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RESEARCH ARTICLE **OPEN ACCESS**

The Prevalence of Contact Lens Wear and Improper Use Among Students of Al-Baha University, Saudi Arabia

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Abstract:

Background: This study aims to evaluate the knowledge and practice of contact lens wear (CLW) among Al-Baha University medical students.

Methods: A cross-sectional study was carried out using an online self-administered questionnaire *via* Google Forms. The questionnaire had three domains: sociodemographic characteristics of the participants, CLW hygiene practices, and CLW-related complications.

Results: A total of 432 students were enrolled. Almost half of them (203,47%) were CLs wearers. Almost half of the participants, 95 (46.8%), used CL for therapeutic and 108 (53.2%) cosmetic purposes. 81 (40%) wore their CLs for a duration of (1-10 hours/day), 149 (73.4%) did not sleep while wearing their CLs, 61 (30%) shared theirs with others, 110 (54.2%) washed their hands before putting on their CLs and 90 (44.2%) replaced their CL cleaning solution regularly. Only 10 (5%) of the participants did not experience any complications related to CLW, while 108(52.6%), 102 (50%), and 97 (47.8%) experienced dry eye, tears, and foreign body sensations, respectively. Moderate satisfaction of the users was reported.

Conclusion: The medical students at Al-Baha University showed a high CLW ratio and used CL predominantly for cosmetic reasons; both male and female students were very aware of hygienic practices, and moderate satisfaction, with moderate complications, was reported.

Keywords: Contact lens, Prevalence, Improper use complications, Medical students, Al-Baha University, Eye glasses.

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1. INTRODUCTION

Recently, there has been a progressive expansion in the wear and demand of contact lenses (CLs) due to significant developments in the field of contactology [1] [2]. CLs are more effective than eyeglasses in treating vision complaints. In addition, they do not change the

image size on the retina, so anisometropia correction is unaffected [3, 4]. CL use leads to greater satisfaction with refractive error correction [5]. CLs are classified as hard, rigid gas-permeable, or soft lenses. Cosmetic CLs are used for non-medical problems [6], and CLs can be classified as therapeutic, cosmetic, optical diagnostic, operative, preventive, and occupational [7, 8] also based on manufacturing material, CLs are classified into Filcons and Facons [7]. The efficacy of CLs can be affected by refractive index, oxygen permeability, wettability, and water content, besides Light transmission, heat resistance, dimensions, and flexural stability [9-11]. CLW presents various potential threats and can cause complications [12, 13], adverse effects of CLW mostly affect conjunctiva and cornea [8, 14]. In addition to the potential for discomfort, wearing CL may carry the risk of infections [6, 14].

Corneal infection or microbial keratitis is the most serious complication of CLW and can lead to blindness [14, 15]. Recent studies confirmed that pathogenic microorganisms adhere to CLs and survive in lens solutions [16]. Fortunately, recent advances in CL material and shape design, along with strict adherence to regular replacement and hygienic care protocols, have significantly reduced discomfort complaints and improved compliance with CLW [17]. However, CL manufacturing still faces many difficulties because of CLW problems [18].

Numerous potentially pathogenic and nonpathogenic organisms make up the microbiological lens pollutants [16]. According to research done in the Kingdom of Saudi Arabia (KSA) a high percentage of CLs were sold in regular stores without prescriptions [19]. A United States study also found that CL wearers are more likely to experience symptoms such as burning, itching, or tearing of the eyes [5]. Furthermore, the lack of growth in CL use in Europe has been attributed in part to the discontinuation of CL wear supply. Additionally, studies have been done on wearers' satisfaction and retention [17, 20-22]. The literature also discusses how various environmental conditions, including temperature and humidity, affect CL wearers' tear films [23, 24]; for this reason, CLs are now being used in ocular surface disease, leading to surface hydration, protection from environmental effects and injury from abnormal lids as well as drug provision to the ocular surface [25].

Studies have found that the prevalence of CLW complaints was higher in soft CLW [26], most of whom have ocular signs and symptoms. Nonetheless, the number of complaints lowered when soft CL wearers are refitted with new-generation silicone hydrogel CLs [26].

Many studies focus on and examine adult CL wearers' eye complaints, such as dryness [12, 14]. The literature also covered the short-term physiological effects of refitting [27, 28], as well as the symptoms, signs, and duration of discomfort experienced by CLs wearers [3, 29]. As shown in a review, soft CLW has also improved [2, 29] [30]. Despite an increase in CLW among medical students at Al-Baha University, lack of knowledge and improper use were seen; therefore, it is crucial to assess the status of CLW. This study intends to evaluate CLW-related knowledge, current use status, pattern, and improper usage among medical students at Al-Baha University and to report any complications.

2. MATERIALS AND METHODS

A cross-sectional study was carried out in Saudi Arabia's Al-Baha area from January 2022 to November 2023. Study participants were recruited from Al-Baha University; they agreed to take part, were of both sexes, could read, and had a social media account. The sample size was calculated using the Epi Info™ (A public domain suite of interoperable software tools) based on a 95% confidence interval, a 5% margin of error, and the total number of Al-Baha University students. The estimated sample size was 385, but it was adjusted to 432 to compensate for a 10% non-response. This study employed an online self-administered questionnaire *via* Google Forms. The generated link was shared through social networks (*i.e.*, WhatsApp and Telegram). The goal of this research was explained in the interface. A validated questionnaire based on earlier studies was used. The questionnaire had three domains. The first included the participants' sociodemographic characteristics, such as age group, gender, nationality, and residence. The second consisted of questions about CL hygiene practices, while the third centered on CLW-related complications.

2.1. Statistical Analysis

The collected data were analyzed using SPSS Version 25, and the variables were then reviewed and presented using descriptive statistics. The categorical variables such as gender, age group, and nationality were summarised and reported in terms of frequency distribution. The reliability test was evaluated using the Cronbach alpha value, which ranged from 0 to 1, and the estimated value was 0.6 – 0.7. The chi-square test was used to evaluate and quantify the associations between sociodemographic factors and CLW. Statistical significance was set at $p \leq 0.05$.

2.2. Ethical Considerations

The Al-Baha University, Faculty of Medicine Research & Ethics Committee approved this study, which was given the approval number: REC/SUR/BU-FM/2022/43. Our institution committee checks the fulfillment rules of the Helsinki Declaration for involving human subjects in the research. Before enrolling in the study, informed consent was obtained from each participant.

3. RESULTS

A total of 432 students were enrolled in the study, 68.6% (n=210) of the students' age ranged from 20-22 years. 68.5% (n=296) of the population were women. Of the 432, 203 (47%) were contact lens users (Fig. **1**) other sociodemographic characteristics are shown in Table **1**.

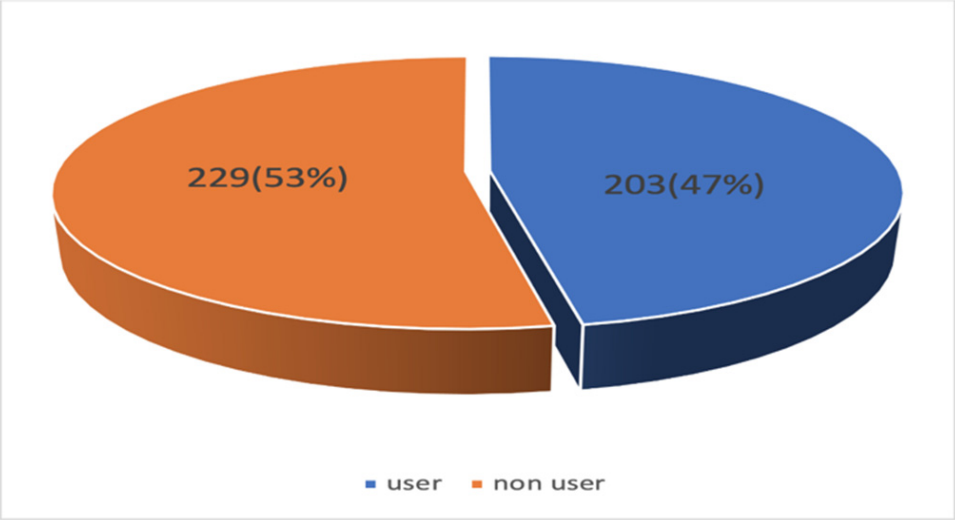

Fig. (1). Percentage of CL use.

Table 1. Sociodemographic characteristics among Al-Baha University students, N=432.

Variable		Number	(%)
Gender	Male	136	31.5
	Female	296	68.5
Age group (Years)	18-20	117	27.1
	20-22	210	48.6
	23-25	97	22.5
	26-30	2	0.5
	More than 30	6	1.4
Nationality	Saudi Arabian	427	98.8
	Not Saudi Arabian	5	1.2
Marital status	Single	401	92.8
	Married	29	6.7
	Divorced	2	0.5
City	Al-Baha	266	61.6
	Al Aqiq	74	17.1
	Tehama	53	12.3
	Others	39	9

176 of 203 (86.7%) are women. It was found that 46.8% (n=95) and 53.2% (n=108) of the participants used CLs for therapeutic and cosmetics, respectively. The educational levels are shown in Fig. (**2**). Regarding hygiene practice, we found that 51.6% (n=105) of students use their contact lens for more than 6 hours, 73.4% (n=149) never sleep with the lens, and the results revealed that 93.8% (n=190) of them wash their hands before putting on the lens, and 92% (n=187) replace the cleaning solution. About 30% (n=61) of the participants share the lens with others as shown in Table **2**. Regarding the complication related to the use of contact lenses, the results showed that only 5% (n=10) of the participants experienced any complications, whereas 52.6% (n=108), 50% (n=102), 47.8% (n=97) reported dry eye, tears, and foreign body sensation, respectively (Fig. **3**).

Table **3** shows the feedback experience of the users; 58.6% (n=119) found it useful and 53.7% (n=109) changed their life. The Chi-square test was conducted to estimate the association between sociodemographics and contact lenses; the results reported that females use frequently than males. There was a statistically significant association, p = 0.0001. A higher percentage of women 86.7% (n=176) use CL compared to men 13.3% (n=27). And when applied to the age group, it was also statistically significant with p value =0.02 (Table **4**).

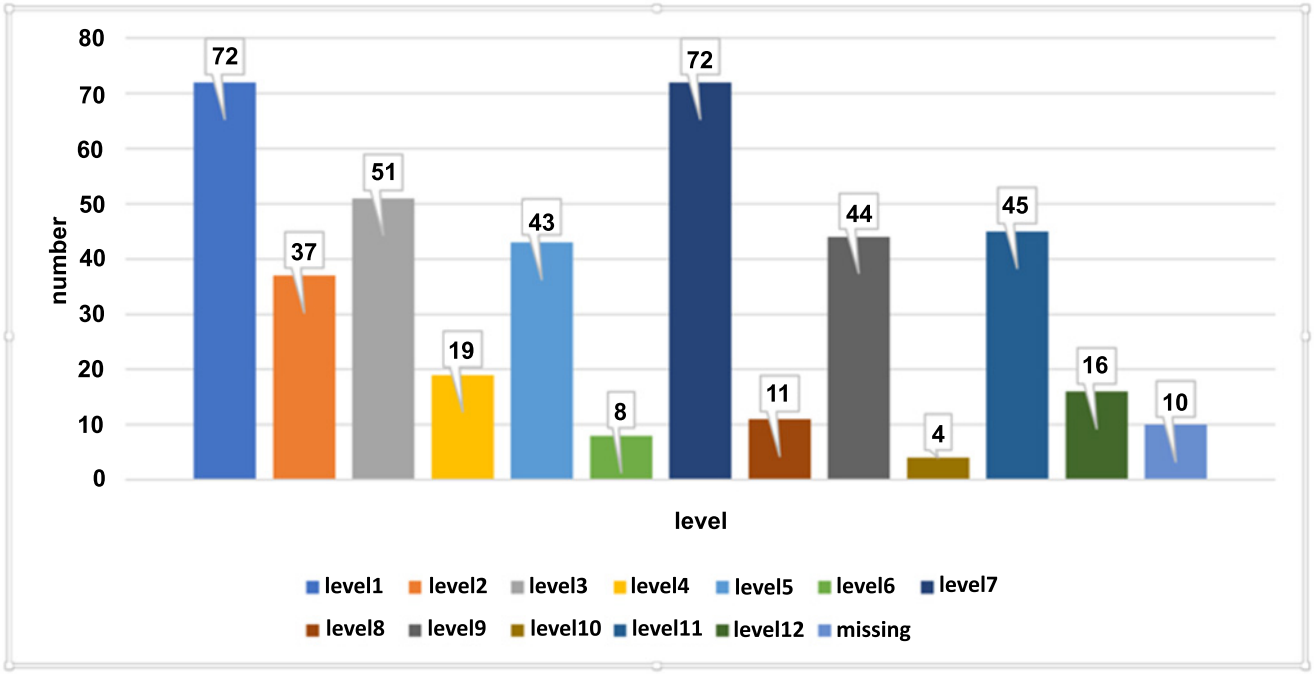

Fig. (2). Participants' educational level.

Table 2. CL hygiene practices reported by Al-Baha University students (N=203).

Hygienic Practices		Number	(%)
Gender of study participant	Male	27	13.3
	Female	176	86.7
Purpose of CL use	Therapeutic	95	46.8
	Cosmetic	108	53.2
How often do you use it?	Less than an hour	17	8.4
	1-5 hours	81	40
	6-10 hours	69	34
	11-15 hours	17	8.4
	16 hours or more	19	9.2
Sleeping with lens habit	Never	149	73.4
	Rare	16	7.8
	Sometimes	18	8.8
	Much	12	6
	Always	8	4
Washing hands before putting on lenses	Never	8	4
	Rare	5	2.5
	Sometimes	38	18.7
	Much	42	20.9
	Always	110	54.2
Replacement of the cleaning solution of CLs	Never	8	4
	Rare	8	4
	Sometimes	52	25.6
	Much	45	22.2
	Always	90	44.2

(Table 2) contd.....

Hygienic Practices		Number	(%)
Sharing lenses with friends	Never	142	70
	Rare	19	9.4
	Sometimes	27	13.3
	Much	9	4.3
	Always	6	3
Do you change the lens if you notice changes in it?	Never	12	6
	Rare	8	4
	Sometimes	44	21.7
	Much	30	14.7
	Always	109	53.7

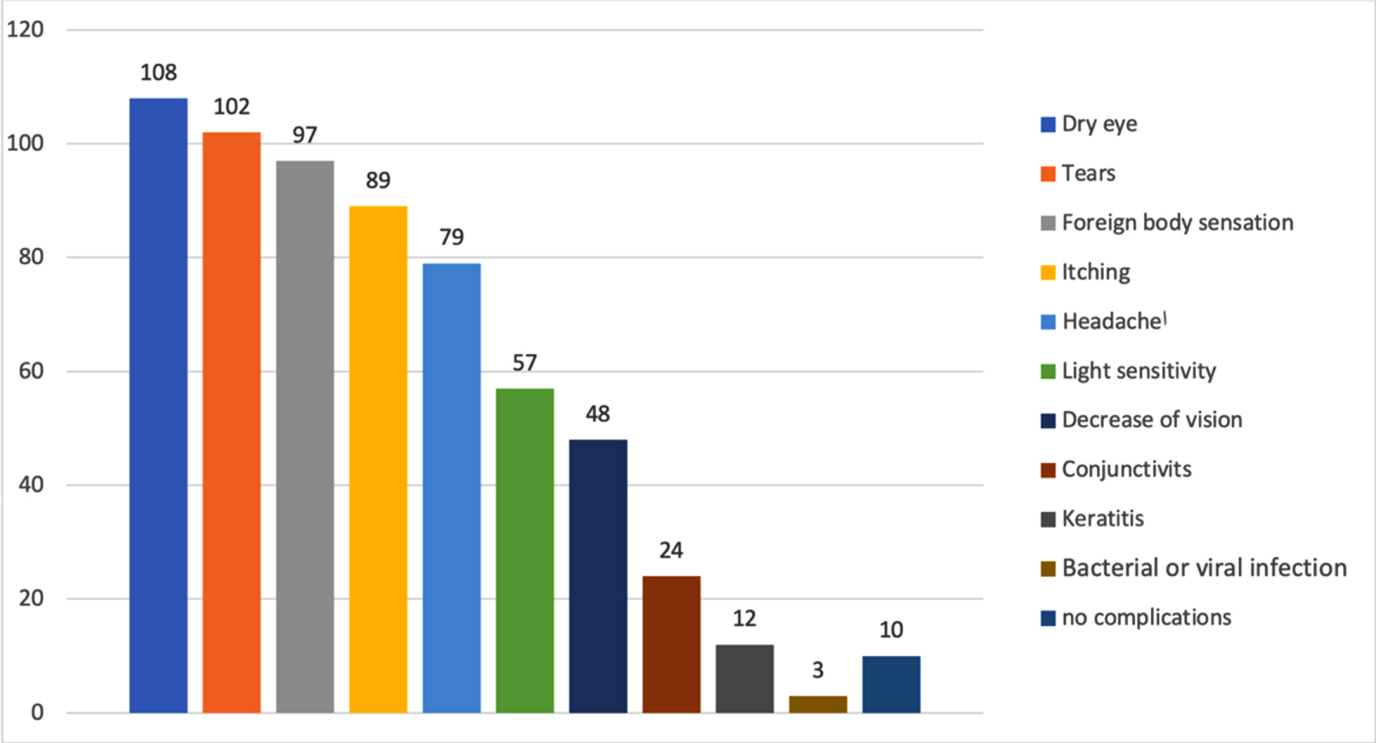

Fig. (3). Reported CL-related complications.

Table 3. Feedback on CL experience among Al-Baha University students, N (%).

Experience Feedback		Number	(%)
Is it useful in your life?	Useful	*119*	58.6
	Maybe	76	37.4
	It is not useful	8	4
Is it expensive?	Expensive	109	53.7
	Neutral	84	41.3
	Cheap	10	5
Is contact lenses a groundbreaking innovation in ophthalmology?	Yes	138	68
	No	5	2.5
	Maybe	60	29.6

Table 4. Relationship between CL use and population variables.

Pattern		Users (n=203)	No-users(n=229)	X^2 (p-value)
Gender	Male	27(13.3)	109(47.6)	58.7(0.001) ***
	Female	176(86.7)	120(52.4)	
Age group(Y)	18-20	68(23.6)	49(21.4)	11.6 (0.02) **
	21-22	86(42.4)	124(54.1)	
	23-25	45(22.2)	52(22.7)	
	26-30	0(0.0)	2(0.9)	
	More than 30	4(1.9)	2(0.9)	

Note: X2 chi-square test., ***, p≤0.001; **, p≤0.01; ns, not statistically significant.

Table 5. Relationship between gender and the purpose of CL use.

		Use		Chi-square (p-value)
		Therapeutic	Cosmetic, N (%)	
Gender	Male, N (%)	20(21)	7(6.4)	63.7 (0.0001)
	Female, N (%)	75(79)	101(93.6)	
Total		95	108	-

Table 6. Reliability test result.

Scale	Items	Cronbach's Alpha	ICC (95%CI)	Value P value
Hygiene	5	0.613	0.613(0.522-0.691)	0.000<

The Chi-square test was conducted to assess the relationship between gender and use, which showed a statistically significant value that 93.6% (n=101) women use contact lenses for cosmetic use more than males (p value= 0.0001) (Table **5**). The questionnaire's reliability was measured by Cronbach's acceptable alpha coefficient. And the consistency between classes is 0.613(0.522-0.691) with a p-value <0.001 (Table **6**).

4. DISCUSSION

In this study, all levels of medical students took part with various percentages; this result is worthy evidence for sample coverage [31]. Moreover, an acceptable alpha Cronbach's value > 0.70 indicates satisfactory internal consistency for a scale [32]. On the other hand, the prevalence of CL wear in this study was 53%, this rate is higher than the rate of medical students of King Faisal University (KFU), Al Ahsa, KSA,2021, which was 47.1% [30], and students of Umm Al-Qura University (UQU) Makkah, KSA, 2016, (50.1%) [29], and study among Saudi female students (47%), 2020 [33], and significantly higher than medical students of King Abdul-Aziz University (KAU), Jeddah, KSA, 2018, which reported prevalence of CL wear to be 40% [2].

Strangely, in a study conducted in Chengdu, China, the rate of CL wear was only 20%, which is much lower than this study [34]. Reversely, a study in Riyadh, KSA, 2014, assessed CL wearing among university female students and reported a prevalence of 70.2% [19], as far as we know, this is the highest rate of CL wear in KSA. The reason for the wide difference in results between Saudi universities may be due to differences in times of studies or populations studied [2], but worldwide, the rate of CL wear among medical students is widely different [15, 35].

From another view, the majority of CL wearers in this study were females (86.7%) this is consistent with the study conducted among medical students of (KAU), Jeddah, and KSA, where females reported a prevalence of 95% [2], and similarly in a study among medical students of (KFU), Al Ahsa, KSA, reported 63.3% [30], and same like a study in Jordan, 2020, conducted among the university population found that 89% of the CL wearers were female [36], moreover in China, a study in eight different universities reported that (82.15%) of CL wearer were female [35], and among medical students of University of Malaya, 87.6% of CL wearer were female [37].

The study revealed that Cosmetic use was the main purpose of CLW among females 93.6% compared to males (6.4%). The Chi-square test revealed a statistically significant value concerning cosmetic Cl wear among females more than males (p value= 0.0001); this result is supported by other similar studies conducted inside KSA, which reported high rates of CL wear for cosmetic purposes among the university female students [2, 19, 29], and also studies conducted outside KSA [37-39].

Concerning CL hygienic practices, almost half of the participants responded to the questions, and the majority of them were female; this is logical because females represent 68.5% of the studied population and 86.7% of CL wearers, and this is also in favor of other published

studies [2, 30, 34, 36, 40], and happily the results were highly satisfactory regarding the time of CL wearing per day (74%), sleeping with CL (73.4%), never sharing CL with others (70%), washing hands before putting on CL (75%), and replacing the cleaning solution (66.4%). These results reflect an elevated level of knowledge, practice, and compliance of Al-Baha medical students concerning hygienic guidelines for CL wear, in comparison, worldwide and local studies have revealed different results of complications and compliance of CLW [30, 40-42] [42].

Results of this study showed that; dryness, tearing, foreign body sensation, and sensitivity to light, are the main complaints reported among CL wearers of Al Baha medical students, while infections are the least one, and although keratitis in this study is the least complication, it is the worst and can lead to severe vision morbidity [6, 11, 42, 43], possibly the low prevalence of infections, including keratitis, among CL wearers of Al Baha medical students may be due to their close adherence to the hygienic protocol, because a lot of studies discovered strong relation between hygiene behaviors of CL wearers and eye complications [16, 42], this is including types of CLs and period of use [44], this is also supported by study conducted in the United States which found that microbial keratitis and dryness were frequently associated with extended CL wearer leading to frequent visiting eye emergency units [43], moreover it led to change in, ocular morphology, corneal sensitivity, and tear film [12]. In the present study, conjunctivitis represented 24% of complaints, but they need more care when they use Cls [13]. Concerning the satisfaction of students, about 60% of the contributors responded positively regarding the benefit of CLs wearing, and 68% looked at CL as an innovative tool in ophthalmology while more than half thought that CLs are expensive. In contrast to these results, a study assessed the satisfaction of CLs wear revealed that significant part of CL users was not satisfied and liable to discontinuation [22, 23], similarly, another study reported that 23% of the wearers had permanently stopped CL use mainly due to dryness and discomfort [21], and another study concluded that a large number of lapsed CL users can be effectively refitted with Cls [17]. A study found that the dropout of new lens wearers was 74%, with many laps in the first two months, and, in addition to lens power, material, and type, the frequent purchase are the reasons [17, 19].

4.1. Limitations of Study

The limitations of this study are that it is an online survey with a limited time.

CONCLUSION

Female medical students from Al-Baha University showed a high CL wear ratio, and both male and female students were highly aware of hygienic practices. Females used CLs predominantly for cosmetic reasons, unlike male students, who use them mainly for therapeutic purposes. On the other hand, a moderate satisfaction level with moderate complications, such as dryness, tearing, and foreign body sensation, was observed among study participants. Although a low ratio of Keratitis was reported, it is considered as a serious complication. Still small ratio of students had malpractice in CL wearing and needed education.

LIST OF ABBREVIATIONS

CLW	=	Contact Lens Wear
CL	=	Contact Lens
KSA	=	Kingdom of Saudi Arabia
KAU	=	King Abdul-Aziz University
KFU	=	King Faisal University
UQU	=	Umm Al-Qura University

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Al-Baha University, Faculty of Medicine Research & Ethics Committee approved this study, which was given the approval number: REC/SUR/BU-FM/2022/43.

HUMAN AND ANIMAL RIGHTS

No animal were used that are the basis of this study. Our institution committee checked the fulfilment rules of the Helsinki Declaration for involving human subjects in the research.

CONSENT FOR PUBLICATION

Before enrolling in the study, informed consent was obtained from each participant.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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