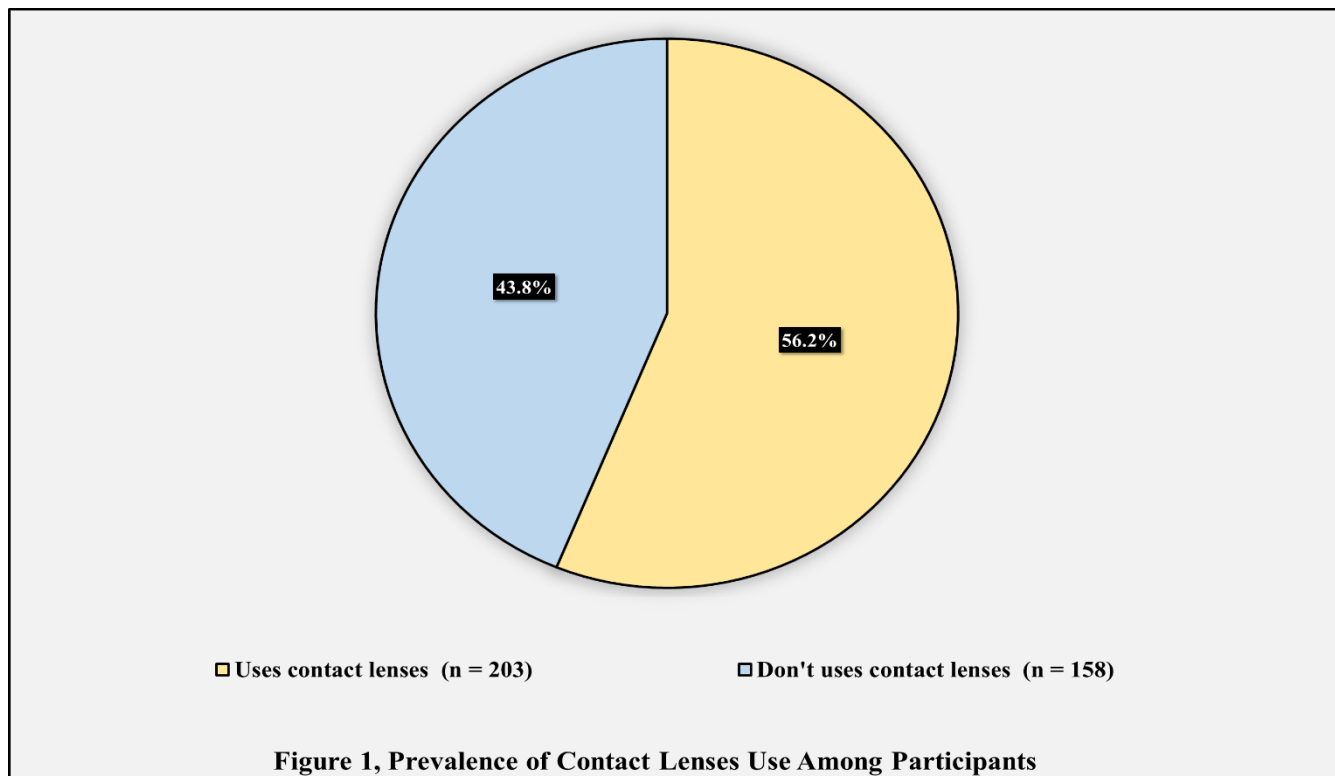
Table1
Socio-Demographic and Academic Profile of The Participants (n = 361)

Demographical Characteristics	n	%
Age		
18 - 20 years	70	19.40
21 - 26 years	283	78.40
27-30 years	8	2.20
Gender		
Male	145	40.20
Female	216	59.80
Marital Status		
Single	318	88.10
Married	41	11.40
Divorced	2	0.60
College		
Dentistry college	39	10.80
Pharmacy college	69	19.10
Applied medical sciences college	82	22.70
Medical college	101	28.00
Nursing college	45	12.50
Public health college	25	6.90
Academic Year		
First	24	6.60
Second	41	11.40
Third	71	19.70
Fourth	53	14.70
Fifth	89	24.70
Sixth	83	23.00

3.2 Prevalence of contact lens use among participants

Figure 1 shows the prevalence of contact lens use among the participants. 203 (56.2%) were using contact lenses, while 158 (43.8%) were not.

Fig. 1. Prevalence of contact lens use among participants



3.3 Personal experience of the participants with contact lenses

Table 2 presents the personal experience of the participants with contact lenses. Among the participants who use contact lenses, 48 (23.6%) reported using it for medical purposes, 109 (53.7%) reported using it for cosmetic reasons, and 46 (22.7%) reported using it for both. Regarding the usage duration, 43 (21.2%) of the participants started using contact lenses less than one year ago, 76 (37.4%) have been using them for 1 - 4 years, and 84 (41.4%) of the participants have been using them for 5 years or more. As for how often the participants wear their contact lenses, 14 (6.9%) reported using them permanently, 146 (71.9%) reported wearing them intermittently, and 43 (21.2%) reported that they do not use them at the moment. As for the type of contact lenses they use, 119 (58.6%) reported using soft lenses, 8 (3.9%) reported using semi-soft lenses, 1 (0.5%) reported using hard lenses, and 75 (36.9%) reported not knowing what type of lenses they are using. Regarding the interruption of contact lenses use, 199 (98%) of the participants reported removing their lenses before sleeping, and 189 (93.1%) reported removing them before swimming. With regards to medical conditions, 126 (62.1%) of the participants reported having a visual problem secondary to using contact lenses, while 88 (43.3%) of the participants have also reported having an allergy secondary to contact lens use. Among those 88 participants, 27 (30.7%) reported consulting an ophthalmologist for the problem, 12 (13.6%) reported using home remedies for it, and 49 (55.7%) reported ignoring it to leave it to resolve on its own. Regarding the comfort while wearing contact lenses, 19 (9.4%) reported always feeling uncomfortable, 109 (53.7%) reported usually feeling uncomfortable, 69 (34%) reported that it depends on the brand they use, and 6 (3%) reported never feeling uncomfortable. Regarding the impact of wearing contact lenses, 37 (18.2%) participants reported having complications due to using contact lenses. As for practice of the participants towards changing the contact lenses, 15 (7.4%) reported changing it after one time use, 14 (6.9%) reported changing it weekly, 46 (22.7%) reported changing it monthly, 66 (32.5%) reported changing it every 6 – 12 months, and 62 (30.2%) reported changing it irregularly. With regards to the safe usage of the lenses, 56 (27.6%) reported using contact lenses beyond the expiry date. Regarding the cleanliness of their lenses, 191 (94.1%) reported they take care of the lenses by using the provided solution, 4 (2%) reported taking care of it by washing it with water, and 8 (3.9%) reported they do nothing to care for their contact lenses. Usually contact lenses are intended for personalised use, however 54 (26.6%) participants reported letting other people use their contact lenses. A significant number of 128 (63.1%) participants reported that they have stopped using contact lenses. With 198 (97.5%) participants the vast majority reported taking care of their hand hygiene and the contact lens container hygiene.

Table 2
Participants Personal Experience with Contact Lenses (n = 203)

Question	n	%
Q1/ For what purpose do you use contact lenses?		
Medical	48	23.6
Cosmetics	109	53.7
Both	46	22.7
Q2/ When did you start using contact lenses?		
Less than 1 year	43	21.2
1-4 years	76	37.4
5 years and more	84	41.4
Q3/ How often do you wear your contact lenses?		
All the time	14	6.9
Part Time	146	71.9
Not using now	43	21.2
Q4/ Which type of contact lens do you use?		
Soft	119	58.6
Semi-Soft	8	3.9
Hard	1	0.5
I don't know	75	36.9
Q5/ Do you remove your contact lenses before sleeping?		
Yes	199	98
No	4	2
Q6/ Do you remove your contact lenses before swimming?		
Yes	189	93.1
No	14	6.9
Q7/ Did you ever suffer visual problems (redness, itching) because of the use of contact lenses?		
Yes	126	62.1
No	68	33.5
I don't know	9	4.4
Q8/ Did you ever suffer an allergic reaction due to wearing contact lenses?		
Yes	88	43.3
No	112	55.2
I don't know	3	1.5
Q9/ If the answer to the previous question was "yes" what action did you take at that time?		
Consult ophthalmologist.	27	30.7
Home remedies use	12	13.6
Ignore	49	55.7
Q10/ Did you ever feel discomfort while using contact lenses?		
Always	19	9.4
Usually,	109	53.7
Depends on the brand.	69	34
Never	6	3
Q11/ Did you ever face any complications because of the use of contact lenses?		
Yes	37	18.2
No	166	81.8
Q12/ How often you usually change your contact lenses?		
After one time use	15	7.4
Weekly	14	6.9

Monthly	46	22.7
6 - 12 months	66	32.5
Irregularly	62	30.5
Q13/ Did you ever use your contact lenses beyond the expiration date?		
Yes	56	27.6
No	147	72.4
Q14/ How do you take care of your contact lenses?		
Using the provided solution	191	94.1
Wash it with water	4	2
I do nothing	8	3.9
Q15/ Did you ever let anyone else use your personal contact lenses?		
Yes	54	26.6
No	149	73.4
Q16/ Did you ever stop using contact lenses?		
Yes	128	63.1
No	75	36.9
Q17/ Do you take care of your hand and contact lens container hygiene before wearing contact lenses?		
Yes	198	97.5
No	5	2.5

3.4 Perception of contact lenses

Table 3 demonstrates the perception of the participants towards contact lens use. When asked what the participant thinks is better for the medical use of contact lenses, 36 (17.7%) answered contact lenses, 117 (57.6%) answered eyeglasses, and 50 (24.6%) reported they do not know. 88 (43.3%) reported they thought that the cosmetic contact lenses are more dangerous than the medical lenses. 178 (87.7%) reported they think it is important to be careful while using contact lenses. 140 (69%) reported they think it is important to change the lenses frequently. Only 36 (17.7%) reported they think the population is aware of how to use contact lenses in a proper way.

Table 3
Perception of Contact Lenses (n = 203)

Question	n	%
Q1/ If the purpose of using contact lenses was medical, which one do you think is better to wear?		
Contact lenses	36	17.7
Eyeglasses	117	57.6
I don't know	50	24.6
Q2/ Do you think cosmetic contact lenses are more dangerous than medical lenses?		
Yes	88	43.3
No	60	29.6
I don't know	55	27.1
Q3/ Do you think it is important to be careful while using contact lenses?		
Yes	178	87.7
No	7	3.4

I don't know	18	8.9
Q4/ Do you think it is recommended to change the contact lenses frequently?		
Yes	140	69
No	16	7.9
I don't know	47	23.2
Q5/ Do you think most of the population have sufficient knowledge of how to use contact lenses in a proper way?		
Yes	36	17.7
No	135	66.5
I don't know	32	15.8

3.5 Perception of contact lens use during the Covid-19 pandemic

Table 4 presents the perception of the participants towards contact lens use during the COVID-19 pandemic. 103 (50.7%) thought that COVID-19 can be transmitted through contact lenses. 46 (22.7%) reported being concerned about having an increased risk for catching COVID-19 due to wearing contact lenses. 53 (26.1%) reported a change in their frequency of using contact lenses because of COVID-19. Only 22 (10.8%) reported they had a professional who offered them information about contact lens use during the COVID-19 pandemic.

Table 4

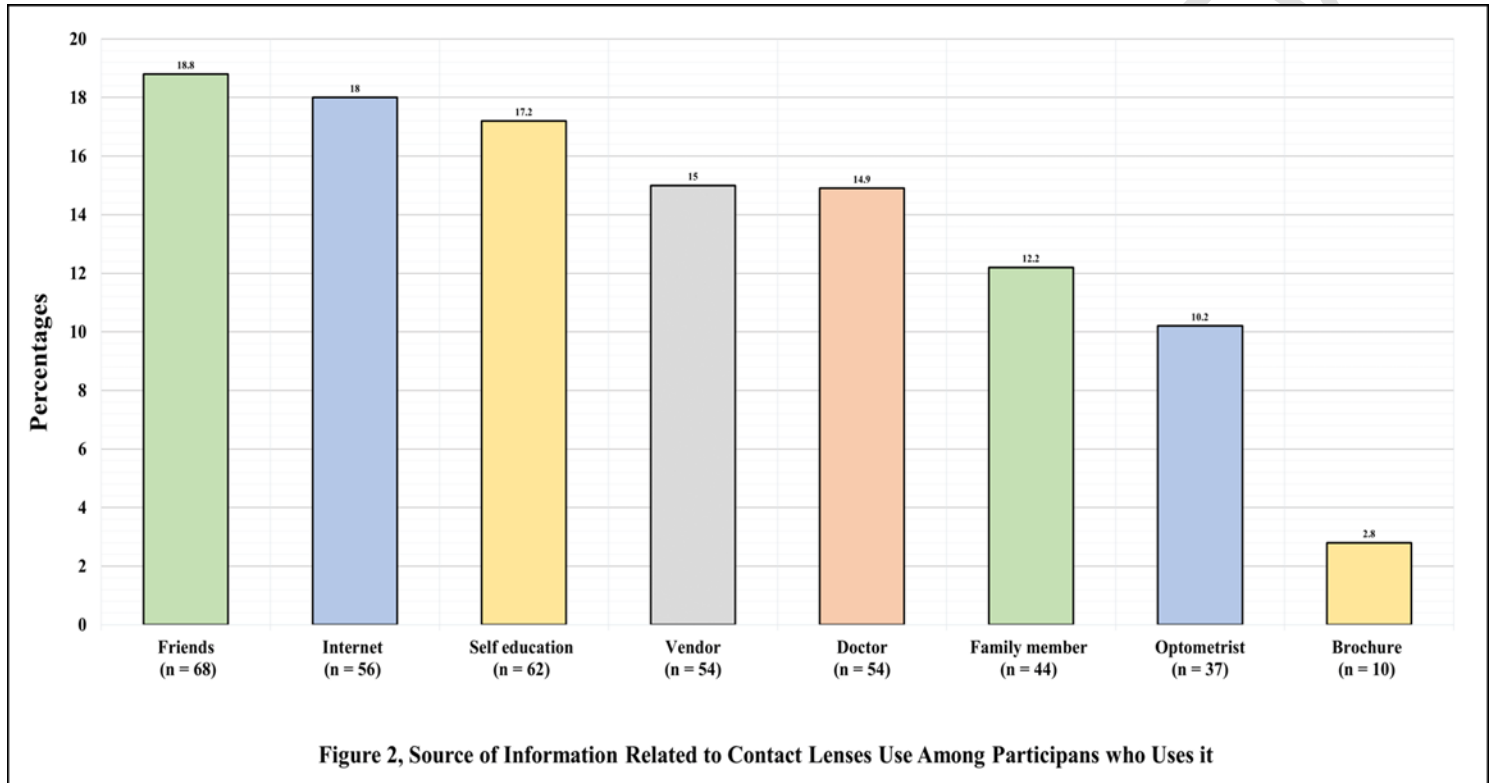
Perception of Contact Lens Use During COVID-19 Pandemic (n = 203)

Question	n	%
Q1/ Do you agree that COVID-19 can be transmitted by contact lenses?		
Yes	103	50.7
No	100	49.3
Q2/ Are you concerned about an increased risk of catching a COVID-19 infection due to contact lens wear?		
Yes	46	22.7
No	157	77.3
Q3/ Is there any change in your frequency of wearing contacts lenses due to COVID-19?		
Yes	53	26.1
No	150	73.9
Q4/ Was there any professional who had offered you information related to contact lenses and COVID -19?		
Yes	22	10.8
No	181	89.2

3.6 Source of information related to contact lens use among participants who use them

Figure 2 illustrates the source of information regarding the usage of contact lenses among participants who use them. The prevalent reported sources were friends 68 (18.8%), internet 56 (18%), self-education 62 (17.2%), and contact lens vendor 54 (15%).

Fig 2. Source of information related to contact lens use among participants who use them



3.7 Assessment of the practice for wearing contact lenses

Table 5 shows the assessment of the practice of participants for wearing contact lenses. The mean practice score was 10.57 ± 1.59 , while the minimum was 6, and the maximum was 12. As for the wearing contact lenses practice level, 31 (15.3%) had a poor to moderately good practice (less than 75% from the total score) (8 and less), and 172 (84.7%) had good practice (75% or more from the total score) (9 and more).

Table 5
Assessment of Participants Practice for Wearing Contact Lenses

Good Practice Score (Maximum possible score is 12, and the minimum possible score is 0)		
Mean		10.57
Standard deviation		1.59
Minimum		6
Maximum		12
	n	%
Wearing Contact Lenses Practice Level		
Poor to Moderately good practice (less than 75% from the total score) (8 and less)	31	15.3
Good practice (75% or more from the total score) (9 and more)	172	84.7

3.8 Factors associated with wearing contact lenses

Table 6 demonstrates the factors associated with wearing contact lenses. Gender was significantly associated with wearing contact lenses ($p < 0.001$), showing that more females were wearing contact lenses compared to males (78.2% vs 23.4%). Marital status was also significantly associated with wearing contact lenses ($p < 0.001$), showing that the percentage of singles wearing contact lenses was significantly higher than the percentage of married participants (80.5% vs 52.8%). Moreover, the college the participants attended was also significantly associated with wearing contact lenses ($p = 0.002$), showing that the college with the highest percentage of wearing contact lenses was the nursing college (75.6%), while the college with the lowest percentage of wearing contact lenses was the pharmacy college (43.5%). Age, and academic year were not significantly associated with wearing contact lenses.

Table 6
Factors Associated with Wearing Contact Lenses

Factor	Wearing Contact Lenses		P-Value
	Yes	No	
Age			
18 - 20 years	39 (55.7%)	31 (44.3%)	0.930
21 - 26 years	160 (56.5%)	123 (43.5%)	
27-30 years	4 (50%)	4 (50%)	
Gender			< 0.001*

Male	34 (23.4%)	111 (76.6%)	
Female	169 (78.2%)	47 (21.8%)	
Marital Status			
Married	168 (52.8%)	150 (47.2%)	0.001*
Single	33 (80.5%)	8 (19.5%)	
College			
Dentistry college	17 (43.6%)	22 (56.4%)	
Pharmacy college	30 (43.5%)	39 (56.5%)	
Applied medical sciences college	41 (50%)	41 (50%)	0.002*
Medical college	64 (63.4%)	37 (36.6%)	
Nursing college	34 (75.6%)	11 (24.4%)	
Public health college	17 (68%)	8 (32%)	
Academic Year			
First	13 (54.2%)	11 (45.8%)	
Second	29 (70.7%)	12 (29.3%)	
Third	39 (54.9%)	32 (45.1%)	0.119
Fourth	35 (66%)	18 (34%)	
Fifth	42 (47.2%)	47 (52.8%)	
Sixth	45 (54.2%)	38 (45.8%)	

*Significant at level 0.05

3.9 Factors associated with good practice score for wearing contact lenses

Table 7 displays the factors associated with a good practice score for wearing contact lenses. Gender was significantly associated with a good practice score ($p = 0.05$), showing that males had a significantly higher good practice score compared to females (11.06 ± 1.65 vs 10.47 ± 1.56).

Table 7
Factors Associated with Good Practice Score for Wearing Contact Lenses

Factor	Good Practice Score for Wearing Contact Lenses		P-Value
	Mean	Standard deviation	
Age			
18 - 20 years	10.72	1.337	0.647
21 - 26 years	10.55	1.648	
27-30 years	10	1.633	

Gender			
Male	11.06	1.65	0.05*
Female	10.47	1.562	
Marital Status			
Married	10.65	1.57	0.173
Single	10.24	1.64	
College			
Dentistry college	10.00	2.12	
Pharmacy college	10.73	1.78	
Applied medical sciences college	10.63	1.64	0.726
Medical college	10.53	1.44	
Nursing college	10.71	1.38	
Public health college	10.59	1.54	
Academic Year			
First	10.77	1.54	
Second	11.17	1.00	
Third	10.26	1.85	0.114
Fourth	10.86	1.48	
Fifth	10.48	1.76	
Sixth	10.27	1.51	

*Significant at level 0.05

4 Discussion

To achieve a better understanding of the present discussion about contact lens use, we decided to conduct this study to measure the awareness of the practice and use of contact lenses amongst students of the Health Faculty at Jazan University during the COVID-19 pandemic. In the current study, more than half of the participants were using contact lenses, and most of the participants exhibited good practice, while nearly a quarter of them had a poor to moderately good practice. Furthermore, contact lens wearing was more prevalent in the female participants. This study has some limitations which should be considered when generalizing and interpreting its findings. The cross-sectional study is not an appropriate approach for establishing the causative associations among the study variables, which is consistent with what other authors found [3,4]. Also, non-response bias is a problem in such studies, consistent with other research [5]. The problem stems from the self-reported questionnaire utilized in this study, which is consistent with other studies [5,6] and contrary to another body of studies [7,8]. Therefore, future studies should utilize various methods, like interviews. Moreover, due to the small sample size considered in this study, which is consistent with [3,9] and in contrast to [6], the determination of exact results and accurate relationships is limited. Future research will require greater cross-sectional sampling and qualitative studies. Furthermore, only students from Jazan University took part in this study, and therefore the results may not be representative of the entire community, similarly to another study [5]. Lastly, the ability to generalize our findings could be limited because of an unequal gender distribution. On the other hand, this study was significant because, as far as we know, only one other study has been conducted in the Jazan region to assess contact lens awareness and practice [3]. Further, this study has a high level of external validity due to the multistage random sampling technique that was utilized to select study participants. This study revealed that more than half of the participants were using contact lenses (56.2%). This finding is in agreement with many previous studies [3,4,10-12],

indicating that contact lenses are widely used. On the contrary, there was a lesser prevalence of contact lens use noted in other studies [12-14]. Moreover, in the current study, wearing of contact lenses was more prevalent in the female participants (59.8%) which is agreement with many other studies [10,14-16]. Furthermore, 53.7% of participants in this study reported using contact lenses for cosmetic reasons which is similar to the findings in many previous studies [3,13-15,17], while 23.6% of the participants in this study reported using it for medical purposes, consistently with [18,19]. In the current study, the majority of contact lens users show excellent hand hygiene and washing practices. Moreover, most of the participants in this study (94.1%) reflected positive behavior in taking care of the lenses by using the provided solution. Also, most of them (97.5%) reflected excellent behavior with the care of their hand and contact lens container hygiene, similarly with other studies [3,22,23]. In this study, 62.1% of participants had a visual problem secondary to using contact lenses, and 43.3% reported having an allergy secondary to contact lens use. In the present study, 18.2% had a complication due to using contact lenses reflecting that those complications can occur due to contact lens usage. Further, inflammation, dryness, keratitis, and even temporal loss of sight are all consequences of wearing contact lenses [20,22,23]. In the current study, most of the participants reported removing their lenses before sleeping similar to [3,4] and removing them before swimming. Moreover, in the current study, the most commonly reported sources of information about using contact lenses were friends (18.8%), internet (18%), self-education (17.2%), and contact lens vendor (15%). The need of regular eye examinations still require reinforcement. We therefore recommend that eye care practitioners should make an effort to provide proper contact lens training, information, and counseling to contact lens users.

4. Conclusion

Contact lens wearing was more prevalent in the female participants and most of them use contact lenses for cosmetic reasons. More than half of the participants were using contact lenses, and most of them exhibited good practice, while nearly a quarter of them showed a poor to moderately good practice. Moreover, most of the participants in this study showed positive behavior regarding the use of contact lens solutions and excellent behavior regarding their hand and contact lens container hygiene. The need of regular eye examinations persists. Therefore, we recommend that eye care practitioners should try to provide proper contact lens training, information, and counseling to contact lens users.

CONSENT AND ETHICAL APPROVAL

This study had been ethically approved by the Research Ethics Committee (REC) at Jazan University (approval number REC-43/02/007, dated September 09, 2021). Additionally, permission was obtained from each participant. No name or other personal details were collected for this study as all the questionnaires were anonymous. All information collected was kept confidential and used only for scientific purposes.

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