

DIFFERENCE IN KNOWLEDGE OF SUNSCREEN BEFORE AND AFTER AN EDUCATIONAL INTERVENTION AMONG FEMALE STUDENTS AT SMAIT AS-SYIFA SUBANG: A ONE-GROUP PRETEST–POSTTEST STUDY

Kayla Azzahra¹, Irene Dorthy Santoso²

¹ Undergraduate Medical Program, Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia

² Department of Dermatology and Venereology, Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia

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Corresponding author :

Kayla Azzahra
Undergraduate Medical
Program, Faculty of
Medicine, Tarumanagara
University, Jakarta, Indonesia

Email:

[kayla.405230088@stu.untar.
ac.id](mailto:kayla.405230088@stu.untar.ac.id)

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ABSTRAK

Paparan terhadap sinar ultraviolet (UV) yang berlebihan dapat menyebabkan berbagai masalah kulit, seperti eritema, penuaan dini, hingga kanker kulit. Remaja putri adalah salah satu kelompok yang rentan terkena dampak buruk sinar UV karena banyaknya aktivitas di luar ruangan namun memiliki pengetahuan yang masih terbatas tentang perlindungan kulit. Tabir surya adalah salah satu proteksi topikal yang terbukti melindungi kulit dari paparan sinar UV, namun pemanfaatannya belum maksimal di kalangan remaja. Tujuan dari penelitian ini adalah untuk mengetahui perbedaan tingkat pengetahuan tentang tabir surya sebelum dan sesudah edukasi pada siswi SMAIT As-Syifa Subang. Penelitian menggunakan desain quasi eksperimental dengan pendekatan one group pre-test post-test. Pengukuran pengetahuan sebelum dan sesudah edukasi mengenai tabir surya dilakukan menggunakan kuesioner terstruktur pada 264 siswi SMAIT As-Syifa Subang. Data dianalisis menggunakan uji nonparametrik Wilcoxon Signed Rank Test. Skor pengetahuan rata-rata meningkat dari 18,07 pada pre-test menjadi 19,48 pada post-test dengan selisih rata-rata 1,41. Hasil uji Wilcoxon menunjukkan perbedaan antara skor pengetahuan sebelum dan sesudah pemberian edukasi ($p < 0,001$). Edukasi kesehatan terbukti efektif dalam meningkatkan pengetahuan siswi tentang penggunaan tabir surya. Upaya edukasi kesehatan kulit perlu ditingkatkan pada populasi remaja sebagai langkah promotif dalam pencegahan dampak paparan sinar UV.

ABSTRACT

Difference in Knowledge of Sunscreen Before and After an Educational Intervention Among Female Students at SMAIT As-Syifa Subang: A One-Group Pretest–Posttest Study. Excessive exposure to ultraviolet (UV) radiation can cause various skin problems, such as erythema, premature aging, and skin cancer. Adolescent girls are one of the groups vulnerable to the adverse effect of UV radiation due to their high level of outdoor activity, yet their knowledge of skin protection remains limited. Sunscreen is one form of topical protection proven to protect the skin from UV exposure. However, its use among adolescents has not been optimal. This study aimed to determine the difference in knowledge levels about sunscreen before and after health education among female students of SMAIT As-Syifa Subang. A quasi-experimental design with a one group pre-test post-test approach was used. Knowledge was measured before and after health education on sunscreen using a structured questionnaire administered to 264 female students of SMAIT As-Syifa Subang, and data were analyzed using the non-parametric Wilcoxon Signed Rank Test. The mean knowledge score increased from 18.07 at the pre-test to 19.48 at the post-test, with a mean difference of 1.41. The Wilcoxon Signed Rank Test showed a difference between the knowledge scores before and after the educational intervention ($p < 0.001$). Health education was proven effective in improving students' knowledge about sunscreen use, and efforts to promote skin health education should be enhanced among the adolescent population as a promotive step in preventing the effects of UV exposure.

INTRODUCTION

Excessive exposure to ultraviolet (UV) radiation is carcinogenic and can lead to deoxyribonucleic acid (DNA) damage, hyperpigmentation, premature skin aging, and immune suppression. The World Health Organization (WHO) reported more than 1.5 million new cases of skin cancer worldwide in 2020 and recommends limiting sun exposure and using broad-spectrum sunscreen as the primary preventive measures.¹ However, global adherence to sunscreen use remains suboptimal. A study conducted in the United States found that nearly 40% of respondents lacked adequate knowledge of sunscreen's protective effectiveness, a finding associated with limited education and awareness of the risks posed by excessive UV exposure.²

As an equatorial country, Indonesia experiences high levels of UV exposure, with the UV Index reaching the extreme category (Index 11) according to the Indonesian Agency for Meteorology, Climatology, and Geophysics (BMKG), where skin and eye damage can occur within minutes.³ Consistent with this high level of exposure, the Global Cancer Observatory (GLOBOCAN) reported approximately 18,000 new cases of skin cancer in Indonesia in 2020, with the incidence continuing to increase.⁴ Despite this elevated risk, public awareness of sun protection remains inadequate. A study conducted among students at Dewi Sartika Senior High School in Jakarta identified a gap between relatively good knowledge of the harmful effects of UV radiation and low awareness of sunscreen use, highlighting adolescence as a critical period for fostering skin health awareness.⁵

Several studies in Indonesia have demonstrated that health education effectively improves students' knowledge of sunscreen. A study conducted at State Vocational High School 1 Cilacap reported a significant improvement in students' knowledge and attitudes following an educational intervention. Similarly, studies evaluating health counseling and educational videos among adolescents showed that the proportion of participants with adequate knowledge increased from 61.5% to 93%.^{6,7} These findings suggest that educational interventions consistently enhance adolescents' understanding of sunscreen use and its role in protecting against UV exposure.

SMAIT As-Syifa Subang is an Islamic boarding senior high school where students frequently participate in outdoor activities and is located in an area with a relatively high daily UV Index. However, no previous study has evaluated differences in students' knowledge of sunscreen before and after an educational intervention at this school.⁸ Based on this background, the study hypothesized that sunscreen education would improve sunscreen-related knowledge among female students at SMAIT As-Syifa Subang. Therefore, this study aimed to evaluate the difference in sunscreen knowledge before and after an educational intervention among female students at SMAIT As-Syifa Subang.

METHODS

This quasi-experimental study employed a one-group pretest–posttest design and was conducted at SMAIT As-Syifa Boarding School, Subang, in January 2026. A total of 264 female students from Grades 10, 11, and 12 during the 2025/2026 academic year were recruited using total sampling based on predefined inclusion and exclusion criteria. The inclusion criteria comprised all actively enrolled female students who agreed to participate in the study. The exclusion criteria included students who were absent or ill during data collection and those who did not complete the study procedures. Participants' knowledge was assessed

using a structured questionnaire administered before and after the educational intervention. The instrument consisted of 20 structured questions. The pretest was administered before the educational session, whereas the posttest was conducted immediately after the session. Each correct response was assigned a score of 1, while incorrect responses received a score of 0. Content validity testing confirmed that all questionnaire items met the validity criteria. Reliability testing demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.948.

The educational intervention was delivered through a presentation covering the definition of sunscreen, its benefits, proper application techniques, appropriate timing, recommended frequency of use, and the harmful effects of UV exposure. Primary data were obtained from respondents' questionnaires, whereas secondary data were collected from school records, the literature, and previous studies. Data were analyzed using SPSS through descriptive and inferential statistical analyses. The Kolmogorov–Smirnov normality test indicated that the data were not normally distributed; therefore, the Wilcoxon signed-rank test was used with a significance level of $\alpha = 0.05$. A p -value of <0.05 was considered statistically significant, indicating a difference in knowledge levels before and after the educational intervention. This study received ethical approval from the Health Research Ethics Committee (KEPK) under approval number 693/KEPK/FK UNTAR/XII/2025.

RESULT

The study evaluating the effectiveness of an educational intervention on sunscreen knowledge among female students at SMAIT As-Syifa Subang included 264 participants and was conducted in January 2026. Data were analyzed using SPSS with descriptive and inferential statistics. Descriptive analysis was performed to summarize participants' characteristics and knowledge scores before and after the educational intervention, whereas inferential analysis was used to evaluate the intervention's effect on sunscreen-related knowledge.

The distribution of participants showed that the largest proportion was from Grade 10, comprising 100 students (37.88%). This was followed by 87 students (32.95%) from Grade 11 and 77 students (29.17%) from Grade 12. The smallest proportion of participants was from Grade 12, accounting for 29.17% of the total sample. The mean age of the participants was 16.25 ± 0.97 years. The median age was 16 years, with ages ranging from 14 to 19 years. Most participants were 16 years old, representing 90 students (34.09%).

Table 1. Participant Characteristics (n = 264)

Characteristic	n (%)	Mean $\pm$ SD	Median (min–max)
Grade			
10	100 (37,88%)		
11	87 (32,95%)		
12	77 (29,17%)		
Age (years)		16,25 $\pm$ 0,97	16 (14–19)
14	2 (0,76%)		
15	64 (24,24%)		
16	90 (34,09%)		
17	82 (31,06%)		
18	25 (9,47%)		
19	1 (0,38%)		

The mean knowledge score before the educational intervention was 18.07 ± 1.36 . Following the intervention, the mean score increased to 19.48 ± 0.82 . The median score increased from 18 to 20, while the minimum score improved from 7 to 16. The lower standard deviation observed in the posttest indicates reduced variability in participants' scores, suggesting that their level of knowledge became more consistent following the educational intervention.

Table 2. Knowledge Scores Before and After the Educational Intervention (n = 264)

Variable	Mean	SD	Median	Min	Max
<i>Pre-test Score</i>	18,07	1,36	18	7	20
<i>Post-test Score</i>	19,48	0,82	20	16	20

The analysis showed that the mean knowledge score increased from 18.07 on the pretest to 19.48 on the posttest, representing a mean increase of 1.41 points. The Wilcoxon signed-rank test yielded a p-value of <0.001 , indicating a statistically significant difference in knowledge before and after the educational intervention. These findings demonstrate that the sunscreen educational intervention effectively improved sunscreen-related knowledge among female students at SMAIT As-Syifa Subang.

Table 3. Effect of the Educational Intervention on Sunscreen Knowledge (n = 264)

Variable	Mean	Std Deviation	<i>p-value</i>
<i>Post-test</i>	19,48	0,82	$<0,001$
<i>Pre-test</i>	18,07	1,36	

DISCUSSION

This study included female students from Grades 10 to 12, representing adolescents in the middle to late stages of adolescence. These characteristics indicate that the participants were at a developmental stage associated with an enhanced capacity to receive, process, and understand health-related information. Educational attainment plays an important role in shaping an individual's knowledge, as higher levels of education are generally associated with greater ability to comprehend and apply health information.⁹

Most participants were 16 years old, with a mean age of 16.25 years. This age range corresponds to middle and late adolescence.¹⁰ Adolescence is a critical developmental period for establishing health-related behaviors. According to Hurlock, as cited by Lestari (2018), age influences an individual's level of knowledge because the ability to understand health information improves with cognitive development and increasing maturity.⁹ Puberty is also characterized by physical and hormonal changes that may affect skin condition. These changes often encourage adolescents to become more concerned about their appearance and skin health.¹¹

Adolescents are frequently exposed to sunlight due to school activities and other outdoor routines. Excessive exposure to ultraviolet (UV) radiation can lead to hyperpigmentation, premature skin aging, and an increased risk of skin cancer.^{11,12} These risks highlight the importance of adequate knowledge regarding sunscreen use as a key strategy for protecting skin health during adolescence.¹¹

The findings showed that the mean pretest knowledge score was 18.07. Following the educational intervention, the mean score increased to 19.48. The median score increased

from 18 to 20, while the minimum score improved from 7 to 16, whereas the maximum score remained unchanged at 20. These results indicate an improvement in participants' knowledge after receiving education on the appropriate use of sunscreen.

The observed improvement in knowledge may have been influenced by the use of PowerPoint presentations during the educational session. Mayer's Cognitive Theory of Multimedia Learning suggests that combining text with visual elements enhances information processing and comprehension more effectively than text alone.¹³ Participants' prior knowledge may also have facilitated the integration of new information, thereby reinforcing learning outcomes.¹⁴

The findings of this study are consistent with those reported by Subaidah WA et al. among students at SMAIT Anak Sholeh Mataram, which demonstrated a significant improvement in knowledge following education on ultraviolet radiation exposure and its preventive measures.¹⁵ These results suggest that health education effectively enhances adolescents' understanding of the benefits of skin protection and the risks associated with excessive exposure to ultraviolet radiation.

The effectiveness analysis showed a mean increase of 1.41 points in knowledge scores, with a 95% confidence interval of 1.25 to 1.56. This interval indicates a consistent improvement in knowledge within the study population following the educational intervention. The Wilcoxon signed-rank test yielded a p-value of <0.05, indicating a statistically significant difference between the pretest and posttest scores. These findings suggest that the educational intervention effectively improved sunscreen-related knowledge among female students at SMAIT As-Syifa Subang.

The improvement in knowledge reflects participants' enhanced understanding of the definition, benefits, appropriate timing, application methods, recommended frequency of use, and the risks associated with ultraviolet (UV) radiation exposure. Sotonade stated that education is a learning process designed to improve individuals' knowledge, skills, and attitudes.¹⁶

The findings of this study are supported by those of Jannah NM et al., who reported a significant improvement in knowledge scores among students at SMA Muhammadiyah Gubug following an educational intervention on sunscreen use. These findings indicate that health education is an effective approach for improving adolescents' understanding of skin protection.⁷

Similarly, a study by Asmiati E et al. among students at SMA Islam Sabilillah Malang demonstrated improved understanding following an educational intervention on the importance of sunscreen use.¹⁷ These findings further support the evidence that health education positively impacts adolescents' knowledge of sunscreen use. The observed improvement in knowledge in the present study may also be attributed to participants' educational backgrounds. All participants were senior high school students enrolled in formal education, which likely contributed to their ability to receive, process, and understand the information delivered during the educational intervention.⁹

The findings of the present study differ from those reported by Susanti S et al. among female students at MTs and MA Pondok Khusus Putri Al Halimy, West Lombok. Although their study observed an increase in the mean knowledge score following education on cosmetic products, including sunscreen, the difference between pre-intervention and post-intervention scores was not statistically significant. This discrepancy may be attributed to differences in participants' access to information, as the respondents in that study had limited baseline knowledge regarding cosmetic products.¹⁸ Excessive exposure to ultraviolet (UV)

radiation can result in sunburn, premature skin aging, and an increased risk of skin cancer. Therefore, regular sunscreen use is recommended as an effective preventive measure to minimize the harmful effects of UV radiation on the skin.¹⁹

The improvement in knowledge levels indicates that the educational intervention effectively enhanced participants' understanding of sunscreen use. However, this study was not designed to evaluate changes in attitudes or sunscreen-use behaviors, as the assessment was limited to knowledge outcomes. Knowledge was measured using a self-administered questionnaire, which relied on participants' honesty and comprehension and therefore may have been subject to information bias. In addition, the study assessed only changes in knowledge following the educational intervention and did not investigate subsequent changes in attitudes or sunscreen-use practices.

CONCLUSION

The educational intervention on sunscreen use significantly improved sunscreen-related knowledge among female students at SMAIT As-Syifa Subang. The mean knowledge score increased from 18.07 on the pretest to 19.48 on the posttest, and the Wilcoxon signed-rank test demonstrated a statistically significant difference ($p < 0.001$). Continuous skin health education is recommended to further enhance knowledge regarding protection against ultraviolet (UV) radiation. Future studies should investigate changes in attitudes and sunscreen-use behaviors in larger and more diverse populations. In addition, the inclusion of a control group and randomization are recommended to enable a more rigorous evaluation of the effectiveness of educational interventions.

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