



## Factors Associated with Adverse Events Related to Topical Whitening Products Used among College Female Students in Sudan

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<p>Accepted: 25 October 2023 Revised: 19 December 2023 Published: 22 January 2024</p> <p><b>How to cite :</b> Mohamedkhair, S. G., Munira, L., Alamin, A. mohammed, &amp; Viwattanakulvanid, P. (2024). Factors Associated with Adverse Events Related to Topical Whitening Products Used among College Female Students in Sudan. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 6(1), 1–12.</p>	<p><i>This study aimed to explore the factors associated with adverse events related to topical whitening products used and to explore the reasons for using topical whitening products among female students in Sudan. A cross-sectional study was conducted from September to October 2023 in Sudan. The Medicine and Pharmacy programs were purposively selected as the study area. The total sample size was 208 participants. The self-administered questionnaire was constructed with a total of seventeen questions. For data analysis, we performed descriptive statistics analysis, bivariate analysis with simple logistic regression, and multivariable analysis with binary logistic regression presenting with adjusted odds ratio (AOR) and 95% confidence interval (95% CI). The results imply that students with middle household income were 93% less likely to get adverse events compared to those students with low household income with <math>p</math>-value = 0.030 (AOR: 0.07, 95% CI: 0.06 ,0.77). Students who have tested the topical whitening products before using them were 99.9% less likely to get adverse events compared to those who do not test, with <math>p</math>-value = &lt;0.001 (AOR: 0.001, 95% CI: 0.001,0.00). Students who shared whitening products with family/friends were 89% less likely to get adverse events than those who do not share with <math>p</math>-value = 0.009 (AOR: 0.11, 95% CI: 0.021, 0.57). Furthermore, students who used whitening products with added water or other agents to whitening products were 95% less likely to get adverse events compared to those who did not use with <math>p</math>-value = 0.038 (AOR: 0.05, 95% CI:0.02, 0.84). The top two reasons respondents for using topical whitening products were acne (26.9%) and for beautification (24.5%). The study suggested the local government and health sectors should educate and raise the awareness of the safety of whitening products use among female students.</i></p> <p><b>Keywords:</b> Adverse events, female students, Sudan, Whitening topical products</p>

## INTRODUCTION

Physical appearance and conventional attractiveness have high values in society, which means that white and fair skin is considered more attractive. This phenomenon increases the use of beautifying compounds like topical whitening products, especially among females (Iftekhhar & Zhitny, 2021; Mahgoub, Ibrahim, Mahgoub, Ahmed, & Elmustafa, 2020). Skin lightening is "the practice of using chemical substances or any other products with a depigmenting potential in an attempt to lighten the skin tone" (Alanzi, Alghamdi, Alsharif, Alghamdi, & El Sayed, 2018; Eagle, Dahl, & Low, 2014).

Skin-lightening products are mainly used among non-white communities, including African regions. For example, based on previous studies, up to 75% of women in Nigeria (Dadzie & Petit, 2009; Dlova, Hamed, Tsoka-Gwegweni, & Grobler, 2015), 60% in Senegal

(Blay, 2011), and 30% in Ghana are estimated to use bleaching creams regularly, with similar rates in other African countries (Lartey et al., 2017).

The dangers of skin lightening without specialized counseling have become a public health crisis (Cheng, De La Garza, Maymone, Johansen, & Vashi, 2021). Sub-Saharan Africa has seen a number of studies to determine the prevalence of skin-whitening product use. Study done in a Senegalese reported 26% of the women using skin-whitening creams and 75 % of them had experience adverse skin effects (Del Giudice, P. and Yves, P., 2002). In Nigeria, there is a historical association between lighter skin and beauty, often tied to colonial influences (Gwegweni, & Grobler, 2015). Lighter-skinned individuals are sometimes perceived as more attractive, and this has contributed to the popularity of skin-lightening products. The most widely used active ingredients in skin-lightening products are mercury, hydroquinone, and steroid (Ho, Abdullah, Hamsan, & Tan, 2017).

The use of these chemicals has undesirable adverse effects. The main adverse effects include skin thinning, scarring, inflammation, irritation, depigmentation, allergies, organ damage involving the kidney, liver, and nerve, squamous cell carcinoma, nephritic syndromes, and abnormalities of brain development in children and fetuses with usage during pregnancy (Addo, 2000; Eric Selorm Agorku, Edward Ebow Kwaansa-Ansah, Ray Bright Voegborlo, Pamela Amegbletor, & Francis Opoku, 2016; Andersen et al., 2010; Chakera, Lasserson, Beck, Roberts, & Winearls, 2011; Ibrahim, Hassim, Yusof, & Abdul Mutalib, 2015; Organization, 2019; Pollack et al., 2018).

In the last two decades, many Sudanese women have paid great attention to skin-lightening products (Bongiorno & Aricò, 2005; Mahe, Ly, Aymard, & Dangou, 2003; Mahé, Ly, & Perret, 2005). In Sudan, skin-whitening products are accessible without a doctor's prescription and are frequently sold on the sides of roads (Charles, 2003; Lewis, Robkin, Gaska, & Njoki, 2011). Previous studies in Sudan in 2015 reported that a majority (74.4%) of Sudanese undergraduate females have tried skin-whitening products. There is a lack of awareness about the serious health consequences of using these products (Ahmed & Hamid, 2017; Osman, Shayoub, Ahmed, & Babiker, 2015).

There are few studies exploring the determinants of adverse events related to topical whitening products among female students in Sudan. The latest studies were found in 2015 (Ahmed & Hamid, 2017; Osman et al., 2015). Therefore, this study provides a snapshot of the current situation of whitening products used in Sudan. This study aimed 1) To explore the factors associated with adverse events related to topical whitening products used and 2) To explore the reasons for using topical whitening products among female students in Sudan. The

results of this study can be used to stimulate female students to actively participate in improving their awareness.

## **METHODS**

### **Study design, area, and population**

A cross-sectional study was conducted in Wad Madani City, the capital city of Al-Gazira state in Sudan. This city is an important industrial and commercial center, hosting various businesses and industries. There is one university and five colleges. The climate of Wad Medani is typical Sahelian climate, characterized by a hot and dry season. Study done from September to October 2023. The study was conducted in two programs at IQRAA College for Sciences and Technology, Sudan. The Medicine and Pharmacy programs were purposively selected as the study area. As those students in the medicine and pharmacy programs will become the leaders of the community in the future or even have an impact on health care information to the public. Therefore, it is essential to study the use of skin whitening products among those students. The participants were undergraduate female students aged  $\geq 18$  years. Those students who used the topical whitening products in the past 12 months were included in the study. Female students who had never used topical whitening products, those who had skin problems or a history of dermatitis and underwent treatment, and those who used whitening products' oral supplements, injections, or lasers were excluded from the study. Based on sample size formula for one population proportion and the effect size from the previous study (Khalil, 2022), the total sample size was 173 and after adding up to 20%, the final sample size was 208 participants.

### **Measurement tools, data collection, and data analysis**

The self-administered questionnaire was constructed with a total of seventeen questions. This questionnaire includes four sections: socio-demographic characteristics, current topical whitening products used, types of adverse events related to topical whitening products used, and reasons for using topical whitening products. For the content validity test, the Index of Item-Objective congruence (IOC) was utilized and evaluated by three experts. Prior to actual data collection, a pilot test was conducted among forty female students from another university with the same characteristics in Wad Madani City (Wadmedani college). For the reliability test, the Cronbach's alpha score was 0.77.

The quantitative data were collected by the main researcher and two research assistants with medical and pharmacy backgrounds. The data collection process includes a

comprehensive explanation of the study and questionnaires, informed consent, and questionnaire distribution. It took a maximum of 20 minutes to complete the questionnaire.

We have one dependent variable - adverse events related to topical whitening products with a binary outcome (categorical data), and all independent variables are also grouped into categorical variables. For data analysis, we used statistical software - SPSS version 28. We performed three steps of data analysis. The first step, we performed descriptive statistics analysis. For bivariate analysis, we used 1) Simple logistic regression as the second step and 2) Multivariable analysis using binary logistic regression as the last step. Simple logistic regression was used to assess the association between each determinant or factor and the dependent variable. Independent variables with a significant level of p-value  $< 0.25$  were selected for further analysis into the binary logistic regression model (p-value  $\leq 0.05$ ).

### **Ethical consideration**

The main researcher received certificate of ethical approval from the Ethical Committee Gezira State, Ministry of Health (no. 44T/2023), Sudan. Also, Permission from academic administrators of the college and related authorities were attained before data collection. The researcher's assistance clearly states the objectives of the study to obtain informed consent from respondents before the distribution of the questionnaires.

### **RESULTS**

**Table 1** shows the socio-demographic characteristics of participants. More than half of the participants were aged  $\geq 22$  years (86.5%). Most participants are from the medicine program (76.3%) and study in the fourth and fifth academic years (32.7% and 35.1%). About one-third of the participants were middle-income (36.1%). Furthermore, one-third of the participants (27.4%) have a skin allergy or sensitivity history. **Table 2** shows the types of adverse events related to topical whitening products used experienced by our participants, such as redness (33%), itching (28%), pimples (17%), pigmentation disorders (13%), cutaneous atrophy (8%) and others (2%).

**Table 1. Socio-demographic characteristics of participants**

Characteristic	Frequency (N=208)	Percentage (%)
<b>Age</b>	(Mean $\pm$ SD: 23 $\pm$ 1.71)	
18 - 21 years old	28	13.5
$\geq$ 22 years old	180	86.5
<b>Program study</b>		
Medicine	140	76.3
Pharmacy	68	32.7
<b>Academic year</b>		
1 <sup>st</sup>	5	2.4
2 <sup>nd</sup>	24	11.5
3 <sup>rd</sup>	38	18.3
4 <sup>th</sup>	68	32.7
5 <sup>th</sup>	73	35.1
<b>Household income per month</b>		
Low income <100,000 SDG (*150 USD)	71	34.1
Middle income 100,000 – 329,999 SDG (*150-500 USD)	75	36.1
High income $\geq$ 330,000 (500 USD)	62	29.8
<b>History of skin diseases or skin hypersensitivity</b>		
Yes	57	27.4
No	151	72.6

\*Currency rate: 1 USD = 600 Sudanese Pound (SDG), September 2023

**Table 2. Types of adverse events resulted (N=46)**

Type of adverse events resulted	Frequency (N=46)	Percentage (%)
<b>Adverse events resulted from using topical whitening products</b>		
Redness	15	32.6
Itching	13	28.3
Pimples	8	17.4
Pigmentation disorders	6	13.0
Cutaneous atrophy	3	6.5
Others	1	2.2

As shown in Table 3, out of 208 participants, 46 (22.1%) had self-reported ever experience of adverse events due to use of topical whitening products. Most of the participants used creams (26.4%), ointment (24.0%) Gel (22.1%), soap (21.6%) while the other replied solution with lower percentages (5.8%). About one-third of the participants (32.2%) usually bought whitening products from cosmetic shop. About one-third the participants (35.1%) utilized cosmetic products for special occasion. Most of participants (84.6%) usually read information from the container or label of the products. This study finding also revealed that

(11.1%) whitening products used by our participants were not registered by the National Medicine and Poisons Board (NMPB) in Sudan.

**Table 3. Adverse events and current topical whitening products used (N=208)**

<b>Variables</b>	<b>Frequency (N=208)</b>	<b>Percentage (%)</b>
<b>Adverse events resulted from using topical whitening products</b>		
Yes	46	22.1
No	162	77.9
<b>Type of whitening products used</b>		
Creams	55	26.4
Gel	46	22.1
Ointment	50	24.0
Soap	45	21.6
Solution	12	5.8
<b>Frequency of topical whitening products use</b>		
Daily	24.1	33.7
For special occasion	25.2	35.1
Sometimes	22.4	31.3
<b>Usually, read information from the container</b>		
Yes	176	84.6
No	32	15.4
<b>The products were registered with the National Medicine and Poisons Board (NMPB) in Sudan</b>		
Yes	160	76.9
No	23	11.1
I do not know	25	12.0
<b>Test whitening products for adverse event</b>		
Yes	49	23.6
No	159	76.4
<b>Shared whitening products with family/friends</b>		
Yes	171	82.2
No	37	17.8
<b>Using traditional whitening products</b>		
Yes	44	21.2
No	164	78.8
<b>Ever added water or other agents to whitening products</b>		
Yes	35	16.8
No	173	83.2

Most of our participants were usually not test the adverse events of the topical whitening products that they used (76.4%). This study also found that most of participants shared whitening products with family/friends (82.2%). About one-third of participants used

traditional whitening products (21.2%). In addition, 16.8% of the participants had a habit of adding water/other agents to topical whitening products.

**Table 4** shows that the top two reasons of respondents for using topical whitening products were acne (26.9%) and for beautification (24.5%). Followed by beautification (19.2), cleaning discoloration or dark spots on skin (18.8%) and others (10.6%). For the other reasons, (9.5%) mentioned reason for using as Anti-aging treatment, (38.1%) for Brightening and same (38.1%) as preventing care.

**Table 4. The reasons for using topical whitening products**

Reason for using topical whitening products	Frequency (N=208)	Percentage (%)
Acne	56	26.9
For beautification	51	24.5
For Experimenting	40	19.2
Cleaning discoloration or dark spots	39	18.8
Others	22	10.6

The results of the bivariate analysis with simple logistic regression with cut off (p-value < 0.25) showed seven significant factors such as 1) Household income (p-value = 0.005), 2) Type of topical whitening products used (p-value = 0.072), 3) Center for shopping of topical whitening products (p-value = 0.099), 4) Frequency of topical whitening products used (p-value = <0.001), 5) Test whitening products for adverse events (p-value = <0.001), 6) Shared whitening products with family/friends (p-value = <0.001), 7) Using traditional whitening products (p-value = 0.084), and 8) Ever added water or other agents to whitening products (p-value = 0.007). These seven variables were added into a binary logistic regression for further analysis.

**Table 5 shows factors associated with adverse events related to whitening products used. This table** represents the results of binary logistic regression. In total, we have five significant variables as predictors of adverse events related to whitening products used among female students in Sudan. The results imply that students with middle household income were 93% less likely to get adverse events compared to those students with low household income with p-value = 0.030 (AOR: 0.07, 95% CI: 0.06 ,0.77). Students who have tested the topical whitening products before using them were 99.9% less likely to get adverse events compared to those who do not test, with p-value = <0.001 (AOR: 0.001, 95% CI: 0.001,0.00). Students who shared whitening products with family/friends were 89% less likely to get adverse events than those who do not share with p-value = 0.009 (AOR: 0.11, 95% CI: 0.021 ,0.57). Furthermore, students who added water or other agents to whitening products were 95% less

likely to get adverse events compared to those who did not add water or other agents with p-value = 0.038 (AOR: 0.05, 95% CI:0.02, 0.84).

**Table 5. Factors associated with adverse events related to whitening products used**

Variables	Adverse events related to topical whitening products					
	95% CI					
	B	SE	P-value <sup>b</sup>	AOR	Lower	Upper
<b>Household income</b>			<b>0.033**</b>			
(Low income <sup>ref</sup> )						
Middle income	-2.63	1.213	<b>0.030*</b>	0.07	0.06	0.77
High income	-.565	1.161	0.626	0.58	0.06	5.53
<b>Center for shopping (Mixed<sup>ref</sup>)</b>			<b>0.108**</b>			
Cosmetic shop	-0.13	1.28	0.918	0.88	0.071	10.84
Supermarket	1.78	1.28	0.162	5.97	0.488	73.08
Pharmacy	-0.17	1.25	0.887	0.84	0.072	9.74
Local Shop	-02.1	1.28	0.095	0.12	0.010	-1.45
<b>Frequency of topical whitening products (Daily<sup>ref</sup>)</b>			<b>0.163**</b>			
For special occasion	-0.67	1.018	0.505	0.51	0.07	3.73
Sometimes	1.27	0.924	0.167	3.58	0.59	21.91
<b>Test whitening products for adverse events (No<sup>ref</sup>)</b>						
Yes	-7.24	1.335	<b>&lt;0.001*</b>	0.00	0.00	0.01
<b>Shared whitening products with family/friends (No<sup>ref</sup>)</b>						
Yes	-2.20	0.84	<b>0.009*</b>	0.11	0.021	0.57
<b>Using traditional whitening products (No<sup>ref</sup>)</b>						
Yes	-1.61	1.09	0.138	0.20	0.02	1.68
<b>Ever added water or other agents to whitening products (No<sup>ref</sup>)</b>						
Yes	-2.99	1.44	<b>0.038*</b>	0.05	0.03	0.84

<sup>b</sup>. P - value from multiple logistic regression \* Significance at p <0.05 and \*\* Overall significant level p <0.05.

## DISCUSSION

The prevalence of adverse events of topical whitening product use among medical students was low. We found 46 (22.1%) had self-reported experience of adverse events due to topical whitening products. This finding was consistent with previous studies conducted in Africa, which found that the prevalence of adverse events due to whitening products used among medical female student are typically low (E. S. Agorku, E. E. Kwaansa-Ansah, R. B. Voegborlo, P. Amegbletor, & F. Opoku, 2016). This is because it is expected that their knowledge of the adverse effects of the products may serve as a deterrent from abuse (Egbi & Kasia, 2021).



This study also found that most participants shared whitening products with family/friends (82.2%), consistent with previous studies' findings (Ahmed & Hamid, 2017). A prior study in Sudan found that female students who had mothers or sisters bleaching were 7.8 times higher compared with women who had no relative bleaching (Ahmed & Hamid, 2017). Female students who practiced skin-lightening alluded to the influence of family members and friends (Yusuf, Mahmoud, Rirash, Stoff, Liu, & McMichael, 2019). Consistency with the in study in beauty salons in Asmara from May to July 2021, the findings of the study indicated found that most participants (60.5%) were aware of topical whitening products from friends who shared to gather the products, and lower experienced adverse events. The results suggest the need for open communication and consent to ensure the safety of participants and address any allergies, sensitivities, or ongoing skin issues (Tesfamariam et al., 2023).

This study finding also revealed that (11.1%) of whitening products used by our participants were not registered by the National Medicine and Poisons Board (NMPB) in Sudan. Unregistered or unregulated skin-whitening products may still be available in the market through informal channels, online sales, or unlicensed vendors. Consumers may inadvertently purchase these products if they are accessible.

The results imply that students with middle household income were 93% less likely to get adverse events than those with low household income with p-value = 0.030 (AOR: 0.07, 95% CI: 0.06, 0.77). Middle-income households may have the means to purchase higher quality, regulated, and reputable skincare products. These products were more likely to undergo safety and quality testing, reducing the risk of adverse events; this study aligns with research findings conducted in Ethiopia (Bilal, Tilahun, Osman, Mulugeta, Shekabdulahi, & Berhe, 2017).

Students who have tested the topical whitening products before using them were 99.9% less likely to get adverse events compared to those who do not test, with p-value = <0.001 (AOR: 0.001, 95% CI: 0.001,0.00). This is good to check for allergic reactions or sensitivity before applying the product to a larger area. This helps identify potential adverse reactions early, reducing the risk of widespread skin problems. This finding is in line with a previous report (Getachew & Tewelde, 2018).

Students who shared whitening products with family/friends were 89% less to get adverse events than those who do not share with p-value= <0.001 (AOR: 0.00, 95% CI: 0.00 ,0.01). However, this finding contradicts with the existing theories, sharing topical products can lead to microbial contamination and potentially cause skin issues like dermatitis and infections (Lundov, Moesby, Zachariae, & Johansen, 2009).

Furthermore, students who added water or other agents to whitening products were 95% less likely to get adverse events compared to those who did not add water or other agents with  $p$ -value = 0.038 (AOR: 0.05, 95% CI:0.02, 0.84). Adding water or other agents to whitening products can dilute the concentration of active ingredients and reduce the risk (Danish Khan & Alam, 2019). The limitation of this study was that we selected only one college due to the budget constraints. Further studies should involve more colleges to participate in the study in order to generalize the results of the study. However, the results of the study can provide the initial information of whitening product use and its adverse events in Sudan.

## CONCLUSION

The findings of the study indicated that the household income, test whitening products, shared whitening products, and adding water were significant four factors associated with adverse events related to topical whitening products. The two main reasons for using these products were acne treatment and beautification. It is necessary to educate and raise awareness for female students about whitening product use and how to prevent adverse events. Furthermore, the government and health sectors would provide media campaigns related to the safety of whitening products use.

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