

Knowledge, Attitude and Practice of Skin Whitening Products, Among Sudanese Undergraduate Females, 2021.

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Research Article

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Abstract

Objectives: The knowledge, attitude and practice of skin-whitening products among female undergraduates in the medical campus, University of Khartoum.

Methods: A cross-sectional study was conducted at the medical campus of University of Khartoum. All consenting female undergraduates were included in the study population. 417 women were chosen through proportional stratified random sampling, and were asked to complete a questionnaire. 365 completed the questionnaire with a response rate of 87%.

Result: 365 women completed the questionnaire, of whom 52% had average knowledge, 32% had poor knowledge and 16% had excellent knowledge. 32% had a positive attitude, and 38% reported using skin-whitening products.

Knowledge, attitude and practice were associated with several factors.

Conclusion : Although The overall knowledge about skin-whitening products is average. The knowledge about skin-whitening agents is rather poor. The majority of Sudanese University students have a negative attitude towards skin-whitening, but still the use of skin-whiteners is common amongst them .. Women who feel pressured by society to whiten their skin, are more likely to use skin-whiteners, as well as those who have a family history of skin-whitening. Media and social media play an important role in this matter, being the most important source of information and the most common factor pressuring women to lighten their skin as well. We recommend media and social to be used to promote the acceptance of dark skin and raise awareness about the safe practice of skin whitening. We also recommend that the Ministry of Health and Standards and Metrology Authority mandate the labeling of all products sold in Sudan detailing ingredients and concentrations of ingredients.

Background

Skin whitening, or skin bleaching, is a cosmetic procedure that aims to lighten dark areas of skin or achieve a generally paler skin tone. Skin-lightening procedures work by reducing the concentration or production of melanin within the skin.⁽¹⁾ Melanin is a natural skin pigment. Hair, skin, and eye color mostly depends on the sort and amount of melanin. Special skin cells called melanocytes make melanin.⁽¹⁾

Everyone has an equivalent number of melanocytes, but some people make more melanin than others, all which depends on the genetic composition⁽²⁾

Examples of skin whitening agents are: Hydroquinone and derivatives thereof, ascorbic acid , kojic acid⁽³⁾ topical steroids, mercury and clobetasol propionate, which belongs to the class of corticosteroids⁽⁴⁾. All which interfere with the production of melanin.

Skin whitening, is currently a widespread global phenomenon, it is estimated that 15% of the world population invest in skin whitening agents.⁽⁴⁾ The users of skin whitening products usually are of the younger population for example 72 percent of the women who practice skin whitening in Lahore, India fall between (20-30) years⁽⁵⁾

The history of skin bleaching is often traced to the Elizabethan age of powder and paint, nowadays skin bleaching is practiced disproportionately within communities "of color." Especially among people of African descent.⁽⁶⁾ The majority of scholars who studied skin bleaching acknowledge the institutions of colonialism and enslavement historically, and global White supremacy modernly, as important causes of the practice for skin bleaching.⁽⁶⁾

Among communities of color skin bleaching represents an attempt to approximate the White ideal which is:- pale skin, long, straight hair, and aquiline features. And consequently gain access to both the humanity and social status historically reserved for Whites.⁽⁶⁾

In Africa skin bleaching became popular as a cosmetic practice as early as the late 1950s. Coinciding with the first wave of the African independence movements. ⁽⁶⁾

Skin-whitening is highly prevalent in university female students of Sudan, a study conducted recently in University of Al-gezira stated that (74.4%) of them practiced skin-whitening. ⁽⁷⁾

Skin-whitening products have several side effects both dermatological and systemic including cutaneous malignancies. ⁽⁸⁾ The complications of skin-whitening can be so severe, to the extent of hospitalization. Not to mention the financial and medical resources that are lost to treat these complications.

A serious problem arising globally is the illegal trade of products with concentrations higher than recommended. In Sudan most of the creams analyzed for hydroquinone had concentrations of 5.7%. While the US Food and Drug Administration's acceptable limit is 2.0%. ⁽⁹⁾

The findings of this research will help in identifying gaps in knowledge and practice and hence inform policy makers to make effective interventions regarding health promotion and drugs regulations. In order to increase safety and reduce complications. Also exploring the motives behind usage will help in properly addressing them. Furthermore compared to the wide use of whitening products in Sudan researches regarding this matter is rather lacking.

Methods

An Institutional based descriptive cross-sectional study was conducted in The Medical campus of Khartoum University, which is located in the center of Khartoum State, Sudan. It is adjacent to Al-Arabi Market and surrounded by several pharmacies, which makes the accessibility to skin-whitening products easy.

The Medical Campus of University of Khartoum is composed of three faculties: Faculty of Medicine, Faculty of Dentistry and Faculty of Pharmacy.

The faculty of Medicine has 6 levels each level has about 300-400 students. The Faculty of Dentistry has 5 levels each level has about 200 students, similar to the faculty of Pharmacy. Ethical approval was taken from the department of Community Medicine, University of Khartoum .Female undergraduates attending the Faculties of Medicine, Pharmacy and Dentistry of University of Khartoum were enrolled in the study after providing written informed consent.417 females were recruited calculated by the following equation: $n = [z^2 * p(1-p)] / e^2$. Where n= sample size, z=1.96, e= level of precision (0.05), *prevalence used in the equation= 74.4% ⁽⁷⁾,the effective Sample size was 292. Putting into account a response rate of 70% the final sample size was calculated as following: Effective sample size/(1-nonresponse rate). The sample was taken through proportional stratified random sampling. The final sample size was 417, 365 women finished the questionnaire with a response rate of 87%. A list of female students within the study population was obtained from the university administration and was divided into three strata depending on faculty, then subjects were chosen randomly through a random number generator .196,89 and 80 females were chosen from the Faculty of Medicine, Pharmacy and Dentistry ,respectively.

Data was collected by the investigator using an online self-administered modified pre-tested standardized questionnaire from Ahmed A, Hamid et al ⁽⁷⁾ On Google form format, which was distributed through Whatsapp and telegram applications. Data was collected over a period of 1 month (18th of December 2020 to 15th of January 2021).No information leading to identification of a specific subject was taken. The questionnaire focused on socio-demographic characteristics (Faculty attended, Academic year, Marital status, tribe, monthly income, Residency), skin characteristics (Type and color), Questions regarding knowledge, attitude and practice of skin-whitening and factors related to the use of skin-whitening products.

Data Analysis:

Data was analyzed by SPSS Version 26. Descriptive analysis was used to summarize data in the form of counts and percentages, and then shown in a form of tables and graphs. There was no missing data. The knowledge score was grouped into poor, average and excellent. The total score was 9. 0-3 was categorized as poor knowledge, 4-6 was categorized as average knowledge and 7-9 was categorized as excellent knowledge. Attitude was categorized into positive and negative as follows: More than or equal 12.5= positive attitude, Less than 12.5 = negative attitude.

Multivariate logistic regression was used to identify predictors of knowledge, attitude and practice) with a 95% confidence intervals.

Results

In this study data was collected from a total of 417, the response rate was 87%. 365 answered questions about knowledge and attitude. 140 participants used skin-whiteners therefor answered questions inquiring about habits of practice.

Socio-demographics of the study participants:

More than half of the participants attended The Faculty of medicine and the rest were almost equally divided between Faculties of pharmacy and dentistry. The majority of them lived with their families and 91.2% were single. Above half of them reported that they have a light skin tone, the rest described their color as dark and the most common skin type was combination skin type. (Table 1 below)

Table (1) socio-demographicS of female undergraduates of the Medical Campus of University of Khartoum, 2020-2021.

		Frequency	Valid Percent
Faculty attended	Medicine	196	53.7
	Pharmacy	89	24.4
	Dentistry	80	21.9
Academic year.	1st year	71	19.5
	2nd year	71	19.5
	3rd year	74	20.3
	4th year	66	18.1
	5th year	49	13.4
	6th year	34	9.3
Monthly income	<5000 SDG	107	29.3
	5000-10,000 SDG	109	29.9
	10,000-15,000 SDG	54	14.8
	>15,000 SDG	95	26.0
Residency	University Dorms	61	16.7
	Private dorms	19	5.2
	Parents/Spouse house	274	75.1
	relatives house	11	3.0
Skin Colour	very light	9	2.5
	light	196	53.7
	dark	158	43.3
	very dark	2	.5
Marital Statues	Single	333	91.2
	engaged	23	6.3
	married	8	2.2
	divorced/widowed	1	.3
Skin Type	dry	33	9.0
	oily	112	30.7
	mixed	152	41.6
	normal	41	11.2
	i don't know	27	7.4

Knowledge about skin-whitening products amongst Female Undergraduates:

Table (2) Knowledge about skin whitening products among female undergraduates of the Medical Campus of University of Khartoum, 2020-2021.

		Frequency	Valid Percent
Necessity of medical supervision.	Yes, all products need supervision	193	52.9
	some products need supervision	168	46.0
	No, all products can be used without supervision	4	1.1
Knowledge about unsafe concentrations	yes	278	76.2
	No	15	4.1
	I don't know	72	19.7
Do skin whitening products have side-effects?	Yes	324	88.8
	No	7	1.9
	I don't know	34	9.3
Knowledge about skin whitening agents	poor knowledge	296	81.1
	good knowledge	69	18.9
Nature of complications of skin-whitening	poor knowledge	144	39.5
	good knowledge	221	60.5

The majority of the participants had overall average knowledge (52%) and (32%) had poor knowledge. The majority of participants had poor knowledge about skin whitening agents (81.1%) and (88%) of the participants knew that skin-whitening products can cause complications, only (60.5%) had good knowledge about the nature of these complications (Table 2 above) The most important source of information about the side-effects was media/social media (77.2%) followed by witnessing them on others (34.9%). Only (27.5%) stated that the faculty's curriculum was a source of knowledge.

Attitude towards Skin-Whitening Products amongst Female Undergraduates:

The majority of the participants had a negative attitude towards skin whitening (68%). (21.9%) believed that skin-whitening increases the opportunity for marriage, (18.6%) of participants thought that skin-whitening helps in job attainment. Only(27.7 %), (22.2%) believed that skin whitening increases social acceptance and attractiveness, respectively. (Figure 1)

Skin-Whitening Practices among Female Undergraduates:

(37.8%) of the participants practiced skin-whitening. Treatment of acne scars was the main reason of usage, (77.9%) followed by lightening the skin complexion (36.4%).(Table 3)

Pharmacies were the main source of skin-whitening products among respondents (63.5%), followed by through a doctor's prescription (38.6 %) and Nearly a half used the products for 1 to 6 months. (Table 3 below)

Only (18.6%) of the participants suffered from side-effects due to skin-whitening and

(32.6%) didn't know the names and concentrations of ingredients present in their products. (Nearly a half used the products for 1 to 6 months. (Table 3 below)

The majority of the participants were satisfied by the results given by skin whitening products (79.3%). The most common form of products used were creams/lotions followed by soaps (97.1%),(45.7%) respectively.

(13.2%) of the study participants felt pressured by society to use skin-whitening products. Media and social media was the main source of societal pressure among the participants.(68.9%), followed by family members. (40%). (68.8%) of the participants had a family history of skin-whitening

Table (3) : practice of skin whitening among female undergraduates of the Medical Campus of University of Khartoum, 2020-2021. (n=140)

		Frequency	Valid Percent
Reason to use skin whitening products	To treat acne scars	109	77.9
	Hyperpigmentation	14	10
	To lighten natural colour	51	36.4
Source of products.	Doctor's prescription	54	38.5
	Pharmacy	89	63.5
	Boutiques/Shops	40	28.5
	Ordered online	19	13.5
	Friends/Family	8	5.7
Duration of usage	less than a month	43	30.7
	1 - 6 months	69	49.3
	6 - 12 months	12	8.6
	> 1 year	16	11.4
Monthly cost.	< 1000 SDG	78	55.7
	1000-2000 SDG	40	28.6
	2000-4000 SDG	16	11.4
	> 4000 SDG	6	4.2
Knowledge about ingredients.	I know the names and concentrations of the ingredients	40	28.5
	I know the names of the ingredients only	54	38.5
	I dont know the names nor the concentrations of the ingredients	46	32.8
Experienced side- effects	yes	26	18.5
	no	114	81.4

Factors Associated with Knowledge, Attitude and Practice of Use of Skin-Whitening:

The attended faculty was associated with attitude and practice. Participants attending the faculty of medicine were 2 times more likely to have a positive attitude (P=0.043)(Table 4 below) and are 2 times more likely to practice skin-whitening compared to those attending the Faculty of Dentistry.(P=0.043)(Table 5 below)

Table 4: Predictors of attitude regarding skin-whitening.

Factors	References	Positive Attitude			
		P	OR	Lower	Upper
Faculty of Medicine	Faculty of Dentistry	.043	1.961	1.023	3.759
Faculty of Pharmacy	Faculty of Dentistry	.410	.725	.337	1.559
Junior years	Senior years	.066	1.659	.967	2.847
Single	Married/Divorced/Widowed	.950	.973	.417	2.270
Monthly income - <10,000 SDG	Monthly income > 10,000 SDG	.019	.555	.340	.906
Skin Colour- Light	Skin colour-Dark	.779	1.072	.659	1.743
Residency - Dormitories	Residency- With family	.085	1.722	.927	3.196
Skin type- Oily	Skin type -Other	.804	1.083	.575	2.041
skin type- Combination	Skin type - Other	.929	.973	.529	1.790
Feeling pressured by society	No	.000	3.636	1.845	7.164
Family members Bleach	No	.159	1.488	.856	2.589
Poor Knowledge	Excellent knowledge	.280	.663	.315	1.398
Average Knowledge	Excellent knowledge	.188	.633	.321	1.249
Practice skin whitening	No	.868	.956	.562	1.628

Table 5: Predictors of practice regarding skin-whitening.

Factors	References	Practice of Skin-whitening			
		P	OR	Lower	Upper
Faculty of Medicine	Faculty of Dentistry	.045	1.976	1.016	3.843
Faculty of Pharmacy	Faculty of Dentistry	.126	1.772	.851	3.688
Junior years	Senior years	.450	.814	.478	1.388
Single	Married/Divorced/Widowed	.241	.598	.253	1.412
Monthly income - <10,000 SDG	Monthly income > 10,000 SDG	.503	.842	.510	1.392
Skin Colour- Light	Skin colour-Dark	.774	1.074	.662	1.742
Residency - Dormitories	Residency- With family	.542	1.225	.639	2.348
Skin type- Oily	Skin type -Other	.001	3.036	1.578	5.843
skin type- Combination	Skin type - Other	.005	2.491	1.324	4.687
Feeling pressured by society	No	.007	2.713	1.314	5.602
Family members Bleach	No	.000	4.445	2.467	8.009
Poor Knowledge	Excellent knowledge	.019	.414	.198	.866
Average Knowledge	Excellent knowledge	.269	.685	.350	1.340
Negative attitude	No	.874	1.044	.612	1.779

Skin tone was associated with knowledge .Participants with light skin are 1.5 times more likely to have poor knowledge than females with dark skin.(P=0.019)(Table 6 below)

Table 6: Predictors of knowledge regarding skin whitening.

Factors	References	Poor Knowledge				Excellent Knowledge			
		P	OR	Lower	Upper	P	OR	Lower	Upper
Faculty of Medicine	Faculty of Dentistry	0.268	.626	.331	1.183	.559	.755	.294	1.939
Faculty of Pharmacy	Faculty of Dentistry	0.888	1.051	.522	2.117	.105	2.274	.843	6.137
Junior years	Senior years	0.130	1.542	.880	2.704	.008	.381	.186	.781
Single	Married/Divorced/Widowed	0.563	.757	.294	1.949	.243	.543	.195	1.514
Monthly income - <10,000 SDG	Monthly income > 10,000 SDG	.140	.757	.879	2.510	.532	.814	.428	1.551
Skin Colour-Light	Skin colour-Dark	.019	1.485	1.106	3.016	.824	1.075	.569	2.030
Residency - Dormitories	Residency- With family	.678	1.826	.902	.473	.646	.813	.335	1.972
Skin type-Oily	Skin type -Other	.756	.902	1.561	.854	.227	1.854	.681	5.049
skin type-Combination	Skin type - Other	.148	1.561	.855	.377	.001	5.151	2.025	13.103
Feeling pressured by society	No	.707	.855	.931	.542	.529	1.328	.548	3.219
Family members Bleach	No	.795	.931	.600	.340	.259	1.593	.710	3.576
Negative attitude	Positive Attitude	.771	.6	.902	.473	.219	.650	.327	1.292
Practice skin whitening	No	.078	.921	.921	.528	.279	1.402	.735	1.292

Skin-type was associated with knowledge and practice of skin-whitening. Participants who have combination skin are 5 times more likely to have excellent knowledge.(P=0.001)(Table 6 above) and are 2.5 times more likely to practice skin-whitening compared to those with dry and normal skin. (P=.005)(Table 5 above). While Participants with oily skin are 3 times likely to practice skin-whitening than normal and dry skin.(P=0.001)(Table 5 above)

Societal pressure was associated with attitude and practice. Participants who felt pressured by society to whiten their skin were 3.6 times more likely to have a positive attitude (P<0.001)(Table 4 above) and are 2.7 times more likely to practice skin whitening compared to those who don't feel pressured.(P=0.007)(Table 6 above)

Family history of skin-whitening was associated with practice. Participants with a family history of skin-whitening are 4.5 times more likely to whiten their skin compared to those who don't.(P<0.001) (Table 6 above)

Participants, who did not obtain products through doctor's prescription and pharmacies, were 3.6 and 3.2 times more likely to be ignorant towards the ingredients present in their skin-whitening products. Compared to those who obtained products through doctors prescriptions and pharmacies. (P =0.016,P=.019) .(Table 7 below)

Table 7; Predictors of knowledge about ingredients present in used products.

Factors	References	Knowledge about names of ingredients and their concentrations.				Ignorance to names of ingredients and their concentrations.			
		P	OR	Lower	Upper	P	OR	Lower	Upper
Source of Products- doctor's prescription	Source of products- elsewhere	.500	.723	.281	1.857	.016	.277	.097	.790
Source of products - Pharmacy	Source of products- elsewhere	.389	1.557	.568	4.272	.019	.309	.116	.824
Source of products- boutiques/shops	Source of products- elsewhere	.371	.629	.228	1.734	.135	.454	.161	1.278
Source of products- online shopping	Source of products- elsewhere	.772	1.217	.323	4.587	.722	1.248	.369	4.226
Source of products - friends/family members	Source of products- elsewhere	.545	.484	.046	5.067	.555	1.633	.320	8.324

Participants who obtained products from their friends/family members are 11 times more likely to experience side-effects than those who obtained from other sources. (P=0.012) (Table 8 below)

Table 8: Predictors of experiencing side-effects due to use of skin-whitening products.

Factors	References	Experienced adverse side-effects.			
		P	OR	Lower	Upper
Source of Products- doctor's prescription	Source of products- elsewhere	.875	1.106	.315	3.885
Source of products - Pharmacy	Source of products- elsewhere	.931	.945	.261	3.418
Source of products- boutiques/shops	Source of products- elsewhere	.104	2.942	.801	10.811
Source of products- online shopping	Source of products- elsewhere	.227	2.583	.554	12.047
Source of products - friends/family members	Source of products- elsewhere	.012	11.010	1.694	71.553

Discussion

Regarding the overall knowledge about skin whitening products was, 52% had average knowledge, 32% had poor knowledge and 16% had excellent knowledge. The majority of participants in this study had negative attitude towards skin-whitening. And 38% of the participants had practiced skin-whitening in a point of their lives.

Socio-demographic factors, skin-characteristics and societal factors were significantly associated with knowledge, attitude and practice of skin-whitening.

Most of the participants knew that skin-whitening products can cause adverse side-effects (88%). In alignment with study conducted in University of Al-gezira ⁽⁷⁾ in Sudan, and another one in Nigeria⁽¹⁰⁾. That indicates that people generally know that skin-whitening can cause adverse side-effects.

Regarding the source of knowledge about the health risks (77.2%) reported that media/social media was their source of information. In alignment with what was found in University of Al-Gezira. ⁽⁷⁾ This highlights the role of social media in educating about skin-whitening.

Although all of the participants attended medical and health allied faculties only (27%) mentioned the faculty's curriculum as a source of knowledge which points out the poor role of universities in educating about this matter.

(81.8%) of the participants had poor knowledge regarding skin-whitening agents .Which is even a higher percentage than what was found in university students in Nigeria (56.1%). ⁽¹⁰⁾ This might be due to the fact that Nigeria is a leading country in manufacturing skin-whitening products, unlike Sudan, therefor knowledge about this matter is higher.

In this study only (32%) reported a favorable attitude, much lower than what was found in University of Al-gezira, 2015 where (87.9%) reported a favorable attitude ⁽⁷⁾ This huge difference indicates that the Sudanese population has developed a less favorable attitude towards skin-whitening in the past 5 years or might be attributed to the different study areas.

(38%) of the participants used skin whitening products. Much lower than results found in the Locality of Omdurman (89.5%). ⁽¹¹⁾ This might be due to the study area, Omdurman locality has one of the largest markets in Sudan ,which is rich with shops and boutiques that sell skin-whitening products.

In this study the majority obtained products from pharmacies, (63.6%), respectively. Similar to results found in high school students in Central Sudan (52.6%) obtained from pharmacies. ⁽¹²⁾This highlights the important role of pharmacists in regulating the purchase and use of skin whitening products in Sudan.

It is worth noting that participants who didn't obtain products through doctor's prescription and pharmacies, were 3.6 and 3.2 times more likely to be ignorant towards the ingredients present in their skin-whitening products . Which shows that products obtained under doctors and pharmacists supervision are more likely to be labeled with ingredients, thus much safer.

Only (18.6%) experienced complications in this study. Which is much lower than what was found in Ibn-Sena University, where (86%) experienced complications ⁽⁵⁾. This difference might be because the majority in this study practiced skin-whitening for a short duration. Nearly a half used for 1 to 6 months in this study.

It is worth mentioning that those who obtained products from friends/family members are 11 times more likely to experience side-effects than those who didn't. Those participants may have used products that aren't suitable for their skin condition/type.

The main reason for using skin-whitening products, was to treat acne scars (77.9%). Substantially higher than what was found in University of Al-Gezira where, only (26.9%), reported acne and acne scars to be reason of usage⁽⁷⁾. This is because; the majority of consumers in this study had combination skin followed by oily skin, which are both prone to acne.

(79.3%) of users in this study were satisfied by the efficacy of the products they've used. Similar to results found in Jordan and Omdurman locality in Sudan. Where (70.9%), (75%) were satisfied, respectively.^{(13), (11)} Which indicates that skin whitening products are indeed efficient in delivering the expected results.

Knowledge about skin-whitening products in this study was associated with, academic year, skin color and skin type. Females with light skin were 1.5 times more likely to have poor knowledge than those with lighter skin. Similar to University of Al-Gezira.⁽⁷⁾ This indicates that dark skinned females are more interested in skin-whitening and therefore have more knowledge. Females with combination skin 5 times more likely to have excellent knowledge than dry and normal skin-types, which could be explained by that combination skin is more challenging due to it having oily areas and dry areas, so those who possess it are more educated about skin-products, in order to find what suits them.

It is worth noting that those who had knowledge about the side-effects and those who didn't, had similar favorable attitudes (32.7% Vs. 24.4%) towards skin-whitening⁽⁷⁾ Which indicates that the motives behind skin-whitening are rather strong and not moved by the fear from side-effects.

The use of skin-whiteners was associated with knowledge, skin-type, societal pressure and family history. Generally, Participants with excellent knowledge tended to practice skin-whitening the most compared to those with average and poor knowledge. (58.3% Vs. 39.9%, Vs. 25.6%) This indicates that participants who don't practice skin-whitening are not interested in the matter therefore have poor knowledge. Females with oily and combination skin were more likely to use skin-whiteners than females with normal and dry skin. This can be explained by the fact that combination and oily skin are more prone to acne therefore acne scars. Which is the main reason for usage in this study.

Societal pressure showed a great impact on the matter of skin-whitening. Where Females who felt pressured by society to whiten their skin were 3.6 times more likely to have a positive attitude and are 2.7 times more likely to practice skin whitening compared to those who don't feel pressured.

The major source of pressure was media/social media. Similar to what was found in High schools of Central Sudan, where the majority admitted the influence of media in promoting skin whitening.⁽¹²⁾

Participants with a family history of skin-whitening are 4.5 times more likely to whiten their skin compared to those who don't. Which points out that family usage has a strong influence on whether a person whitens their skin or not.

The study has some limitations, it was limited to female university students, which is not representative of all Sudanese women. It also didn't include males whom nowadays practice skin-whitening as well. Nonetheless this study gives a general picture about the knowledge attitude and practice of female university students, whom lie in the age group most likely to use skin-whiteners.

Declarations

Ethics approval and Consent to participate:

Ethical approval was taken from the department of Community Medicine, University of Khartoum. Written consent was taken from all participants.

Consent for publication:

Not applicable

Availability of Data and Materials:

The dataset used or analyzed during this study are available from the corresponding author on reasonable request.

Competing Interest:

The authors declare that they have no competing interests.

Funding:

Not applicable

Authors Contribution:

RA Conceptualized the idea, designed work, analyzed data , interpreted Data, drafted the manuscript and approved the submitted version

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References

1. Cosmetic procedures - Skin lightening [Internet]. nhs.uk. 2021 [cited 31 December 2021]. Available from: <https://www.nhs.uk/conditions/cosmetic-procedures/skin-lightening/> O A. 2021. What Is Melanin?. *WebMD*. <https://www.webmd.com/a-to-z-guides/what-is-melanin#1>
2. Couteau C, Coiffard L. Overview of Skin Whitening Agents: Drugs and Cosmetic Products. *Cosmetics*. 2016;3(3):27.
3. Maneli M, Wiesner L, Tinguely C, Davids L, Spengane Z, Smith P et al. Combinations of potent topical steroids, mercury and hydroquinone are common in internationally manufactured skin-lightening products: a spectroscopic study. *Clinical and Experimental Dermatology*. 2015;41(2):196-201. \
4. Pillaiyar T, Manickam M, Namasivayam V. Skin whitening agents: medicinal chemistry perspective of tyrosinase inhibitors. *Journal of Enzyme Inhibition and Medicinal Chemistry*. 2017;32(1):403-425.
5. Abdalla A, Ahmed M. Facts, Traditions, and Complications of Skin Whitening Products among Female Students in Sudan: A Cross-Sectional Study. *Global Journal of Health Science*. 2020;12(3):103.

6. Blay y. Skin Bleaching and Global White Supremacy: By Way of Introduction. The Journal of Pan African Studies. 2011;4(4).
7. Ahmed A, Hamid M. Use of Skin-Whitening Products by Sudanese Undergraduate Females: a Survey. Journal of Racial and Ethnic Health Disparities. 2016;4(2):149-155.
8. Dadzie O, Petit A. Skin bleaching: highlighting the misuse of cutaneous depigmenting agents. Journal of the European Academy of Dermatology and Venereology. 2009;23(7):741-750.
9. Mustafa A, Aziz M. Determination of Hydroquinone in Skin Lightening Creams Sold in Sudan by Using High Performance Liquid Chromatography. The Journal of Middle East and North Africa Sciences. 2016;2(7):17-21.
10. Amodu M, Bolori M, Ahmad I, Kale A, Kuchichi A. Knowledge, Attitude and Practice of Skin Whitening among Female University Students in Northeastern Nigeria. OALib. 2018;05(04):1-14.
11. Buraie Hamza Adam R. Perception of Skin Lightening Creams among Females in Omdurman Locality, Khartoum State, Sudan. DSpace Repository [Internet]. 2016 [cited 1 January 2022];. Available from: <http://repo.uofg.edu.sd/handle/123456789/556>
12. Yousif A, Ahmed A, Idris A, Elmustafa M, Ahmed E. The Use of Bleaching Creams among Central Sudan Students, 2010. Pharmacology & Pharmacy. 2014;05(05):532-539.
13. Hamed S, Tayyem R, Nimer N, AlKhatib H. Skin-lightening practice among women living in Jordan: prevalence, determinants, and user's awareness. International Journal of Dermatology. 2010;49(4):414-420.

Figures

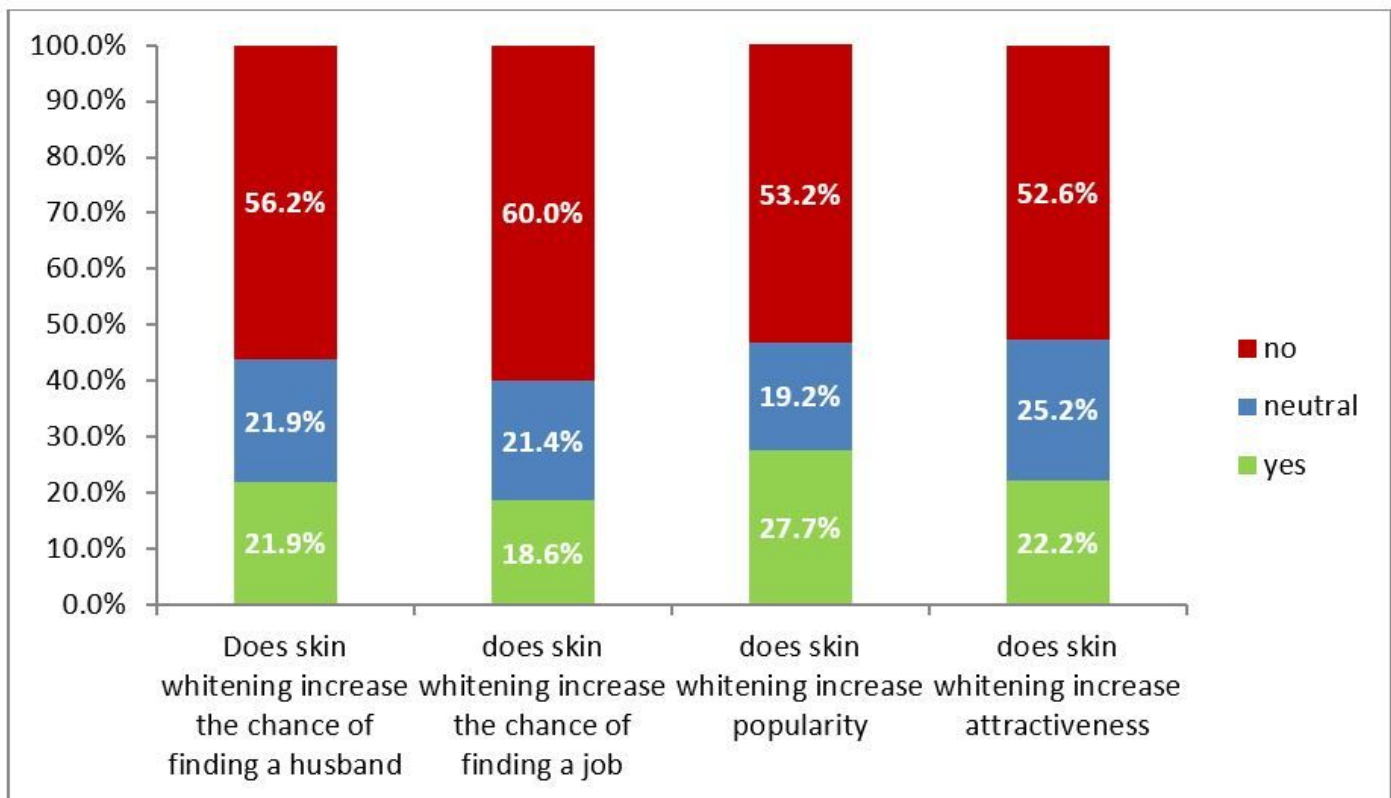


Figure 1

Attitude of respondents towards skin whitening products among female undergraduates of the Medical Campus of University of Khartoum, 2020-2021.