



Public awareness about skin cancer and sun protection assessment in Jeddah

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ABSTRACT

Background: Sun exposure remains the major pathogenic factor for skin cancer. Despite this well-known association, the global incidence of skin cancer is continuously increasing. In Saudi Arabia, the risk of skin cancer may be under estimated. Therefore, public awareness and knowledge about such risk and the protective attitudes should be continuously assessed. **Objectives:** To provide an updated insight into the level of public awareness about skin cancer, and to assess the level of compliance with protective measures.

Methods: Between September 2018 and January 2019, a population-based, cross-sectional study was conducted in Jeddah city. A self-administered questionnaire was distributed among 385 participants, including visitors of a commercial mall at the center of Jeddah (250) and attendees of outpatient clinics of the National Guard Hospital (135). **Results:** According to Fitzpatrick's skin type classification, 49.6% of the participants had type IIIa 25.5% type IV, and 18.4% type II. Skin pathological history showed sunburn (34.6%), moles or nevi (20.5%), skin growth of lump (17.6%), and personal (0.5%) and family (2.6%) history of skin cancer. Of all respondents, 58.9% correctly identified ultraviolet light exposure as the strongest risk factor for skin cancer, and females were more aware of this correlation (65.5%) than males (53.2%), ($p=0.049$). More than half the participants reported being exposed to direct sunlight at least ½ hour per day, while only 26.2% reported using sunscreen regularly, and 12.2% and 70.4% often or regularly used an umbrella and covered their head, respectively. **Conclusion:** The level of awareness about the carcinogenic risk of ultraviolet light exposure is unsatisfactory among Jeddah's population, which associates a very low level of protective behaviors. More efficient health orientation and educational programs should be conducted to raise public awareness and fight against skin cancer epidemic.

Keywords: Awareness, Skin Cancer, knowledge

1. INTRODUCTION

The global incidence of skin cancer outranked that of 29 other cancer groups in 195 countries, with an estimated 7.6 million incident cases in 2017 (Fitzmaurice et al., 2018). In Saudi Arabia, skin cancer is the ninth most common malignancy, representing approximately 3.2% of all diagnosed cancers in 2010. It develops equally in males and females, with a median age of 68 years at the time of diagnosis (Al-Dawsari and Amra, 2016). Clinically, skin cancers are divided into nonmelanoma skin cancers (NMSC) and melanoma cancer (MC) (Barton et al., 2017). Nonmelanoma skin cancer is twenty times more prevalent than MC, and is subdivided into basal cell carcinoma (BCC), the most widespread type of skin cancer, and squamous cell carcinoma (SCC). On the other hand, MC represents the most severe type (Samarasinghe and Madan, 2012).

The main pathogenic mechanism of skin cancer involves damage of skin cells' DNA by the effect of ultraviolet radiation, which is contained in the sunlight. The epidemiological studies that showed this association are strongly supported by experimental trials on animal models that evidenced the causal relationship between these radiations and SCC and MC (Armstrong and Krickler, 2001; Mabruk et al., 2009; Scerri and Keefe, 1995). Thus, extended exposure to direct sunlight remains the major risk factor for skin cancer, with outdoor workers being a high-risk subpopulation (Aquilina et al., 2004; Scerri and Keefe, 1995). However, besides this unintended exposure, recent trend toward tanning and its cultural tie to healthy lifestyle broadens the population at risk, which complexifies the epidemiological characteristics of the disease and the resulting preventive measures (Eller et al., 1996). Another potential population at risk are individuals with vitamin D deficiency, who are estimated over one billion worldwide, and who are encouraged to increase their exposure to sunlight as a therapeutic option; whereas the risk of developing skin cancer outweighs the benefits of vitamin D correction (Holick and Chen, 2008; Naeem et al., 2010; Nair and Maseeh, 2012).

These observations highlight the importance of sun protective measures among the general population to reduce the incidence of skin cancer and the associated morbidity, mortality and medical expenses. Consequently, several studies have been conducted internationally to measure people's awareness about skin cancer and sun protection, as a background for tailored awareness campaigns and education programs. In Saudi Arabia, where the climate is particularly favorable to ultraviolet radiation risk, the level of public awareness and compliance with protective actions should be frequently monitored and adjusted. The few studies that addressed this issue reported unsatisfactory levels of awareness about the causative association of high sun exposure with skin cancer, along with very low levels of compliance (<10%) with protective measures such as the use of sunscreen (AlGhamdi et al., 2016; Al Robaee et al., 2010; Bahakim et al., 2016). All of these studies were conducted in the other areas including Riyadh, Al-Qassim and Al-Kharj cities, while limited studies were conducted in the Western region so far. Therefore, we conducted this research to provide an updated insight into people's awareness about the carcinogenic risk of exposure to sunlight and to measure the level of sun protection practice among the population of Jeddah.

2. MATERIALS AND METHODS

A population-based, cross-sectional study was conducted among inhabitants of Jeddah City, Saudi Arabia, between September 2018 and January 2019. Participants were recruited among visitors of a big commercial center in the center of Jeddah as well as attendees and visitors of the Outpatient Clinics of the National Guard Hospital, Jeddah. Jeddah is located in the west of the kingdom of Saudi Arabia, by the eastern coast of the Red Sea, and inhabits around 3 million populations, which represent approximately 10% of the Saudi population. The target sample size ($N=385$) was calculated by using the online sample size calculator by Raosoft

(<http://www.raosoft.com/samplesize.html>), to detect an unknown proportion of participants who are aware about the association between sun exposure and skin cancer ($P=50\%$), with 95% confidence level and 5% margin error.

Data was collected using a self-administered questionnaire, which was designed by the researchers. The questionnaire was composed of four sections. The first section collected demographics such as gender, age, income, and educational qualification. The second section assessed participant's skin types, using the Fitzpatrick skin color classification, and explored skin history including number of sunburns, presence of skin lump or mole, and vitamin D status (deficient or normal) with eventual management methods in case of deficiency. The third section included probed into awareness and knowledge about skin cancer, notably risk factors, signs of malignant transformation of a benign lesion such as mole. The fourth section explored practice in sun protection and the methods used, notably the use of sunscreen.

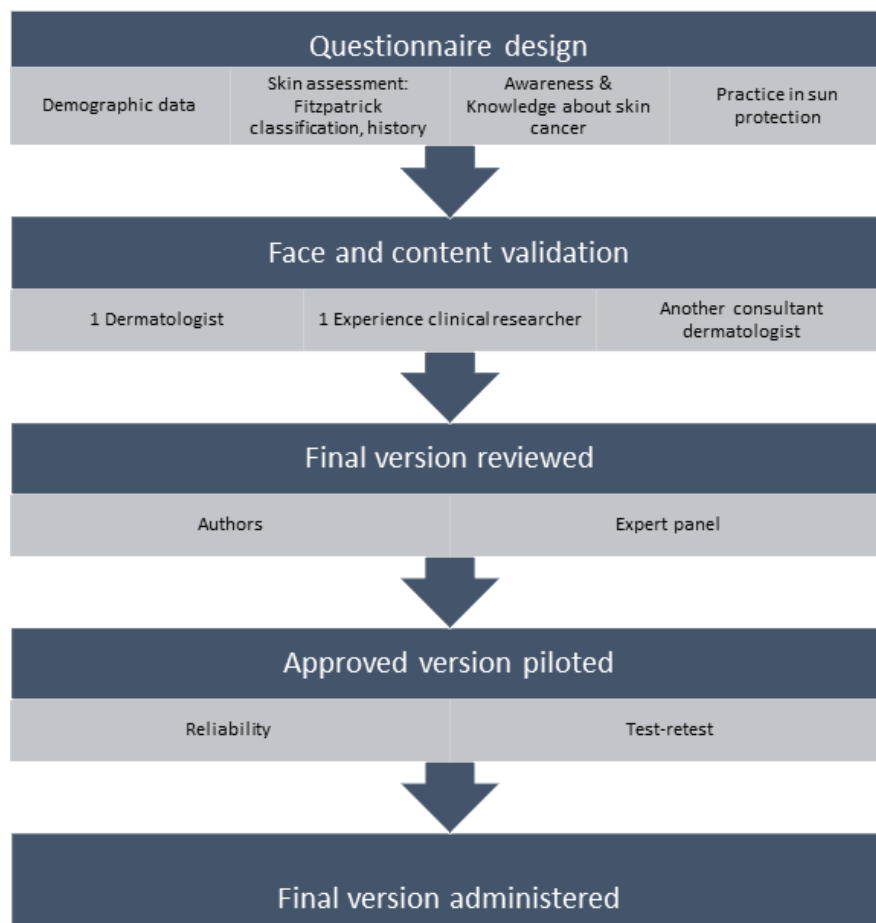


Figure 1 flow chart questionnaire design validation, and administration

The questionnaire underwent face and content validity process. First, a panel of experts including a dermatologist and an experienced researcher evaluated the relevance of each item separately, by reference to the study objectives. Afterwards, the full instrument was compiled and evaluated for content validity, pertaining to the degree to which the instrument fully assesses or measures the construct of interest. Finally, another consultant dermatologist rated the questionnaire items and evaluated their consistency with the respective research questions and objectives. The final version of the instrument was reviewed for clarity and approved by the authors and the members of the expert panel. To examine the responses reliability, test and retest method was adopted on a pilot population including 25 participants, who were surveyed twice at two-week interval. Paired correlation analyses were conducted to compare the test and pretest data for each item. Correlation coefficients were calculated as above 0.70 indicating strong correlation between the first and the second set of data, which reflects high reliability of responses, the questionnaire design, validation, and administration is explained in figure 1 as flow chart.

The questionnaire was distributed in different places of both the mall and the outpatient clinics. A convenience sampling was used to include all adult volunteers, who were free of major physical handicap or mental disorder. The study objectives and methods

were explained by the investigators, who obtained clear verbal consent from the participants prior to inclusion. Participant's privacy and confidentiality was assured, no identifiers were collected, and copies of the questionnaire were kept in a secure place within National Guard Health Affairs premises. The study was approved by the institutional review board of King Abdullah International Medical Research Center.

Statistical analysis

Data were entered and analyzed using the Statistical Package of Social Science (SPSS) software, Version 18 for Windows (SPSS Inc., Chicago, IL, USA), with check for consistency. Descriptive statistics were used to present participants' characteristics and the pattern of responses to the questionnaire; frequencies and percentages were calculated for the independent variables. Knowledge about skin cancer was analyzed by gender by comparing the correctness rate for each item using chi-squared test. Additionally, the rate of exposure to sunlight was compared across other demographic factors using chi-squared test. P-values less than 0.05 were considered for statistical significance.

3. RESULTS

Of the total 385 participants, 197 (51.2%) were females, 323 (83.9%) were Saudi citizens and 167 (43.4%) were aged 21-30 years; while only 41 (10.6%) were aged 41 and above. Majority had high educational level including bachelor's degree (102, 26.5%), diploma (16, 4.2%), college degree (102, 26.5%) and higher education degree (13, 3.3%). Economic status showed that majority are of low income, low (158, 41.0%) and intermediate (124, 32.2%) incomes (Table 1).

Table 1 Participants' characteristics (N=385)

Variable	Category	N	%
Gender	Male	188	48.8
	Female	197	51.2
Age	20 and less	115	29.8
	21-30	167	43.4
	31-40	62	16.1
	41-50	27	7.0
	51-60	7	1.8
	61+	7	1.8
Education	School graduate	149	38.6
	College	102	26.5
	Diploma	16	4.2
	Bachelor	102	26.5
	Higher education	13	3.3
Monthly income (SAR)	Low (<5k)	158	41.0
	Intermediate (5k – 20k)	124	32.2
	High (>20k)	8	2.1
	Not answered	95	24.7
Nationality	Saudi	323	83.9
	Non-Saudi	62	16.1

Skin and skin cancer history is depicted in Table 2. According to Fitzpatrick's skin type classification, the most prevalent skin type was type III (191, 49.6%), followed by type IV (98, 25.5%) and type II (71, 18.4%). Majority of respondents reported no previous history of sunburns, while 65 (16.9%) reported more than 5 episodes. Only two individuals reported that they were diagnosed with skin cancer (prevalence=0.5%, 95% CI=0.1% – 1.9%). Other participants reported history of undefined skin growth (68, 17.6%) and moles or nevi (79, 20.5%). Exploration of skin care seeking behaviors showed that more than half of the participants would see a physician, including a dermatologist (210, 54.5%) or a general practitioner (37, 9.6%), if they had an undefined skin growth, whereas 91 (23.6%) would ignore it.

Table 2 Skin and skin cancer history (N=385)

Variable	Categories	N	%
Skin type	Type I	13	3.4
	Type II	71	18.4
	Type III	191	49.6
	Type IV	98	25.4
	Type V	11	2.9
	Type VI	1	0.26
History of Sunburns	None	184	47.7
	Once	15	3.9
	2-4	53	13.8
	>5	65	16.9
	Don't know	68	17.6
Previous diagnosis of skin cancer	Yes	2	0.52
	No	283	99.5
History of undefined skin growth or lump	Yes	68	17.6
	No	267	69.4
	Don't know	50	13.0
Attitude in case of under fined skin growth	Visit Dermatologist	210	54.5
	Visit General doctor	37	9.6
	Self-treatment	47	12.2
	Ignore it	91	23.6
History of moles/nevi	Yes	79	20.5
	No	268	69.6
	Don't know	38	9.9
Family history of skin cancer	Yes	10	2.6
	No	364	94.5
	Don't know	11	2.9

Table 3 Sunlight exposure and Vitamin D status (N=385)

Variable	Categories	N	%
Vitamin D deficiency	Yes	183	47.5
	No	96	24.9
	Don't know	106	27.6
Exposure to sunlight	> ½ Hour	210	54.6
	< ½ Hour	175	45.4
Use of sunscreen	Daily	45	11.7
	Sometimes*	56	14.5
	Rarely	105	27.3
	Never	179	46.5

*2-3 times a week.

Regarding other sun protection behaviors, practice varied by method. Seeking shade was the most frequently adopted method among participants, as 44.7% of them reported that they always seek shade and 51.2% often do (Table 4).

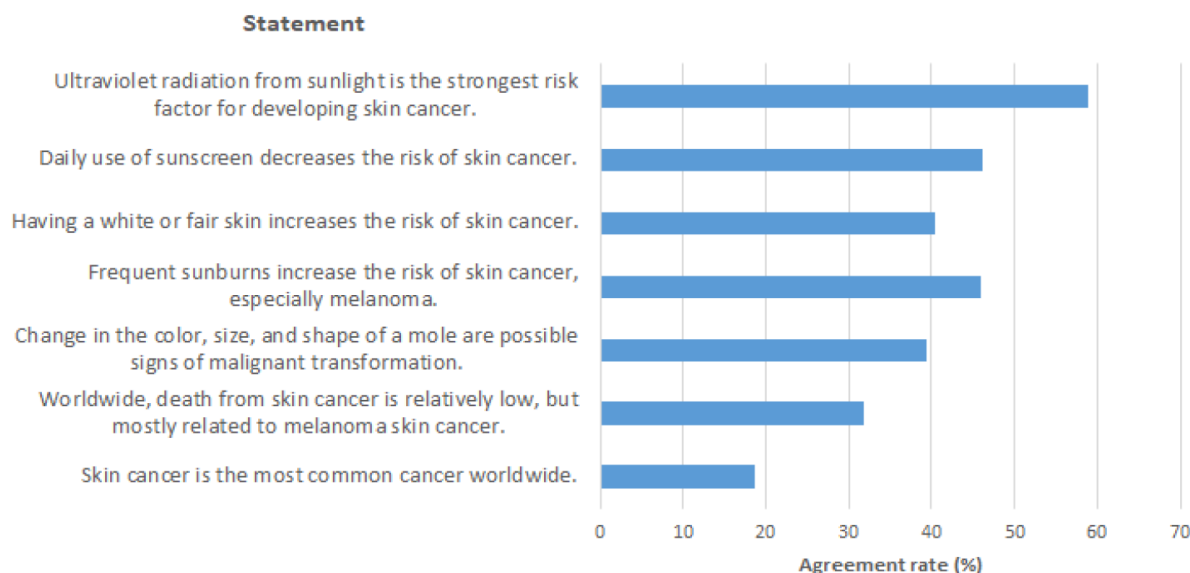
Table 4 Sun protection behavior

Practice	Always (%)	Often (%)	Never (%)
To wear sunglass	32.7	47.0	20.3
To use Umbrella	1.8	10.4	87.8
To seek shade	44.7	51.2	4.1
To cover the head	29.1	41.3	29.6

Table 5 Knowledge about skin cancer

Statement	Agree	Neutral	Disagree	Don't know
Skin cancer is the most common cancer worldwide.	18.7	21.0	19.2	41.1
Worldwide, death from skin cancer is relatively low, but mostly related to melanoma skin cancer.	31.7	13.5	3.6	51.2
Change in the color, size, and shape of a mole are possible signs of malignant transformation.	39.5	13.8	5.4	41.3
Frequent sunburns increase the risk of skin cancer, especially melanoma.	46.0	12.2	5.9	35.8
Having a white or fair skin increases the risk of skin cancer.	40.5	8.8	9.6	41.0
Daily use of sunscreen decreases the risk of skin cancer.	46.2	17.7	8.1	28.1
Ultraviolet radiation from sunlight is the strongest risk factor for developing skin cancer.	58.9	10.1	2.1	28.9

Values are in percentages

**Figure 2** statements and the percentage of the respondents

The responses of the participants toward their knowledge about skin cancer are summarized in Table 5. The majority of respondents (58.9%) agreed that ultraviolet radiation from sunlight was the strongest risk factor for developing skin cancer. On the other hand, fair skin complexion and frequent sunburns were identified as additional risk factors for skin cancer by 40.5% and 46.0% of the participants, respectively. The daily use of sunscreen was identified as a protective factor by 46.2%. Further, 39.5% of the respondents were aware about the change in gross characteristics of mole being warning signs for malignant transformation (Figure 2).

Female participants showed higher awareness regarding 6 out of the 7 items related to skin cancer (Table 6). Most remarkably, 51.8% versus 26.6% were aware about the change in gross characteristics of mole being a warning sign for malignant transformation ($p=0.001$), 57.4% versus 34.0 about frequent sunburns being a risk factor for melanoma ($p=0.001$), and 48.2% versus 32.4% about fair skin complexion being a risk factor for skin cancer ($p=0.005$), in females versus males, respectively. Regarding sun protection behavior, females were more prone to use sunscreen (70.6%) than males (35.0%) and the difference was statistically significant ($p<0.0001$).

Table 6 Knowledge about skin cancer by gender:

Statement	% Agreement		
	Male	Female	P value
Skin cancer is the most common cancer worldwide.	2.7	24.7	0.007**
Worldwide, death from skin cancer is relatively low, but mostly related to melanoma skin cancer.	29.3	34.0	0.289
Change in the color, size, and shape of a mole are possible signs of malignant transformation.	26.6	51.8	0.001**
Frequent sunburns increase the risk of skin cancer, especially melanoma.	34.0	57.4	0.001**
Having a white or fair skin increases the risk of skin cancer.	32.4	48.2	0.005**
Daily use of sunscreen decreases the risk of skin cancer.	46.3	46.2	0.020*
Ultraviolet radiation from sunlight is the strongest risk factor for developing skin cancer.	53.2	65.5	0.049*

Values are percentages. *significant at 5%, **significant at 1%

The association of high exposure to sunlight (>1/2 hour per day) with other demographic and clinical data showed no statistically significant difference by educational level ($p=0.286$), income ($p=0.693$), skin type ($p=0.422$), history of sunburns ($p=0.383$) and vitamin D status ($p=0.116$).

4. DISCUSSION

Saudi Arabia is a well-known region for its sunny and hot climate almost throughout the year (Almazroui et al., 2014). Furthermore, the climate in Jeddah is noticeably characterized by high temperature especially during summer, reaching up to 50°C, and going down to 20°C in winter, in average, which may represent an assumed advantage for the populations given the health benefits of sunlight. On the other hand, prolonged exposure to sunlight constitutes the strongest risk factors for skin cancer, which represent a major health risk for the local populations and imposes rules for caution (Lavers et al., 2016). Findings of this study showed low levels of sun protection among the population of Jeddah, with approximately one individual in ten only (11.7%) using sunscreen on a regular basis, while majority do not use it at all. These findings are relatively similar to observations reported in other local studies, (AlGhamdi et al., 2016; Al Robaee et al., 2010; Bahakim et al., 2016) as well as in a study from Brazil that found 15.1% are regular users of sunscreen among the respondents (Urasaki et al., 2016). On the other hand, head cover was commonly used in the study population, which constitutes an effective protective measure against sunlight. However, head cover in the local population is more related to the traditional outfits, both in males and females, than of a sun protection behavior. Further, the present study also indicated that one-third (32.7%) of participants wear sunglasses and almost half of them (44.7%) seek shade as a protection behavior against the sunlight. This is partially consistent with findings from the previous Brazilian study, which showed that 33.1% wear sunglasses but only 16.6% seek shade during exposure to sunlight (Urasaki et al., 2016). This difference in behavior may be due to the skin real feel under sunlight which may be more pronounced in the region.

Regarding knowledge and awareness about skin cancer, only 58.9% of the participants correctly identified exposure to sunlight and ultraviolet radiation as a major risk factor for skin cancer; and females exhibited higher levels of awareness toward both risk factors and protection methods, compared to their male counterparts. Another local study in Jeddah, which evaluated the knowledge, attitude, and practices in sun exposure, showed a higher level of awareness (78.8%) about the relationship between skin cancer and sunlight exposure (Almuqati et al., 2019). However, the previous study was conducted among non-medical female

students, which may explain the higher level of awareness compared to our study. Indeed, significant gender discrepancy was observed in other local studies, (AlGhamdi et al., 2016; Al Robaee et al., 2010) as well as in a study by Yurtseven et al. in Turkey (Yurtseven et al., 2012). This is probably due to women being more compliant with general health recommendations and healthy lifestyle and showing greater attention towards skin aging. Lower levels of awareness about the methods to reduce the risk of skin cancer were reported in other international studies, such as the study by spradlin et al. (2010), who reported an awareness rate of 29%. On the other hand, authors reported higher levels of awareness about the relationship between sun exposure and skin cancer (Spradlin et al., 2010). Other aspects of knowledge were explored by other researchers, such as Kohler et al. who investigated awareness about the different types of skin cancer and showed that only 51.8% of the respondents were aware of melanoma skin cancer, with no difference between males and females, although this type constitutes the most fatal form of skin cancer (Kohler et al., 2015).

Besides skin cancer, other negative health consequences on the skin are caused by prolonged exposure to ultraviolet radiations from the sun, such as sunburns and skin aging (Pastila et al., 2013). The degree of the effect depends both on the overall exposure time and individual's sensitivity, and whether sun protection methods were applied. Consequently, the amount of daily exposure is used as a standard indicator of exposure (Morison et al., 1997). On the other hand, the duration of exposure that the skin can tolerate depends on the skin type, and ranges from 10 minutes to 60 minutes. In the present study, more than half the participants (54.6%) declared having more than half an hour exposure to sunlight daily, which is comparable to two other studies in Saudi Arabia (Armstrong and Krickler, 2001; Eller et al., 1996). Intriguingly, the present study did not show any association between exposure to sunlight and vitamin D deficiency, which indicates that sun exposure, is mainly unintentional in the study population.

5. CONCLUSION / RECOMMENDATION

The level of knowledge about skin cancer risk factors and preventive measures is inadequate among the population of Jeddah, associating poor practice in sun protection and exposing the population to high risk of skin cancer. These findings highlight the need for more health orientation, educational programs, and public campaigns to increase awareness about the hazards of ultraviolet radiation exposure, notably its relationship with skin cancer. Planning of education campaigns should support effective change in public attitudes and behaviors toward skin cancer and ultraviolet radiation exposure. Social and mass media should be used to deliver facts about skin cancer and sunlight exposure and underline the particular risk in the region. Although the present study was conducted in one of the largest cities in the kingdom, further multi regional studies with more adequate sampling are warranted to evaluate correctly the overall population awareness toward skin cancer and practice in sun protection. Such studies would deliver valuable data besides being a baseline indicator for eventual mass awareness campaigns.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Informed consent

Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee of King Abdullah International Medical Research Center (ethical approval code: SP17/382/J).

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Authors' Contributions

All the authors listed have participated equally in collecting the data, analyzing the data, writing the manuscript, and reviewing the article.

Declarations

Authors declare having no financial or other conflict of interest.

All authors certify having read and approved the submitted version of the manuscript.

The requirements for authorship have been met for each other.

Each author believes that the manuscript represents honest work.

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