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Effect of a Structured Health Education Intervention on Knowledge of the Health Consequences of Skin Bleaching among Female Tertiary Students in Bauchi State, Nigeria

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Abstract

Skin lightening, commonly referred to as skin bleaching, remains a public health and social concern because of the potential toxicity of some depigmenting products and the socio-cultural pressures that encourage their use. This study examined the effect of a structured health education intervention on female tertiary students' knowledge of the health consequences of skin bleaching in Bauchi State, Nigeria. A quasi-experimental pre-test/post-test design was used. A total of 120 female students were selected from three public tertiary institutions representing Bauchi South, Bauchi Central and Bauchi North educational zones, with 40 participants from each zone. Data were collected using a researcher-developed Knowledge and Consequences of Skin Bleaching Questionnaire and a four-week Health Education Intervention Package. Descriptive statistics were used to answer the research questions, while paired-samples t-tests were used to test the hypothesis at the 0.05 level of significance. Baseline knowledge was low across the three zones, with an overall mean score of 2.03 (SD = 0.82). The leading reported drivers were media portrayals of lighter skin (M = 3.41), perceptions that fair skin represents beauty and social status (M = 3.32), and unsupervised self-medication for skin conditions (M = 3.25). Following the intervention, the overall mean knowledge score increased to 3.52 (SD = 0.52), representing a mean gain of 1.49 points. The overall paired-samples t-test indicated a statistically significant difference between pre-test and post-test scores, $t(119) = -24.03$, $p < .001$. The findings suggest that structured health education can substantially improve students' knowledge of the risks associated with skin bleaching. Integrating cosmetic safety, chemical literacy and media literacy into tertiary health education programmes may therefore strengthen informed decision-making among young adults.

Keywords: skin bleaching; skin lightening; health education; health literacy; female students; tertiary institutions; Bauchi State; Nigeria

Introduction

Background

Skin lightening refers to the intentional alteration of natural skin pigmentation through topical or systemic agents. The practice is described in the literature using terms such as skin bleaching, skin whitening, skin toning and cosmetic depigmentation. Products used for this purpose may contain hydroquinone, corticosteroids, mercury compounds and other depigmenting substances. Their effects are linked to interference with melanogenesis, particularly the tyrosinase-dependent pathway involved in melanin production (Mohiuddin, 2019; Ong & Maibach, 2017). Although selected depigmenting agents may have legitimate therapeutic uses under professional supervision, their unsupervised cosmetic use presents a different public-health concern.

The safety concern is particularly important where products are obtained from informal markets or used without adequate knowledge of their ingredients. Prolonged or inappropriate exposure to potent depigmenting agents has been associated with dermatological complications, including skin atrophy, irritation, telangiectasia and exogenous ochronosis. Heavy-metal exposure, particularly from mercury-containing preparations, may also produce systemic toxicity, including renal and neurological effects (Liang *et al*., 2020; Paller & Mancini, 2020). Arbutin and other botanical or cosmetic ingredients may also be incorporated into lightening formulations, illustrating the wide range of substances marketed for depigmentation (Boo, 2021).

The persistence of skin lightening cannot, however, be explained by toxicology alone. In Nigeria and other African settings, cosmetic decisions are influenced by social meanings attached to complexion. Colorism, perceptions of beauty, media representation, peer influence and perceived social advantages associated with lighter skin can shape attitudes towards skin lightening (Archibong, 2019; Sommerlad, 2022). Bakare *et al*. (2023) similarly reported that aesthetic motivations and gaps in knowledge about adverse effects were important features of skin-lightening practices among residents in Lagos.

Health literacy is therefore central to the problem. Knowing that a product changes skin colour is different from understanding its active ingredients, mechanisms of action, possible adverse effects and the importance of professional guidance. Research on health information literacy among young adults has pointed to gaps in understanding the risks associated with skin-bleaching products (Aramide *et al*., 2019). Health education can address such gaps by providing accessible information, encouraging critical evaluation of cosmetic claims and strengthening individuals' confidence to make safer choices. Health education is broadly concerned with helping individuals and communities acquire knowledge and skills that support health-promoting decisions (Edelman & Kudzma, 2021; Nancy & Dongre, 2021; Sharma, 2021).

For tertiary students, this intervention is particularly relevant. Young adults are active consumers of media and cosmetic information and may also influence peers, family members and wider communities. Evidence that educational interventions can strengthen functional health literacy supports the use of structured educational approaches in addressing preventable health risks (Vamos *et al*., 2020). Against this background, the present study examined whether a structured four-week health education intervention could improve female

tertiary students' knowledge of the health consequences of skin bleaching in Bauchi State.

Problem Statement

Skin bleaching remains a concern despite growing awareness of its potential adverse effects. Female students may encounter products through informal markets, social media vendors, peers and commercial advertising, while information about chemical composition and long-term safety may be incomplete. The problem is compounded when cosmetic ideals favour lighter complexions or when depigmenting products are initially used to manage acne marks, hyperpigmentation or other localized skin concerns and subsequently become routine cosmetic products (Bakare *et al*., 2023; Sommerlad, 2022).

The central problem addressed by this study is therefore not simply the availability of skin-lightening products, but the apparent gap between exposure to these products and adequate knowledge of their health consequences. Without appropriate health education, misconceptions may persist and may contribute to continued use of potentially hazardous preparations. Evidence from Nigeria has also identified weaknesses in pharmaceutical and cosmetic supply chains that can facilitate the circulation of unapproved products (Yakubu, 2020). A context-specific educational intervention is consequently warranted.

Objectives

The study sought to:

• assess the baseline level of knowledge of the health consequences and medical risks of skin bleaching among female tertiary students in Bauchi State;

• identify the major socio-cultural and psychological factors associated with skin-bleaching practices among the students; and

• determine the effect of a structured four-week health education intervention on students' knowledge of the consequences of skin bleaching.

Research Questions

• What is the baseline level of knowledge regarding the health consequences and medical risks of skin bleaching among female tertiary students in Bauchi State?

• What socio-cultural and psychological factors are associated with skin-bleaching practices among the students?

• What effect does the structured four-week health education intervention have on students' knowledge of the consequences of skin bleaching?

Hypothesis

H0: There is no significant difference between the pre-test and post-test mean knowledge scores of female tertiary students regarding the health consequences of skin bleaching following exposure to the four-week health education intervention.

Skin Lightening and Depigmentation

Skin lightening is a heterogeneous practice involving different products, ingredients and motivations. Hydroquinone has historically been used to reduce pigmentation by interfering with melanogenesis, while corticosteroid-containing products can alter skin physiology when used inappropriately. Mercury

compounds are particularly concerning because of their potential for systemic absorption and toxicity (Mohiuddin, 2019; Ong & Maibach, 2017). Some products also contain ingredients such as arbutin, kojic acid or other compounds intended to modify pigmentation (Boo, 2021).

The clinical consequences depend on the substance, concentration, duration and pattern of use. Dermatological complications may include irritation, epidermal thinning, telangiectasia, altered pigmentation and exogenous ochronosis. Systemic effects are of particular concern when products contain toxic substances that can be absorbed through the skin or are administered systemically without appropriate medical supervision (Liang *et al*., 2020; Paller & Mancini, 2020).

Socio-Cultural Determinants

Skin lightening is embedded in social meanings surrounding complexion. Historical and contemporary colour hierarchies may influence perceptions of attractiveness, status and opportunity. Archibong (2019) described the Nigerian context as involving complex motivations and repercussions, while Sommerlad (2022) highlighted colourism and social expectations as important influences. Juliano (2022) likewise linked the global spread of dangerous skin-lightening products to colourism and emphasized the need for educational and regulatory responses.

Among young adults, peer influence and media exposure can reinforce these norms. Advertising and social media may repeatedly associate lighter skin with attractiveness, success or desirability. At the same time, some individuals use depigmenting products in an attempt to treat hyperpigmentation or other skin concerns, sometimes without professional advice (Aramide *et al*., 2019; Bakare *et al*., 2023). These interacting factors indicate that effective interventions should address both biomedical knowledge and the social environment in which cosmetic choices are made.

Health Education and Behaviour Change

Health education aims to provide knowledge and develop skills that enable individuals to make informed decisions. It is not limited to transmission of facts; it can also address beliefs, perceived risks, social influences and confidence in adopting healthier behaviours (Edelman & Kudzma, 2021; Nancy & Dongre, 2021). Sharma (2021) emphasizes the theoretical foundations of health education and health promotion, while Vamos *et al*. (2020) argue that education is an important component of functional health literacy.

In the context of skin bleaching, health education can help students identify potentially hazardous ingredients, understand possible adverse effects, evaluate cosmetic claims and recognize when professional dermatological care is appropriate. It can also challenge social assumptions that equate lighter skin with greater beauty or social value.

Theoretical Framework: Health Belief Model

The study was guided by the Health Belief Model (HBM). The model proposes that health-related action is influenced by perceptions of susceptibility, severity, benefits, barriers, cues to action and self-efficacy. Applied to skin bleaching, students are more likely to reconsider harmful practices when they understand their personal susceptibility to adverse effects and perceive those effects as serious. They also need to recognize the benefits of avoiding hazardous products, overcome social and psychological barriers, and develop confidence in making independent health decisions.

The four-week intervention was therefore designed as a practical cue to action. By presenting information on skin physiology, chemical ingredients, possible complications and safer decision-

making, the programme sought to strengthen perceived susceptibility and severity while improving perceived benefits and self-efficacy (Sharma, 2021).

Empirical Evidence

Bakare *et al*. (2023) reported knowledge gaps among skin-lightening product users in Lagos and identified aesthetic motivations as important reasons for use. Aramide *et al*. (2019) similarly identified deficiencies in health information literacy concerning the risks and chemical constituents of bleaching products among young adults. Sommerlad (2022) reviewed causes and complications of skin lightening and emphasized the dermatological consequences associated with prolonged or inappropriate use. Juliano (2022) further situated the problem within the broader phenomenon of colourism and the international circulation of potentially dangerous products. Together, these studies support the need for interventions that combine health information with attention to social and behavioural influences.

Research Design

A quasi-experimental pre-test/post-test design was adopted. The design allowed the researchers to measure participants' knowledge before the intervention and again after the four-week health education programme. Complete randomization of individual students was not considered practical within the existing institutional arrangements.

Study Setting and Population

The study was conducted in public tertiary institutions in Bauchi State, North-East Nigeria. The study population comprised female undergraduate students enrolled in selected institutions across the three educational zones of the state.

Sample and Sampling Procedure

A multi-stage sampling procedure was used. The state was considered across Bauchi South, Bauchi Central and Bauchi North educational zones. One public tertiary institution was selected from each zone, and 40 female students were recruited from each institution, giving a total sample of 120 participants.

Instrumentation

Data were collected using a researcher-developed Knowledge and Consequences of Skin Bleaching Questionnaire (KCSBQ). The instrument covered demographic characteristics, knowledge of chemical constituents and mechanisms of depigmentation, socio-cultural determinants, and perceived medical and physiological consequences. The Health Education Intervention Package (HEIP) consisted of instructional slides, informational leaflets and guided discussions covering skin physiology, chemical toxicity, health consequences and strategies for resisting harmful social pressures.

Validity and Reliability

The instruments were reviewed by three experts two in Health Education/Public Health and one in Test, Measurement and Evaluation for clarity, relevance, language and alignment with the study objectives. A pilot test was conducted among 20 female tertiary students outside the study sample. Cronbach's alpha was specified for Likert-type items and KR-20 for dichotomous knowledge items, with a coefficient of 0.75 regarded as acceptable.

Data Collection

Data collection occurred in three phases. A pre-test was administered before the intervention. Participants then received the four-week Health Education Intervention Package through weekly 60-minute sessions involving visual presentations, group activities and educational leaflets. A post-test was administered at the end of the intervention using a reshuffled version of the questionnaire.

Data Analysis

Frequencies, percentages, means and standard deviations were used to summarize the data and answer the descriptive research questions. A paired-samples t-test was used to compare pre-test and post-test knowledge scores at the 0.05 significance level.

Participant Distribution

Zone	Institution	n	Percentage
Bauchi South	Selected tertiary institution A	40	33.3%
Bauchi Central	Selected tertiary institution B	40	33.3%
Bauchi North	Selected tertiary institution C	40	33.3%
Total	Three institutions	120	100.0%

Baseline Knowledge

Knowledge domain	South M±SD	Central M±SD	North M±SD	Overall mean	Decision
Chemical ingredients/mechanisms	2.15±0.81	2.08±0.86	2.13±0.85	2.12	Low
Dermatological pathologies	2.08±0.76	2.02±0.81	2.05±0.80	2.05	Low
Systemic/renal toxicity	1.98±0.80	1.90±0.84	1.94±0.82	1.94	Low
Cutaneous malignancies/risks	2.25±0.85	2.18±0.90	2.20±0.89	2.21	Low
Unapproved systemic lighteners	1.85±0.72	1.78±0.77	1.80±0.76	1.81	Low
Overall pre-test index	2.06±0.79	1.99±0.84	2.02±0.82	2.03	Low

Baseline knowledge was low in all three zones. The overall mean was 2.03 (SD = 0.82), with the lowest domain score recorded for knowledge of unapproved systemic lighteners (M = 1.81).

Socio-Cultural and Psychological Determinants

Determinant	Mean	SD	Decision
Fair skin perceived as a sign of status, beauty and opportunity	3.32	0.68	Agreed
Peer/campus pressure	3.18	0.74	Agreed
Unsupervised self-medication for skin conditions	3.25	0.71	Agreed
Media portrayals/commercial marketing	3.41	0.62	Agreed
Availability of unapproved custom-mixed creams	3.10	0.80	Agreed
Overall determinant score	3.25	0.71	Strong driver

Media portrayals had the highest mean score (M = 3.41), followed by perceptions linking fair skin with status and beauty (M = 3.32) and unsupervised self-medication (M = 3.25).

Effect of the Intervention

Zone	n	Pre-test M	Pre-test SD	Post-test M	Post-test SD	Mean gain	Increase
Bauchi South	40	2.06	0.79	3.56	0.49	+1.50	72.8%
Bauchi Central	40	1.99	0.84	3.48	0.54	+1.49	74.8%
Bauchi North	40	2.02	0.82	3.52	0.53	+1.50	74.2%
Overall	120	2.03	0.82	3.52	0.52	+1.49	73.4%

Knowledge increased substantially in every zone. The overall mean increased from 2.03 (SD = 0.82) before the intervention to 3.52 (SD = 0.52) after the intervention, representing a mean gain of 1.49 points.

Hypothesis Test

Level	n	Mean difference	t	df	p	Decision
Bauchi South	40	-1.50	-14.70	39	<.001	Reject H0
Bauchi Central	40	-1.49	-13.42	39	<.001	Reject H0
Bauchi North	40	-1.50	-13.88	39	<.001	Reject H0
Overall	120	-1.49	-24.03	119	<.001	Reject H0

The overall paired-samples t-test showed a statistically significant difference between pre-test and post-test knowledge scores, $t(119) = -24.03$, $p < .001$. The null hypothesis was therefore rejected.

Discussion

The study found that female tertiary students entered the intervention with relatively low knowledge of the health consequences of skin bleaching. The pattern was consistent across Bauchi South, Bauchi Central and Bauchi North. This finding is consistent with earlier Nigerian evidence indicating gaps in health information and risk awareness among users and potential users of skin-lightening products (Aramide *et al*., 2019; Bakare *et al*., 2023). The low score for unapproved systemic lighteners is particularly important because students may encounter products promoted through informal or commercial channels without adequate information about their safety.

The results also indicate that social and environmental influences are important. Media portrayals recorded the highest determinant score, while colourist perceptions and peer pressure were also prominent. These findings are compatible with literature describing skin lightening as a socially embedded practice rather than a purely individual cosmetic decision (Archibong, 2019; Juliano, 2022; Sommerlad, 2022). The implication is that health education should not focus exclusively on listing chemical risks. It should also help students critically evaluate media messages, recognize social pressure and develop confidence to resist harmful beauty norms.

The most important finding was the marked improvement in knowledge following the four-week intervention. The overall mean increased from 2.03 to 3.52, and the paired-samples t-test demonstrated a statistically significant difference. The relatively similar gains across the three zones suggest that the intervention was effective across the participating settings. The result is consistent with the broader health-education literature emphasizing the value of structured learning for improving health literacy and supporting informed health decisions (Edelman & Kudzma, 2021; Nancy & Dongre, 2021; Vamos *et al*., 2020).

The findings can also be interpreted through the Health Belief Model. The intervention supplied information capable of increasing perceived susceptibility and perceived severity by explaining how apparently routine cosmetic practices can result in adverse outcomes. It also provided cues to action and potentially strengthened self-efficacy by giving students practical knowledge for evaluating products and seeking safer alternatives. The HBM therefore provides a useful behavioural explanation for why a structured educational intervention may influence knowledge and risk perception (Sharma, 2021).

Nevertheless, increased knowledge should not automatically be interpreted as proof of long-term behavioural change. The present study measured knowledge before and after a relatively short intervention period. Sustained changes in product use, attitudes and behaviour require longitudinal assessment. This distinction is important because cosmetic practices are influenced by social norms, access to products and personal motivations in addition to knowledge.

Conclusion

Female students in the selected tertiary institutions in Bauchi State demonstrated low baseline knowledge of the health consequences of skin bleaching. Media influence, colourist beauty standards, peer pressure and unsupervised treatment of skin conditions emerged as important determinants. The structured four-week health education intervention produced a substantial and statistically significant improvement in knowledge. The study therefore concludes that structured, theory-informed health education is a promising approach for strengthening cosmetic safety knowledge and health literacy among tertiary students.

Recommendations

• Tertiary institutions should incorporate cosmetic safety, skin health and chemical literacy into student orientation and relevant health education programmes.

• Campus health services should provide accessible information on the risks associated with unregulated skin-lightening products and encourage students with skin disorders to seek qualified professional care.

• Health education programmes should include media literacy and discussion of colourism, peer pressure and socially constructed beauty standards rather than concentrating only on biomedical risks.

• Relevant regulatory and public-health agencies should strengthen monitoring of unapproved cosmetic products and collaborate with tertiary institutions on awareness campaigns.

• Student-led peer education initiatives should be encouraged to promote evidence-based skin health information and challenge harmful misconceptions.

• Future research should examine whether improvements in knowledge are sustained and whether they translate into measurable changes in skin-lightening practices over longer follow-up periods.

Limitations of the Study

The study involved 120 female students from three selected public tertiary institutions in Bauchi State, so the findings should not be generalized automatically to all tertiary students in Nigeria. The post-test was conducted shortly after the intervention; consequently, the study does not establish whether knowledge gains or behavioural changes were maintained over an extended period. In addition, some information on cosmetic practices and determinants was self-reported and may therefore be affected by recall or social-desirability bias.

Contribution to Knowledge

The study contributes local evidence on cosmetic health literacy among female tertiary students in Bauchi State. It demonstrates the feasibility of delivering a structured four-week intervention that combines biomedical information with behavioural and socio-cultural content. It also provides evidence supporting the application of the Health Belief Model to health education addressing cosmetic practices in a Nigerian tertiary-education context.

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