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KNOWLEDGE, AWARENESS AND BEHAVIOUR TOWARD SUN EXPOSURE AMONG PHARMACY STUDENTS

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Abstract:

Background: Sunlight exposure has several health advantages, including sulphated vitamin D3 synthesis, enhanced cognitive function, supporting bone health, decreasing blood pressure, avoiding illness, and fostering positive mental health. Nevertheless, there are still taboo that relates sun exposure and skin cancer and this phenomenon makes people prefer staying indoor most of the time. Many international studies have been conducted to assess the public perceptions towards sun exposure. To date, there is scarce data on this topic among students in Malaysia. **Objectives:** This study aimed to assess the knowledge, awareness and behaviours towards sun exposure among the Diploma in Pharmacy students of Universiti Teknologi MARA (UiTM). **Methods:** An online cross-sectional study was conducted from March to May 2022 among the Diploma of Pharmacy students in UiTM Cawangan Pulau Pinang. A self-administered questionnaire was constructed in Google Forms

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consisting of multiple-choice closed-ended questions. Descriptive analysis were used to summarise the sociodemographic profile of the respondents while Chi-square test was used to explore the association between sociodemographic variables and adequacy of knowledge, awareness and behaviour. **Result:** A total of 176 students with a 100% response rate participated in the study. Majority of the students had high knowledge on the benefits of sun exposure and high awareness on harmful effects of lacking sun exposure. They also showed slightly positive behaviour towards sun exposure. **Conclusion**: Education and awareness regarding the effects of sun exposure on human health, particularly among students, has to be more progressive. With good instruction and understanding from everyone, we could inform the public about the benefits of sun exposure and encourage them to practise it safely.

Keywords:

Sun Exposure; Sunlight; Ultraviolet; Circadian Rhythm; Vitamin D

Introduction on Sunlight Spectrum

Sunlight exposure has been recognized as a critical factor in determining human health since ancient times. Historical evidence reveals that sunlight has been utilized in heliotherapy for medicinal purposes by various civilizations. Hippocrates of Kos, known as the "Father of Medicine," emphasized the importance of light and heat in treating the root cause of many metabolic diseases, while Soranus of Ephesus introduced the use of natural ultraviolet (UV) from the sun in treating neonatal jaundice. In the early 1900s, a Swiss doctor named Auguste Rollier established a method of safe sun exposure at high latitudes to treat tuberculosis patients. These examples demonstrate the historical significance of sun exposure in promoting human health (Kleisiaris et al., 2014; Martel, 2018).

Sunlight is composed of a wide range of electromagnetic radiation spanning from infrared (IR) to near ultraviolet (UV) wavelengths, with each wavelength measured in nanometers (nm). The visible light spectrum falls within a narrow range of 400 to 750 nm. Red and IR light are located in the spectrum between 650 to 900 nm, while UV radiation is divided into three bands: UVA, UVB, and UVC, with wavelengths ranging from 100 to 400 nm. UVC radiation is normally filtered by Earth's atmosphere, while UVB and UVA radiation can reach humans more easily and in larger proportions (Gorman et al., 2017). The proportion of these different wavelengths varies throughout the day and depends on geographical location. For example, most of the IR, UVA, and visible light spectrums are emitted during sunrise and sunset, while UVB light is radiated optimally at noon.

Literature Review on Benefits of Sun Exposure

Numerous studies have demonstrated that sunlight exposure can have positive long-term impacts on human health, particularly in relation to vitamin D production. The UVB portion of the solar spectrum triggers the body to synthesize vitamin D when the skin is exposed to bright sunlight during specific times of the day. In Malaysia, for instance, the ideal period for UVB exposure is between 10 am to 4 pm (Leiu et al., 2020). Vitamin D is essential for good health, and its deficiency or insufficiency can lead to a wide range of health issues such as rickets in children (Sahay & Sahay, 2012; Elder & Bishop, 2014; Chanchlani et al., 2020), osteoporosis (Oommen & AlZahrani, 2014; Gupta & March, 2016), fractures (Mow et al., 2015; Nishimura et al., 2022), diabetes, hypertension, infections, cardiovascular diseases, and autoimmune diseases (Kruse, 2013; Park et al., 2018; Melguizo-Rodríguez et al., 2021).

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Apart from UVB, exposure to other parts of the solar spectrum, including IR, UVA, and visible light, particularly during sunrise and sunset, also has a significant impact on human health, particularly on the synchronization of the body's circadian rhythms. Additionally, each organ in our body has its own circadian clock, which can also be influenced by sunlight exposure (Panda, 2018).

The blue spectrum of visible light, which is detected by opsin photoreceptors in our eyes and skin (Leonardo Vinicius Monteiro de Assis et al., 2021), has a significant influence on the hormonal cycles that regulate our physiological systems throughout the day (Panda, 2018; Martel, 2018). Melatonin, a critical hormone in our body, is closely linked to sunlight exposure. Circulating melatonin, which is produced by the pineal gland, is regulated based on a narrowband wavelength signal in the violet, blue, and green region of the visible spectrum (Zimmerman & Reiter, 2019). Insufficient sunlight exposure may disrupt these cycles, leading to inflammation at the cellular level and ultimately the onset of diseases (Nerich et al., 2011; Lindqvist et al., 2016; Queirós & Freitas, 2019; Magalhaes et al., 2019).

The red and IR spectrums of the sun are believed to have profound effects on our cellular and hormonal health. Unlike other wavelengths of sunlight, these two spectrums can penetrate deep into the cells, tissues, blood, nerves, rods and cones of the eyes, the brain, and bones (Whitten, 2018). Research has shown that exposure to red and IR light can have a variety of benefits for human health, such as stimulating collagen and elastin production and fighting skin aging (Avci et al., 2013), promoting the release of fatty acids from fat tissue and aiding in weight loss management (Jackson et al., 2012; Avci et al., 2013), enhancing blood circulation and aiding in wound healing management (Barolet, 2016), improving physical strength and endurance (Baroni et al., 2015), and optimizing brain function (de la Torre, 2017). In summary, red and IR light can be powerful tools for improving overall well-being.

Another significant spectrum that is emitted from sunlight is UVA, which has been found to affect human blood pressure. Sunlight exposure on the skin leads to a reduction in blood pressure, predominantly due to UVA-mediated photolysis of cutaneous nitrite to nitric oxide (NO). This process causes arterial vasodilation, which has the potential to reduce the incidence of cardiovascular diseases (Liu et al., 2014). Furthermore, a study by Lindqvist et al. (2021) found that increased sun exposure appears to be associated with a dose-dependent reduction in the risk of hypertension. This suggests that sunlight exposure may mediate, at least in part, the lower cardiovascular disease mortality observed in individuals with higher levels of sun exposure.

Owing to the numerous health benefits of sun exposure and the paucity of data on the topic among Malaysian students, this study was conducted to evaluate the knowledge, awareness and behaviours of Diploma in Pharmacy students at Universiti Teknologi MARA (UiTM) regarding sun exposure.

Methods

Study Design

A cross-sectional study with an online survey questionnaire was conducted among pharmacy students of Universiti Teknologi MARA (UiTM) Cawangan Pulau Pinang Kampus Bertam from March until June 2022. Respondents were selected based on their willingness to participate in this research. According to the Raosoft sample size calculator, the recommended

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sample size for this research is 121 with a 95% confidence level, 5% margin of error, 50% response distribution and the population size is 176. If a 10% non-response rate is added (17), the total respondents needed for this study is 138. The survey received a 100% response rate, indicating that all respondents contacted completed the survey.

Data Collection

A survey was developed to assess the knowledge, awareness and behaviours towards sun exposure. The online survey questionnaire formed using online Google Form was used to collect the data from respondents. All respondents were requested to complete the survey through a questionnaire that was sent through WhatsApp with request letters for their responses (Othman et al., 2022). The online survey questionnaire comprised four sections which include demographic information, knowledge of sun exposure and behaviours towards sun exposure. The demographic information consisted of gender, age, semester of study, height, weight, and body mass index (BMI). The second section comprised of five close-ended questions (Yes/No/Not sure response) to gain insight into students' knowledge on sun exposure benefit. The third section of the survey contained five close-ended questions presented in a 4-point Likert scale format (ranging from 'strongly agree' to 'strongly disagree') that assessed students' awareness of the harmful effects of a lack of sun exposure. The last section of the survey included 11 open-ended questions that asked students about their behaviors towards direct sunlight exposure, with response options of 'regularly,' 'sometimes,' or 'never'.

Data Analysis

The data obtained were analysed by frequency of common students' responses and were stated in percentages. The respondents' details on demographic information, responses on students' knowledge, awareness, and behaviors towards sun exposure were presented in a table with percentages (%). Chi-square test was used to compare the differences in knowledge, awareness, and behavior between male and female respondents.

Ethical Aspect

Prior to collecting the data reported in this study, the survey and methods were approved by Universiti Teknologi MARA's (UiTM) Research Ethics Committee (REC) reference number BERC/05/2022 (UG/MR/54).

Results

Socio-demographic Data

In this study, a total of 176 participants were recruited from semesters 2, 4, and 6, within the age range of 18 to 21 years. The female to male ratio was 3:1, with the majority of participants from semester 6. Of the total participants, 71% had a healthy body mass index (BMI), while the remaining 29% were categorized as underweight (5.7%), overweight (18.8%), or obese (4.5%). Table 1 summarizes the socio-demographic characteristics of the study population.

Table 1: Socio-demographic Data of the Survey Respondents (n = 176)

Characteristics	Frequency (%)
Gender	
Male	41 (23.3)
Female	135 (76.7)

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Age (years)	
18	18 (10.0)
19	33 (19.0)
20	37 (21.0)
21	88 (50.0)
Semester	
2	52 (29.6)
4	37 (21.0)
6	87 (49.4)
Weight (kg)	
≤40	11 (6.3)
41 - 50	52 (29.7)
51 - 60	62 (35.3)
61 - 70	32 (18.2)
71 - 80	19 (10.5)
Height (cm)	
<140	1 (0.6)
141 - 150	21 (11.9)
151 - 160	86 (48.9)
161 - 170	56 (31.8)
171 - 180	12 (6.8)
Body Mass Index (BMI)	
Underweight (<18.5)	10 (5.7)
Normal (18.5–24.9)	125 (71.0)
Overweight (25–29.9)	33 (18.8)
Obese (≥30)	8 (4.5)

Knowledge on Sun Exposure Benefits

Table 2 displays the level of knowledge of the respondents with respect to the benefits of sun exposure. The majority of both male and female respondents showed adequate knowledge regarding the advantages of sun exposure. A significant proportion of the respondents agreed that getting enough sun is essential for the synthesis of vitamin D (91.5%), quality sleep (79.6%), and a robust immune system (86.3%). However, approximately 42% of the respondents seemed to be confused about the relationship between having a tan and having healthy skin. This finding is consistent with a study by Qian Gao et al. (2014), which found that a small percentage of respondents believed that tanning was attractive. Notably, there was a significant difference ($p<0.05$) in knowledge between male and female students concerning the importance of daily sun exposure to maintain optimal circadian rhythm.

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Table 2: Respondents' Knowledge of the Sun Exposure (n = 176)

		Frequency (%)			
		Yes	**No**	**Not Sure**	***P*-value**
1.	Our body needs to be exposed to sunlight to synthesise vitamin D.				
Male		39 (22.2)	0 (0.0)	2 (1.1)	0.565
Female		122 (69.3)	2 (1.1)	11 (6.3)	
		161 (91.5)	2 (1.1)	13 (7.4)	
2.	Daily sun exposure is critical to help us get quality sleep.				
Male		35 (19.9)	2 (1.1)	4 (2.3)	0.124
Female		105 (59.7)	1 (0.6)	29 (16.4)	
		140 (79.6)	3 (1.7)	33 (18.7)	
3.	Daily sun exposure is good for the immune system to combat disease (s).				
Male		37 (21.0)	0 (0.0)	4 (2.3)	0.435
Female		115 (65.3)	5 (2.8)	15 (8.5)	
		152 (86.3)	5 (2.8)	19 (10.8)	
4.	My skin seems healthier when tanned.				
Male		19 (10.8)	8 (4.5)	14 (8.0)	0.092
Female		38 (21.6)	37 (21.0)	60 (34.1)	
		57 (32.4)	45 (25.5)	74 (42.1)	
5.	Daily sun exposure is important for optimal circadian rhythm.				
Male		32 (18.2)	0 (0.0)	9 (6.1)	0.034
Female		75 (42.6)	1 (0.6)	59 (33.5)	
		105 (60.8)	1 (0.6)	68 (38.6)	

Awareness on Harmful Effects from Lack of Sun Exposure

Table 3 presents the results of respondents' awareness regarding the negative consequences of inadequate sun exposure. The majority of respondents were aware (either agreed or strongly agreed) that insufficient sun exposure can lead to various negative effects on general health, including vitamin D deficiency (90.3%), disruption of circadian rhythm (83.0%), weight management issues (69.6%), and decreased mental health (81.9%). These findings suggest a good level of understanding among respondents regarding the potential risks associated with inadequate sun exposure. Overall, there were no significant differences in awareness levels between male and female students, except for the association between avoiding sun exposure and the risk of bone diseases ($p<0.05$).

Table 3: Respondents' Awareness on Harmful Effects from Lacking Sun Exposure (n = 176)

		Frequency (%)				
		Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**	***P*-value**
1.	Avoidance of sun exposure is associated with vitamin D deficiency.					
Male		12 (6.8)	27 (15.3)	2 (1.2)	0 (0.0)	0.458
Female		33 (18.8)	87 (49.4)	15 (8.5)	0 (0.0)	
		45 (25.6)	114 (64.7)	17 (9.7)	0 (0.0)	
2.	Avoidance of sun exposure may disrupt circadian rhythm.					

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Male	3 (1.7)	36 (20.5)	2 (1.1)	0 (0.0)	0.054
Female	11 (6.3)	96 (54.5)	28 (15.9)	0 (0.0)	
	14 (8.0)	132 (75.0)	30 (17.0)	0 (0.0)	
3.	Avoidance of sun exposure may cause bone disease(s).				
Male	3 (1.7)	30 (17.0)	8 (4.6)	0 (0.0)	0.024
Female	10 (5.7)	62 (35.2)	60 (34.1)	3 (1.7)	
	13 (7.4)	92 (52.2)	68 (38.7)	3 (1.7)	
4.	Avoidance of sun exposure is associated with decreased mental health.				
Male	12 (6.8)	24 (13.7)	5 (2.8)	0 (0.0)	0.434
Female	27 (15.4)	81 (46.0)	24 (13.6)	3 (1.7)	
	39 (22.2)	105 (59.7)	29 (16.4)	3 (1.7)	
5.	Avoidance of sun exposure is associated with body weight management issue.				
Male	5 (2.8)	30 (17.0)	6 (3.4)	0 (0.0)	0.077
Female	11 (6.3)	76 (43.2)	44 (25.0)	4 (2.3)	
	16 (9.1)	106 (60.2)	50 (28.4)	4 (2.3)	

Sun Exposure Behaviours

Table 4 presents the participants' behaviours towards sun exposure, with 11 statements assessed, out of which 7 had statistically significant differences between male and female respondents. Statements 3 and 4 evaluated sun protection measures, while the other statements assessed students' attitudes towards direct sunlight exposure. Results showed that 69.3% of respondents of both sexes frequently used sunscreen or sunblock, while 54.5% occasionally used an umbrella while under the sun. However, the majority of students did not frequently expose themselves to direct sunlight. Even though the respondents had adequate knowledge and awareness about the benefits of sunlight in vitamin D production, 38.1% of them did not enjoy being outside in the sun between 10 am and 3 pm, when UVB is optimally radiated to induce the epidermal synthesis of vitamin D. Only 12.5% of respondents routinely exposed themselves to sunshine during these hours, which is concerning. Moreover, approximately 25% of respondents never exposed themselves to sunshine for more than half an hour daily, while 30.6% never exposed themselves for more than 2 hours a day. These findings indicate a lack of understanding of the importance of sunlight for overall health among younger generations.

Table 4: Sun Exposure Behaviours among Respondents (n = 176)

	Frequency (%)			
	Regularly	**Sometimes**	**Never**	***P*-value**
1. I always do activities outside of the room/house/building, especially in the morning.				
Male	11 (6.3)	26 (14.8)	4 (2.3)	0.232
Female	29 (16.5)	78 (44.3)	28 (15.9)	
	30 (22.8)	104 (59.1)	32 18.1)	
2. During the day, I walk outside of the building (not roofed).				
Male	25 (14.2)	13 (7.4)	3 (1.7)	0.001
Female	41 (23.3)	66 (37.5)	28 (15.9)	
	66 (37.5)	79 (44.9)	30 17.6)	
3. I use a hat/an umbrella each time under the sun.				
Male	7 (4.0)	21 (11.9)	13 (7.4)	0.718
Female	22 (12.5)	75 (42.6)	38 (21.6)	

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	29 (16.5)	96 (54.5)	51 29.0)	
4. I apply sunscreen/sunblock every time I go out under the sun.				
Male	19 (10.8)	11 (6.3)	11 (6.2)	<0.001
Female	103 (58.5)	22 (12.5)	10 (5.7)	
	121 (69.3)	33 (18.8)	21 11.9)	
5. In the afternoon, I expose myself to sunlight indirectly through the window.				
Male	22 (12.5)	14 (7.9)	5 (2.8)	0.75
Female	42 (23.9)	70 (39.8)	23 (13.1)	
	64 (36.4)	84 (47.7)	28 15.9)	
6. I always expose myself to morning sun without any sunscreen/sunblock/sunglasses.				
Male	26 (14.8)	15 (8.5)	0 (0.0)	<0.001
Female	36 (20.5)	53 (30.1)	46 (26.1)	
	62 (35.3)	68 (38.6)	46 26.1)	
7. I expose myself to sunlight for a cumulative period of 30 minutes per day.				
Male	15 (8.5)	17 (9.7)	9 (5.1)	0.053
Female	25 (14.2)	75 (42.6)	35 (19.9)	
	40 (22.7)	92 (52.3)	44 25.0)	
8. I expose myself to sunlight for more than 2 hours per day.				
Male	11 (6.3)	25 (14.2)	5 (2.8)	<0.001
Female	13 (7.4)	73 (41.5)	49 (27.8)	
	24 (13.7)	98 (55.7)	54 30.6)	
9. I always expose to sunlight from sunrise to 9 am.				
Male	14 (8.0)	21 (11.9)	8 (4.6)	0.005
Female	25 (14.2)	56 (31.8)	59 (33.5)	
	39 (22.2)	77 (43.7)	67 38.1)	
10. I always expose to sunlight between 10 am to 3 pm.				
Male	9 (5.1)	24 (13.6)	8 (4.6)	0.004
Female	13 (7.4)	63 (35.8)	59 (33.5)	
	22 (12.5)	87 (49.4)	67 38.1)	
11. I always expose to sunlight between 5 pm till sunset.				
Male	25 (14.2)	12 (6.8)	4 (2.3)	0.024
Female	33 (18.8)	79 (44.9)	23 (13.0)	
	58 (33.0)	91 (51.7)	27 (15.3)	

Discussion

Although Malaysia is blessed with abundant sunshine throughout the year, there is a concerning issue of vitamin d insufficiency among its citizens (Zaleha et al., 2022). This phenomenon is not unique to Malaysia, as Brazil - a country with a typical tropical environment in South America - also experiences vitamin D insufficiency and deficiency despite significant UVB radiation throughout the year (Mendes et al., 2018).

Vitamin D is a prohormone that can be synthesized in the skin photochemically and obtained through the diet, with fatty fish, milk, eggs, and wild mushrooms being dietary sources of ergocalciferol (vitamin D2) and cholecalciferol (vitamin D3). However, up to 90% of vitamin D is obtained through the action of sunshine on the skin, which converts 7-dehydrocholesterol

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to vitamin D3. Vitamin D3 undergoes two hydroxylation processes, one in the liver and one in the kidneys, to reach its active form 1,25-dihydroxyvitamin D, also known as calcitriol.

UVB rays, with a wavelength ranging from 280-315 nm (Martel, 2018), are only able to penetrate the epidermis layer of the skin (D'Orazio et al., 2013). This means that UVB can only reach the skin in the absence of physical or chemical barriers, such as clothing, topical sunscreens or sunblocks, powders, creams, or lotions (Kruse, 2013; Martel, 2018). However, our findings indicate that 69.3% of respondents reported always applying sunscreen or sunblock before going outdoors. This finding is consistent with a recent study by T. Ngo and D. Rivera (2022) that reported 62.4% of respondents choosing to use sunscreen and sunblock as their primary sun protection measure. In contrast, a study by Khalid M. AlGhamdi et al. (2016) found that only 24.0% of respondents frequently applied sunscreen and sunblock. It is possible that the respondents in our study may not be fully aware that calcitriol, the active form of vitamin D, can only be produced in the skin through the penetration of UVB radiation.

Additionally, it is highly likely that the majority of respondents are concerned about the risk of developing skin cancer if they are exposed to the sun without first applying a sunscreen or sunblock, although this issue was not specifically addressed in our study. However, numerous studies have reported on this concern (T. Ngo & D. Rivera, 2022; Pinos-León et al., 2021; Low et al., 2021; Stephens et al., 2018; Khalid M AlGhamdi et al., 2016; Qian Gao, 2014). Ultraviolet radiation (UVR) from the sun is widely recognized as the primary cause of skin cancer, including malignant melanoma (MM), squamous cell carcinoma (SCC), and basal cell carcinoma (BCC).

According to our survey results, only 12.5% of the respondents, regardless of gender, reported regular UVB exposure during peak hours (10 am - 3 pm). However, it is important to note that some level of UVB exposure is necessary for our health and well-being. To safely achieve this, experts recommend following a sunbathing routine (Kruse, 2013; Panda, 2018; Lee, 2022). This routine includes exposing your skin to the sun during times of low UVB intensity, such as during sunrise (6:45-7:30 am), morning solar exposure (7:30-9:15 am), and evening solar exposure and sunset (5:00-7:15 pm). These practices help to prepare the skin to produce a sun callus, a state in which the skin pigment melanin acts as a natural sunscreen. The sun callus protects the skin by absorbing the necessary amount of UVB and blocking excessive UVB radiation when we are exposed to sunlight during peak hours. Additionally, the sun callus protects the skin from sunburn and can result in a tanned and radiant complexion. It is recommended to perform these activities without covering your face or skin in any way in order to fully benefit from sun exposure.

More than half of participants (67.6%), believed that there is no correlation between skin health and tanning (Table 2, Statement 4). This perception may be due to the lack of understanding of the difference between sunburn and tanning. Sunburn is a painful redness of the skin caused by excessive sun exposure, while tanning is the process of skin darkening due to exposure to the sun (Oxford Learner's Dictionary). Developing an epidermal solar callus is a way to prevent sunburn (Kruse, 2013). However, the misconception that fair skin is more attractive, especially among younger people, may be contributing to the scepticism of tanned skin.

With the rise of social media influences and peer pressure, an increasing percentage of people today are spending less time outdoors. Our data revealed that only 13.7% of the respondents were exposed to more than 2 hours of natural light per day (Table 4, Statement 8), despite over

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81.9% of them feeling that sun exposure is essential for mental health (Table 3, Statement 4). Research has shown that exposure to natural light can improve mental performance, reduce aggressive behaviour, and alleviate depression (Edwards & Torcellini, 2002; Humble, 2010; Levandovski et al., 2013; An et al., 2016; Beute & de Kort, 2018; Samefors et al., 2020; Taniguchi et al., 2022). The Covid-19 shutdown required people to remain indoors, further reducing their exposure to sunlight, and has resulted in a worldwide increase in the number of mental illness cases (Stock et al., 2022; Ribeiro et al., 2021; Giuseppina Spano et al., 2021; Facer-Childs et al., 2021; Killgore et al., 2020).

Biologically speaking, retinal exposure to early morning light stimulates the conversion of the amino acid tryptophan to serotonin (Azmitia, 2020). Serotonin is a neurotransmitter that transmits messages throughout the brain and body and plays a key role in human emotions (Gupta et al., 2013; Daut & Fonken, 2019). However, it also influences digestion and metabolism. Therefore, it is essential to spend time outdoors and get natural sunlight exposure to maintain good mental and physical health.

In addition, it is important to note that solar exposure can have a significant impact on human circadian rhythm, which regulates the 24-hour biorhythm of the body, including sleeping and waking cycles (Lee, 2022). Adequate sunlight exposure during the day is crucial for experiencing deep, restful sleep. Photoreceptors in the eyes and skin detect sunlight during sunrise and send a signal to the suprachiasmatic nucleus (SCN) and pineal gland to produce melatonin hormone, which will be enhanced and ready to be secreted when the sun sets in the evening (Kruse, 2013; Ramkisoensing & Meijer, 2015). This triggers the body to prepare for sleep. Insufficient sun exposure can lead to low levels of melatonin at night, which can cause insomnia. As daytime melatonin levels are lower than nighttime levels, people tend to be more alert and awake during the day. Nearly 83% of respondents agreed that adequate sunlight exposure is crucial for maintaining healthy circadian rhythms (Table 3, Statement 2), which is consistent with the findings of Farhud and Aryan (2018).

Conclusion

The study findings suggest that while most respondents showed awareness of the importance of adequate sun exposure, their behaviors did not align with this understanding. Therefore, it is crucial to implement educational and health promotion programs aimed at promoting safe and healthy sun exposure practices among individuals. Improving behaviours towards sun exposure could help to mitigate the risks associated with vitamin D deficiency or insufficiency, which can have adverse effects on health in the long run.

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Conflict of Interest

The authors declare no conflict of interest.

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