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## **An Epidemiological Survey on the Presence of Toxic Chemicals in Soaps and Cosmetics Used by Adolescent Female Students from a Nigerian University**

By Obuekwe, Ifeyinwa Flossy, PhD<sup>i</sup> and Ochei Uche Mabel, M. Pharm<sup>ii</sup>

### **Abstract**

An epidemiological survey was conducted into the presence of toxic chemicals in soaps and cosmetics used by 200 adolescent female students between 17 and 26 years of age from a Nigerian university, The University of Benin, Benin City. Most of these cosmetics, which included creams, lotions and soaps, were imported from Europe. 20% of these young girls had used cosmetics to lighten their skin for between two months to two years and claimed that they had some irritations. Another 40% used a mixture of cosmetics and soaps in combination and their skins were burnt during the period. Over 66% used medicated soaps which they claimed were very good on their skin, but 17% of these cosmetics contain hydroquinone while 14% and 35% of the soaps contain potassium mercuric iodide. The presence of these chemicals, (hydroquinone and mercuric iodide), which had already been banned worldwide in cosmetics and soaps must be viewed with serious concern, especially when most of the users claimed that they were ignorant of the health implications involved. Government agencies controlling the regulations and importation of these pharmaceutical products should ensure that Nigeria does not become a dumping ground for such undesirable products, which can become carcinogenic on the skin after long-term use. Follow-up action on educating these young girls on the health implications involved in the use of these pharmaceutical products is highly recommended.

*Key Words:* toxic chemicals, soaps and cosmetics, adolescent female students, Nigeria.

### **Introduction**

In Nigeria today, the cosmetic use of bleaching agents by women is widespread. Hydroquinone, a common bleacher, is a white crystalline powder which darkens upon exposure to light and air. It may cause transient erythema and a mild burning sensation as well as undesirable pigmentation changes (1). Occasionally, hypersensitivity occurs and so some sources recommend skin testing before use. Hydroquinone also may have caused conjunctiva changes so contact with the eyes must be avoided.

A report of patchy de-pigmentation of the palm, forefinger and base of the neck in a West Indian woman after using a cosmetic containing hydroquinone was documented (2). An epidemiological survey on the use of bleaching agents by the women of Bamako (Mali) has been studied, ((3). It was observed from the study of 210 subjects, that 21% of the cosmetics used were hydroquinone-containing products and 11% mercuric derivatives. The study also observed some dermatological effects, which did not hinder the use of these agents, and that bleaching was particularly frequent in unmarried women. Localized exogenous ochronosis (blue-black hyper pigmentation) of the face developed in a fifty year-old black woman who had used a proprietary bleaching cream containing 2% hydroquinone up to six times daily for about two and half years. Eighteen months after discontinuing the use of the cream, the hyper pigmentation cleared, except for some residual changes in the periorbital areas (4). Brown discoloration of the nails developed

in two women after the use of hydroquinone-containing cosmetic skin-lightening creams for actinic lentiginosities of the hands (5).

Hydroquinone increases melanin excretion from melanocytes and may also prevent its production. It is topically used as a de-pigmenting agent for the skin, which should be protected from sunlight to reduce re-pigmentation. It is also used as an antioxidant from ether. In the United Kingdom, law to 2% limits the maximum concentration of hydroquinone in hair dyes and cosmetic products for localized skin lightening. Analysis of forty-one skin-lightening creams available over the counter in the UK revealed that 8 contained more than 2% hydroquinone (6). An analytical study of the cosmetic products used and artificial de-pigmentation practice of the skin in women of Dakar, Senegal were evaluated (7). They established that those products were essentially corticoids and hydroquinone-base products and could induce serious dermatological trouble to users and suggested emergency actions to be taken for eradication.

Soaps are the sodium and potassium salts of fatty acids or similar products formed by the saponification or neutralization of fats or oils with organic or inorganic bases. They may irritate the skin by removing natural oils and may produce redness, soreness, cracking and scaling and papular dermatitis. There may be some irritation of the eyes and mucous membranes. Ingestion of some soap may cause gastro-intestinal irritation and occasionally vomiting. Treatment is usually symptomatic. A severe allergic reaction occurred in a thirty-three year-old pregnant woman soon after being given an enema consisting of a proprietary brand of soap flakes in about 2 pints of water. She developed swelling of the mouth, numbness in the limbs, tightness in the chest, bronchospasm and generalized urticaria and subsequently collapsed and became unconscious. She soon recovered consciousness with oxygen therapy, adrenaline and chlorpheniramine and delivered a baby without any untoward effects (8).

Meningitis in 3 women who had received spinal anesthesia was also attributed to the use of detergent solution (Alconox) in the cleansing of syringes (9). Small amounts of residue were found in syringes subjected to the procedure. A soap enema prepared inaccurately and concentrated soap solution in a liter produced inflammation of the colonic mucosa, with hypertension, nausea and vomiting and fever in a woman in active labour. The baby was stillborn (10). Such enemas were hazardous and of questionable value. There is an evidence of strong association between dysuria and the use of soap. Of 22 women with dysuria, who stopped (16) or reduced (6) their use of soap on the sexual organs, dysuria disappeared completely in 17; 4 out of 6 whose use of soap was unchanged still had dysuria on follow-up (11). It must be noted that the National Agency for Food and Drugs Administration and Control (NAFDAC) – a regulatory body in Nigeria stipulates that all active ingredients used in the manufacture of drugs, soaps and cosmetics must be printed on the packaging materials.

This study therefore evaluates the presence of toxic chemicals (hydroquinone and mercuric iodide) in cosmetics and soaps used by adolescent female students from a Nigerian University and its health implications.

## **Methodology**

The method used in this survey was questionnaire-based. Well-structured, in-depth and open-ended questionnaires were given out to respondents who were adolescent female students of the University of Benin, Benin City, Nigeria.

The aim of this survey was to identify the presence of these toxic chemicals banned world wide in cosmetics and soaps (as indicated on packaging labels by manufacturers of such products), used by adolescent female students from a Nigerian university – The University of Benin, Benin City. The length of time the products have been in use as well as the contraindications on the users were the main criteria on which this study was based.

Well-structured, in-depth, open and closed-ended questionnaires were given out to respondents, who could all read and write; and included the questions in Table 1. The questionnaires were distributed amongst 300 adolescent female students of the University of Benin, Benin City, Nigeria.

The female students were selected from their halls of residence. An estimated 1000 female students live in the halls of residence at the University of Benin. Three hundred students who make up to about 30% of the female student population were randomly sampled and used for the study. The study depended on the active ingredients (especially hydroquinone and mercuric iodide) as labeled on the packaging materials. Hydroquinone and mercuric iodide have been banned worldwide in cosmetics and soaps, but these chemicals still appear on packaging materials both in the pharmaceutical products made locally as well as those imported into the country.

## Results

Of the 300 questionnaires distributed, 200 students returned them. Table 2 shows the age distribution of the 200 respondents who used cosmetics and soap containing toxic chemicals. Age was actually no barrier to the use of these pharmaceutical products because it spanned from 17 to 26 years with 40 (20%) of the respondents in the age bracket of 25 years. Eight (4%) of the respondents who were younger (17 years) also used the bleaching creams.

Tables 3 and 4 also show the duration of the use of the bleaching creams and soaps among the respondents. Some have used these cosmetics for more than five years and continued despite the side effects.

## Discussion

The packaging materials results of the labels of the products show that **hydroquinone** and **mercuric derivatives** are active ingredients used in the manufacture of cosmetics and soaps respectively imported into Nigeria.

Occasionally, hypersensitivity has occurred and some sources recommend '**skin testing**' before use. This was observed in 5 (2.5%) of the respondents in this study who claimed that they had irritation and some burning sensations during use of the creams containing hydroquinone. Hydroquinone has caused conjunctiva changes, so contact with the eyes should be avoided. In this study, 17% of the creams and 35% of the soaps contained potassium mercuric iodide respectively. This should be viewed with great concern especially when most of the users claimed that they were ignorant of the health implications involved in the use of such toxic pharmaceutical products.

Black women have been known to bleach their skin using hydroquinone-based products (3, 4, 5 and 7). Even when dermatological side effects were observed, they did not hinder the use of these agents. In the present study, about 13% (26) of the respondents claimed that they used the bleaching creams briefly (1 – 2 weeks); 7% (14) used them for

so long (2 months -2½ years); 2.5% (5) had irritation during use and another 10% (20) had their skin lightened by the bleaching agents (Table 2). This phenomenon is facilitated by easy access to skin bleaching products available in the town market places and it affects an important part of the female population of all ages (educated, illiterate, married and single).

Sodium lauryl sulphate (SLS) is an anionic emulsifying agent. It is a detergent and wetting agent used in medicated shampoos and as a skin cleanser. SLS is known to penetrate the skin and cause cutaneous irritation. Epidermal concentrations of SLS after application of 1% (34mM) aqueous SLS solution for 24 h were above the threshold levels, which are known to evoke typical skin irritation responses. Traces of SLS were observed in tissues 7 days after single 24 h application of SLS (12). Cumulative treatment of SLS significantly increased the concentration of this compound in the underlying epidermis. This has actually shown that traces of these toxic chemicals – hydroquinone and the mercuric derivatives could be detected in increased concentrations in the underlying epidermis of the skin, days or even months after they have been applied. This again calls for serious health concern on the part of the users.

### Conclusions and Recommendations

The results of this study have shown that hydroquinone and mercuric derivatives are still being used in cosmetics and soaps in the Nigerian market despite the worldwide ban of such chemicals. This is a very serious health concern, especially since most of the respondents claimed that they were ignorant of the health implications involved. Nigeria should not be a dumping ground for pharmaceutical products manufactured with such chemicals.

This study recommends that Government Regulating Agencies (Standards Organization of Nigeria – SON and NAFDAC), in control of the regulations and importation of these pharmaceutical products should ensure that such undesirable products are not registered or allowed entry into the country. Also, a follow-up action to educate young girls on the implications of using these toxic products, which could be injurious to their health, is highly recommended.

“Skin testing’ before use of these pharmaceutical products is also recommended, as hypersensitivity has been known to occur in some cases during use. The use of soaps for enema should also be discouraged. Stiff penalties/sanctions should be imposed on importers and local manufacturers who produce and import into Nigeria those cosmetics products containing toxic chemicals (*hydroquinone and mercuric derivatives*), which have been banned worldwide.

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**Table 1: Questionnaire used in the study.**

- i. Age;
- ii. sex; kind of cosmetics do you use (creams, lotion, jelly, etc.);
- iii. the active ingredients contained in the cream (please check the label on the cream, lotion, etc);
- iv. ever used a bleaching cream before and for how long;
- v. type of reaction after application of products;
- vi. whether the cosmetic in use was made locally or imported;
- vii. kind of bathing soap in use (medicated, antiseptic, mild, etc);
- viii. type of active ingredients contained in the soap (please check the accompanying package);
- ix. how long the soap has been in use;
- x. if the soap was made locally or imported;
- xi. whether a mixture of different soaps and creams have been used and
- xii. finally isthere was any advice on the use of cosmetics and soaps?

**Table 2. Age Distribution of the 200 Respondents.**

<b>Age</b>	<b>Number of Respondents</b>	<b>% Distribution</b>
17	8	4
18	22	11
19	26	13
20	28	14
21	18	9
22	22	11
23	18	9
24	10	5
25	40	20
26	8	4

**Table 3. The duration of use and effects of the bleaching creams among the respondents.**

<b>Duration of use</b>	<b>No. of respondents</b>	<b>%</b>
1 – 2 weeks	26	13
2 months – 2½ years	14	7
Had skin irritation	5	2.5
Lightened their skin	20	10
No effect on skin	135	67.5

**Table 4. The duration of use of the soap among the respondents.**

<b>Duration of use</b>	<b>No. of respondents</b>	<b>%</b>
2 – 6 months	45	22.5
1 year	35	17.5
2 years	58	27
3 years	12	6
4 years	10	5
5 years	30	15
>5 years	13	6.5

**Table 5a. Active ingredients present in the soap used by the respondents.**

<b>Active Ingredients in soap</b>	<b>No. of respondents using the type of soap</b>	<b>%</b>
Trichlorocarbanilide	70	35
Mercuric iodide	26	13
Chloroxenol	7	3.5
Irgasan	10	5
Lime	3	1.5

**Table 5b. Active ingredients present in the cosmetics used by the respondents.**

<b>Active ingredients in cosmetics</b>	<b>No. of respondents using the type of cosmetics.</b>	<b>%</b>
Olive oil	14	7
Glycerin	40	20
Hydroquinone	34	17
Aloe vera	17	8.5
Vitamin E	20	10
Phenol irgasan	5	2.5
Collagen	16	8

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