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## **COSMETICS UTILIZATION PATTERN AND RELATED ADVERSE REACTIONS AMONG FEMALE UNIVERSITY STUDENTS**

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### **ABSTRACT:**

**Background:** Cosmetics are articles applied to the human body for cleansing, beautifying, promoting attractiveness or altering appearance. In the last few years, the consumption of cosmetics has touched new heights and the curve is shooting upwards. Along with this, cosmetics are causing alarming adverse reactions to consumers and hence studying their utilization pattern and impact besides beautifying would be important.

**Objective:** To assess cosmetics utilization pattern and common cosmetics related adverse reactions among Mekelle University female students.

**Method:** A cross-sectional study was carried out on cosmetics utilization pattern and related adverse reactions, among Mekelle University female students, from April to June, 2009. The study participants were selected by stratified and then systematic sampling technique from all colleges and campuses of the university. Data were collected by using self-administered, semi-structured questionnaire through trained pharmacists. Epi info 3.5.1 and SPSS version 12 for windows program were used for the data entry and analysis, respectively.

**Result:** The study showed that 710 (97.8%) of the participants had a habit of using cosmetics. The most frequently used cosmetic products were body lotion (76.0%) followed by deodorants (74.0%) and hair cosmetics (51.3%). Cosmetics related adverse reactions were encountered by 131 (18.4%) of cosmetics users primarily on their face, hair and skin. Deodorants and lotion were the primary adverse reaction causing cosmetic products. There was a significant association between economic status of the students and cosmetics use. Occurrence of cosmetics related adverse reactions was significantly associated with the number of cosmetics used per day, source of cosmetics and sharing of cosmetics.

**Conclusion:** The study revealed that majority of the students were cosmetics users. A significant proportion the users suffered from cosmetics related adverse reactions. The students need to be awared on rational cosmetics utilization practices to help in decreasing the reported adverse reactions.

**INTRODUCTION:** Cosmetics are articles meant to be rubbed, poured, sprinkled, sprayed, introduced into or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness or altering the appearance. These include skin creams, lotions, perfumes, makeups, hair preparations, deodorants and others<sup>1, 2</sup>. Cosmetic products have become everybody's daily grooming habit, particularly the fashion following groups, young females who dwell in higher institutions<sup>3,4</sup>.

Food, drug and cosmetics regulatory authorities urge cosmetic makers to do whatever tests are needed to prove whether their cosmetics are safe. Nevertheless, cosmetics makers can sell products without the authorities' approval. In addition, a cosmetic manufacturer does not have to report injury from its product and they can add any ingredient to beautify their brand with out any approval. This set up expose consumers to suffer from adverse effects of cosmetics<sup>5</sup>. Currently, cosmetics, due to their multiple ingredients, are the top causes of toxicity exposure<sup>6,7</sup>.

To compensate this, cosmetics consumers are highly recommended to follow some safety tips. These include reading ingredients on the labels, not to share cosmetic products, utilize hygienically, to consume products with fewer ingredients, to buy from right source and others. Generally, care to get the maximum benefits from cosmetics fall on the hands of consumers<sup>8</sup>.

The problem is most of the cosmetic users are not seriously concerned about the effect of usage of products to their skin. Instead, they focus on the short-term result to their skin appearance rather than the long-term effects to the whole body. Studies indicated that quite a large number of cosmetic users were threatened with terrible result but still continued using the product in order to satisfy their egoistic needs<sup>9</sup>.

Several studies revealed the fact that cosmetics use is highly related with self-confidence<sup>10, 11, 12</sup> and providing educational programs for promotion of self-esteem can be beneficial to minimize unnecessary cosmetics use<sup>13</sup>. Adverse effects from cosmetics can happen immediately after application or on long-term usage. The multitude of adverse reactions include dermatitis, tissue damage, infection, discoloration, bleeding,

nervousness, respiratory system reactions, vomiting, diarrhea, urogenital reactions and flammability induced death. Eventhough these reactions are seen in every consumer, at least once, they are more pronounced in those who do not follow the safety tips. Moreover, females are the most affected, most likely because they tend to use more cosmetic products than do men<sup>14</sup>.

To come up with this problem FDA has established a network system for the sake of gathering consumers' complaints. Likewise, European countries have designed a project intended to collect information on cosmetics utilization pattern, so that they can use the information as an input for hazard assessment<sup>15</sup>. Similarly, Cosmetics, Toiletry and Fragrance Association have donated different institutions to conduct risk assessment studies. Through this technique, more than nine cosmetic ingredients were reviewed to be unsafe, though their usage is not ceased<sup>16</sup>.

Generally, the goal of all the above measures were urging manufacturers to turn to safer products and update consumers' knowledge on safe utilization of cosmetics. Hence, preliminary data could help a lot in supplementing any adverse reaction (risk assessment) test on cosmetics and as well it will serve as baseline data for health education in creating public awareness; the reason that initiated the commencement of this study.

## METHODS AND MATERIALS

**Study Setting and Design:** The study was conducted in Mekelle University, which is found in Mekelle town located 783 Km from Addis Ababa to the North of Ethiopia. Mekelle University is one of the largest universities in Ethiopia, which had around 20,000 students, during the study period. The university has three campuses namely: *Arid*, *Adihaki* and *Ayder* campus, which are further, classified in to eight colleges. Of the total number of students in the university, 4484 were females.

A cross-sectional study design was used to assess cosmetics utilization pattern and related adverse reactions among female students of the university, April to June, 2009. Data were collected from 726 students by using self-administered questionnaire through trained data collectors.

**Population and Sampling:** All Mekelle University female students were the source population while all female students who were captured by the sampling technique and gave their informed consent constituted the study population. The sample size was determined by single population proportion formula<sup>17</sup>, taking the proportion of students experiencing adverse effects from cosmetics as 50%; standard normal deviation of 1.96 (at 95% confidence interval), 5% degree of freedom and a design effect of 2. The final sample size was adjusted to 780 by using the sample size reduction formula, since the target population is less than 10000, and adding 10% for non-respondents. The source population was first stratified by the colleges and samples were taken from each college proportional to the total number of female students in each college. Systematic sampling technique was employed to select the predetermined number of students from each college employing independent sampling intervals.

**Data Collection and Analysis:** Pre-tested, semi-structured questionnaire adapted from previous studies<sup>3, 18</sup> was used for the data collection. The questionnaire included both open-ended and closed-ended types of questions. It had three main parts. Part 1 was on general information of the study population. Part two addressed cosmetics utilization pattern of the study population. The last part had questions that address the issue of cosmetics related adverse effects in the study population. The questionnaires were coded before allocation to the data collectors. All the data obtained from the study participants were recorded and documented. The filled questionnaires were checked for completeness and accuracy by the principal investigator (PI) before the data entry. The collected data was entered to Epi info 3.5.1 and analyzed by SPSS version 12 for windows program. Logistic regression model was used to assess the determinants of cosmetic utilization pattern and occurrence cosmetics related adverse reactions among the respondents.

**Ethics and Data Quality Assurance:** The proposal of the study has been reviewed and obtained ethical approval from College of Health Science, Mekelle University Human Research Ethics Review Committee. Before respondents were requested for consent, they were informed well about the purpose and potential

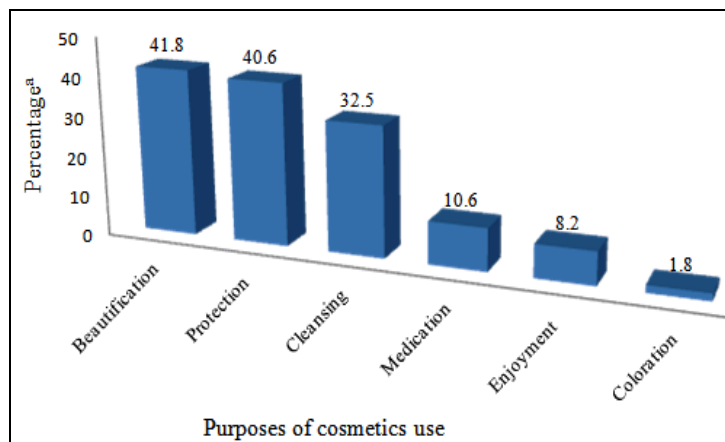
benefits of the study; the confidentiality of the information collected from them and their full right not to give response to specific questions, or not to participate at all. The confidentiality of individuals' data collected was strictly maintained and any information that can potentially expose recognition of a particular study participant was excluded from the data collection tools. The data collectors were four pharmacists who are fluent in Amharic (Ethiopian language) and English and given two-days training by the PI. In the training sessions, the questionnaire as well as the data collection procedure were exhaustively discussed so as to enable the data collectors acquire the knowledge and skills of data collection. Pretest was done on 5% of the final sample size on a population that is similar to but not included in the study population. Data collection tools and procedures were modified as found necessary in the pretest. Appropriate supervision of the data collection process was made by the PI. Data entry was performed by the PI and fulfillment of assumptions of the models used was checked before data analysis and interpretation.

**RESULTS:** Among 780 questionnaires distributed to the study participants, 742 were collected back, of which 16 were discarded due to incompleteness, resulting in a response rate of 93.1%.

**Sociodemographic Results:** The age of the study participants ranged from 19 to 24 years with a mean of 21.4 years. Many of them (207[29.1%]) were second year students; followed by fourth years 204 (28.1%). Their ethnicity profile showed that 235 (33.1%) were Tigre, 203 (28.6%) were Oromo, 141(19.9%) were Amhara and 131 (18.4%) were other different ethnic groups. Three hundred forty six (47.7%) respondents were Orthodox Christians; while 235 (32.4%) and 135 (18.6%) respondents were Protestants and Muslims, respectively. The income profile of the students showed 278 (50.3%) of them receive 500 birr and above per month while the rest were earning less than 500 birr.

**Cosmetics Utilization Pattern:** Of the total study participants, 710 (97.8%) had a habit of using one or more cosmetics. As detailed in **figure 1**, the students' response on their purpose of cosmetics use showed that 297 (41.8%) of the users employ cosmetics for beautification; 288 (40.6%) for protection; 75 (10.6%)

for medication, 58 (8.2%) for enjoyment and 13 (1.8%) for coloration.



**FIGURE 1: PURPOSE OF COSMETICS UTILIZATION AS CLAIMED BY THE RESPONDENTS.** The percentage was taken against the total number of responses and thus cant add upto 100

Assessment of the commonly utilized cosmetic products showed that lotions, deodorants and hair cosmetics were used by most of the users: 540 (76%), 525 (74%) and 364 (51.3%), respectively (**table 1**). Main sources of cosmetics were various among the students and included supermarkets 239 (33.7%), drug retail outlets 157 (22.1%), groceries 143 (20.1%) and local shops 171 (24.1%).

**TABLE 1: TOP FIVE COSMETICS ON USE AMONG THE RESPONDENTS**

| Cosmetics  | Lotions | Deodorants | Hair cosmetics | Body cream | Eye make ups |
|------------|---------|------------|----------------|------------|--------------|
| Frequency  | 540     | 525        | 364            | 156        | 112          |
| Percentage | 76.0    | 74.0       | 51.3           | 22.0       | 15.8         |

**TABLE 2: NUMBER OF COSMETICS USED PER DAY BY THE RESPONDENTS**

| Number of cosmetics used per day | Frequency | percent | Cumulative percent |
|----------------------------------|-----------|---------|--------------------|
| 1                                | 140       | 19.7    | 19.7               |
| 2                                | 201       | 28.3    | 48.0               |
| 3                                | 154       | 21.7    | 69.7               |
| 4                                | 124       | 17.5    | 87.2               |
| 5                                | 57        | 8.0     | 95.2               |
| >5                               | 34        | 4.8     | 100                |
| Total                            | 710       | 100     |                    |

**TABLE 3: COSMETICS USE RELATED PRACTICES AMONG THE RESPONDENTS**

| Cosmetics use related practices | Frequency of responses |            |       |
|---------------------------------|------------------------|------------|-------|
|                                 | Yes                    | No         | Total |
| Label reading                   | 467 (65.8)             | 243 (34.2) | 710   |
| Testing for allergy             | 176 (24.8)             | 534 (75.2) | 710   |
| Sharing                         | 345 (48.6)             | 365 (51.4) | 710   |
| Using traditional cosmetics     | 185 (26.1)             | 525 (73.9) | 710   |
| Sun screen use                  | 58 (8.2)               | 652 (91.8) | 710   |
| Adding water to cosmetics       | 125 (17.6)             | 585 (82.4) | 710   |
| Mascara use                     | 112 (15.8)             | 598 (84.2) | 710   |
| Hair dye use                    | 236 (33.2)             | 474 (66.8) | 710   |

As detailed in **table 2**, the number of users who responded to use more than five cosmetic products per day accounted for about 4.8%. The mean and median of cosmetic products used per day were found to be 2.78 and 2 respectively; lotion and deodorants being the top to be utilized on daily basis.

**Cosmetics use Habit:** Some cosmetics utilization related practices were also assessed and the result is summarized in **table 3**. Results on label reading habit showed that 467 (65.8%) of the respondents responded to read information on cosmetics containers. Of these, 98.3% usually try to read use instruction; 49.3% contents; 31.5% brand names; 3.5% read special remarks such as safety and storage. Expiry date was reported to be looked for by less than one percent of the students. Only 176 (24.8%) of the users reported to test their cosmetic products prior to use. Of the mascara users, only 5.7% apply it during night and cleanse it before bed; and 51.7% store mascara more than three month. Sun screens were shown to be used with face powders or alone. Of the hair dye users, 33.3% used permanent hair dyes. In addition, 18% of cosmetics utilizers added water /saliva to their cosmetics.

**Adverse effect Assessment:** It was found that 131 (18.4%) of the users complained different forms of adverse effects from cosmetics. The most complained cosmetics were deodorants (57.2%), lotions (37.1%) and hair cosmetics (11.4%). The adverse effects include allergic reactions, inflammation, loss, discoloration, brittleness and breakage of hair, sore on skin and face, bleeding on scalp, stinging, darkening of armpits and others. Highly affected body parts include face and hair (in 42.9% of the respondents, each).

The assessment on the way students solved the adverse effects revealed that only 11.1% of the affected individuals consult health professionals. Other responses from the students included: completely avoiding the suspected cosmetic or similar products and quitting the products until the symptoms of the injuries get disappeared.

**Determinants of Cosmetics Utilization and Adverse Reaction Occurrence:** Effort was made to investigate factors that could affect cosmetics utilization and occurrence of cosmetics related adverse reactions among the respondents and the result is summarized in table 4. Accordingly, the proportion of students using cosmetics increased with their study year, but the relationship didn't show statistically significant association. Cosmetics utilization increased about three times among students having monthly income of

500 birr and above as compared to those getting less than 500 birr per month. Monthly income had a statistically significant association with cosmetics utilization (OR=2.764, 95% CI=1.004–19.738).

The occurrence of cosmetics related adverse reactions was observed to increase by a factor of greater than five for students who were using more than five cosmetics per day as compared to those who were using one or two cosmetics only; and the difference was significant (OR=5.814, 95% CI=2.798–12.082). The sources of cosmetics showed a significant association with the occurrence of adverse reactions. The proportion of students suffering from adverse reactions decreased by a factor of three for students buying their cosmetics from drug retail outlets relative to those who were getting from other sources (OR=2.979, 95% CI=1.688–5.255). Chances of getting adverse reaction had a significant association with sharing of cosmetics as well.

The proportion of respondents complaining of adverse reactions doubled among students who were sharing cosmetics as compared those that were not sharing (OR=1.859, 95% CI=1.262–2.738). Eventhough there was increased prevalence of adverse reactions among traditional cosmetics users relative to non-users, no statistically significant difference was observed.

Table 4: Determinants of cosmetics utilization and adverse reaction occurrence

| Variables                          | Cosmetics utilization     |            | OR         | 95% CI for OR |                               |
|------------------------------------|---------------------------|------------|------------|---------------|-------------------------------|
|                                    | Yes (%)                   | No (%)     |            |               |                               |
| Year of study                      | First year                | 121 (96.0) | 5 (4.0)    | 1.000         |                               |
|                                    | Second year               | 202 (97.6) | 5 (2.4)    | 1.661         | 0.471 – 5.856                 |
|                                    | Third year                | 186 (98.4) | 3 (1.6)    | 2.562         | 0.601 – 10.917                |
|                                    | 4 <sup>th</sup> and above | 201 (98.5) | 3 (1.5)    | 2.769         | 0.650 – 11.791                |
| Monthly income (Birr)              | < 500                     | 434 (96.9) | 14 (3.1)   | 1.000         |                               |
|                                    | ≥500                      | 276 (99.3) | 2 (0.7)    | 2.764         | (1.004 – 19.738) <sup>a</sup> |
| <b>Adverse reaction experience</b> |                           |            |            |               |                               |
|                                    |                           | Yes (%)    | No (%)     |               |                               |
| No. cosmetics used/ day            | one or two                | 61(17.9)   | 280 (82.1) | 1.000         |                               |
|                                    | three to five             | 51 (15.2)  | 284(84.8)  | 1.213         | 0.808 – 1.822                 |
|                                    | > five                    | 19 (55.9)  | 15 (44.1)  | 5.814         | (2.798 – 12.082) <sup>a</sup> |
| Sources of cosmetics               | DRO <sup>b</sup>          | 16 (10.2)  | 141(89.8)  | 1.000         |                               |
|                                    | Others                    | 115 (20.8) | 438 (79.2) | 2.979         | (1.688 – 5.255) <sup>a</sup>  |
| Traditional cosmetics use          | No                        | 88 (18.8)  | 381 (81.2) | 1.000         |                               |
|                                    | Yes                       | 45 (25.7)  | 130 (74.3) | 1.450         | 0.9939 to 2.259               |
| Sharing cosmetics                  | No                        | 51(14)     | 314(86)    | 1.000         |                               |
|                                    | Yes                       | 80 (23.2)  | 265 (76.8) | 1.859         | (1.262 – 2.738) <sup>a</sup>  |

<sup>a</sup>significant association; <sup>b</sup>Drug retail outlets: pharmacy, drug shop and rural drug vendor; Reference categories are indicated by value of 1.000; OR=Odds Ratio, CI=Confidence Interval; CAR=cosmetics adverse reaction

**DISCUSSION:** The magnitude of cosmetics use among the students (97.8%) was higher than previous reports from other parts of the country<sup>3, 18</sup>. This might be because the students were forced to use more cosmetic products because of the hardness of the water and windy and dusty condition existing in Mekelle town.

Eventhough there were no statistically significant differences, cosmetics utilization showed a progressive increment with seniority. This might be due to the fact that adaptation to the university environment would increase with seniority and the seniors might have lesser educational tension so that they might be more concerned about their appearance and beauty. Cosmetics utilization showed a significant association with monthly income; increasing about three times among students having a monthly income of 500 birr and above as compared to those getting less than 500 per month (OR=2.764, 95% CI=1.004 – 19.738). This is in consonance with a recent study among Isfahan University female students<sup>19</sup>.

In the modern era cosmetics exert a four fold action: decorative, psychological, social and clinical<sup>20, 21, 22</sup>. These purposes were seen in the majority of students' responses. However, some of the students didn't know why they are using the preparations. In some others, the cosmetics they were using and the purposes they claimed to benefit were not in conformity.

Complaints against the claimed adverse effect causing products were in concurrence with other studies<sup>3, 18, 23</sup>. Lotions were the top to be used and the second complained cosmetics, following deodorants. Similarly, many population-based studies reported high prevalence of adverse reactions from deodorants<sup>24, 25</sup>.

Lotions and deodorants are highly enriched with alpha and beta hydroxy acids, claimed to minimize skin wrinkles. These acids are known to make human skin susceptible to UV-radiation, thereby facilitating sun burn, cancer and other undesirable effects<sup>26</sup>. In the present study, face and hair were the most affected body parts by cosmetics adverse reactions and this agrees with previous studies<sup>27, 28, 29</sup>.

The percentage of students who obtained their cosmetics from sources other than drug retail outlets was very high. The sources of cosmetics had a

significant association with the occurrence of adverse reactions. The proportion of students suffering from adverse reactions was observed to decrease by a factor of three for students buying their cosmetics from drug retail outlets, such as pharmacy, drug shop and rural drug vendor, relative to those who were getting from other sources such as supermarkets, groceries and ordinary shops (OR=2.979, 95% CI=1.688–5.255). Cosmetics in shops are likely to be depreciated and depreserved from storage inconveniences. Hence, they are liable to microbial growth and cause successive infections as compared to that of cosmetics from drug retail outlets.

Testing cosmetics prior to use for adverse effects (allergy) is recommended behavior for all cosmetic consumers. This behavior was reported to be practiced only by 24.8% of the students. Eventhough some of the testing methods mentioned seem to comply with standard patch test, some others were not recognizable to any standards. These include using products with a label of 'natural cosmetics' but these products are not proven to be free from allergic reactions<sup>5</sup>. Since testing cosmetics helps users to identify uncomfortable products, sensitization need to be conducted among the students.

Nearly half (48.6%) of the respondents shared cosmetics with their friends. Sharing had a statistically significant association with the occurrence of adverse reactions. (OR=1.859, 95% CI=1.262–2.738). Sharing is known to make cosmetic products prone to microbial contamination, which in turn causes acne and other infections<sup>30, 31</sup>.

A significant proportion of the students used traditional cosmetics like honey and *kesil* for application on their face; and egg and avocado fruit and butter for their hair. Eventhough this practice had no significant association with the occurrence of adverse reactions, the proportion of students complaining of adverse reactions was higher among traditional cosmetics users relative to non-users. The use of traditional cosmetics, the safety of which is least known, might impose reactions, by increasing cosmetics burden, and interacting with the industrially fabricated cosmetics. Otherwise, specific interaction of the mentioned home preparations requires further risk assessment studies.

Students in this study had unacceptable habits concerning the safety tips they should follow during usage of cosmetics. Not cleansing body parts with cosmetics might increase cosmetics-skin contact time and so does adverse effects. Long-term sun exposure of the body with cosmetics is a potential cause of facial as well as skin damage<sup>5,32</sup>. The other undesirable habit observed was addition of water/ saliva to some of their cosmetics. Water and saliva are suitable media for bacterial growth; by virtue of decreasing the concentrations of the preservatives in one way or another<sup>5</sup>. This might be one of the possible reasons for the unpleasant injuries reported by the students.

The occurrence of cosmetics related adverse reactions increased by a factor of greater than five for students who were using more than five cosmetics per day as compared to those who were using only one or two cosmetics. This relationship was statistically significant (OR=5.814, 95% CI=2.798–12.082). This might be due to the increased cosmetics burden and possible interaction among the multiple cosmetics ingredients.

**CONCLUSION:** The study showed that cosmetics burden among the students was less as compared to other countries' reports. However, awful practices on label reading, testing cosmetics, sharing and poor safety during cosmetics application, traditional cosmetics use and addition of water/saliva to cosmetics were observed. The frequently complained undesirable effects were discoloration, loss and breakage of hair, facial and skin discoloration and acne. Face and hair were the peak to be affected. The top complained cosmetics were deodorants and lotions. Statistically significant association was observed between the injuries complained and irrational practices related to cosmetics use.

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