

# General Public knowledge, Attitudes, and Practice towards Hair Dye Usage and its Adverse Effects in the Northern Emirates of the United Arab Emirates

Shareef et al. KAP related to Hair dye

Javedh Shareef, Sathvik B. Sridhar, Safeera Sherin, Sumanjebin Abdunazar

Department of Clinical Pharmacy and Pharmacology, RAK College of Pharmacy, Ras Al Khaimah Medical and Health Sciences University, Ras Al Khaimah - United Arab Emirates

## Corresponding Author Information

Javedh Shareef

javedh@rakmhsu.ac.ae

<https://orcid.org/0000-0002-5892-5909>

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## ABSTRACT

**Introduction:** Hair dye (HD) use is extremely prevalent in today's modern world. However, frequent use of HD has raised concerns about its safety, causing detrimental effects on health.

**Aims:** The study aimed to assess the general population's knowledge, attitude, and practice towards HD usage and its adverse effects in the northern emirate of the United Arab Emirates.

**Methods:** A cross-sectional study was conducted for three months in the general population of Ras Al Khaimah. Information was collected by providing a pre-validated self-administered questionnaire related to hair dyes. Data collected were analyzed using descriptive statistics and binary logistic regression to correlate HD use to various sociodemographic variables. Results with a p-value less than 0.05 were considered statistically significant.

**Results:** In total, 333 of the 405 distributed questionnaires completed the study with a response rate of 82.20%. The majority (52.85%) of the participants were using natural hair dyes, and most (30.59%) admitted that the motivation to use the HD was to get rid of grey hair. Of the total, nearly 75% of the study sample agreed that they had never performed an allergic test before using the HD, and almost 70% believed that providing advice regarding the HD would be beneficial. Genders ( $P < 0.0001$ ), age (in years) ( $p = 0.032$ ), and occupation ( $p = 0.042$ ) were associated with the frequency of HD use, which is statistically significant.

**Conclusion:** In the present study, HD is common among students, employees and in middle-aged groups.

Approaches such as educational awareness programs with special attention on the safe and effective use of HDs may help to select appropriate HDs and avoid preventable adverse effects.

**Keywords:** Hair dye, Health knowledge, adverse effects, Surveys and questionnaires

## Introduction

Healthy and beautiful hair enhances personality, physical appearance, and beauty. Maintaining good, healthy, and stylish hair has gained much importance presently and significantly among adolescents, possessing a profound effect on his/her outlook.<sup>1</sup> In today's modern world, using hair dye (HD) products is widely accepted irrespective of gender, age, educational or social status to conceal grey hairs or just for changing fashion trends.<sup>2</sup>

Temporary, semi-permanent, and permanent are the different types of hair dyes used to modify hair color for a beautiful and younger look. Hair dyes consisting of natural and synthetic agents provide the hair with good shape, an attractive and elegant appearance, and long-lasting color. The periodic use of hair dyes or coloring products has become routine for many individuals, devoting considerable time and financial expenditure to having soft, silky, and shiny hair.<sup>1,3</sup>

The assumption that hair dyes are safe and will not cause damage to human health, the increase in hair coloring trend has raised concerns about its safety as some synthetic agents contain toxic substances known to be detrimental to their well-being.<sup>4</sup> Studies have reported that cosmetics, including hair products, are associated with various known and unknown adverse reactions ranging from mild local reactions to more severe systemic life-threatening reactions jeopardizing a person's life in danger.<sup>3,5,6</sup> Keeping in view the numerous health hazards associated with using HD, adequate knowledge and accurate information about the hair dye composition, its use, and adverse effects are important in reducing the prevalence of hair dye-associated complications among users. It has been reported that the use of para-phenylenediamine, a synthetic aromatic amine is the leading cause of contact dermatitis among hair dye users. In addition, hyperpigmentation, leukoderma, hair loss, chemical burns, skin malignancy and systemic diseases are some of the adverse effects reported with the use of hair dye preparations.<sup>2,4</sup>

However, there is a paucity of literature describing the adverse effects of hair dyes among HD users. To the best of our knowledge, no previous study has attempted to assess the level of knowledge, attitude, and practices of hair dyes among the users in the Northern emirates of United Arab Emirates region. Considering this, the present study aimed to assess the knowledge, attitude, and practice regarding hair dye and its adverse effects among HD users.

## **Methods**

### **Study design and settings**

It was a cross-sectional, pre-validated, self-administered questionnaire-based study conducted in the emirate of Ras Al Khaimah region from February 2022 - July 2022. Ethical approval was obtained from the institutional research ethics committee and from the Ministry of Health and Prevention - Ras Al Khaimah Research ethics committee before the initiation of the study (MOHAP/REC/2022/7-2022-UG-P). Subjects from either gender aged 18 years and above who had used hair dye (natural/synthetic) at least once in their lifetime were included after getting their informed consent.

### **Study procedure**

The sample size was calculated using the Rao soft calculator.<sup>7</sup> Assuming that the estimated urban population of Ras al Khaimah is nearly one lakh and the prevalence rate of hair dyes used in the Gulf Cooperation Council (GCC) based on earlier studies is 30%. The minimum sample size would be 330 respondents with a 5% margin of error, 95% confidence interval, and 50% response distribution. A convenient sampling technique was used to enroll the participants in the study. Information was collected from the general population and employees of our university through a pre-validated questionnaire developed by the researcher via Google Forms provided through emails. In addition, subjects visiting the hair and beauty salons were contacted, and information was collected by providing a hard copy of the questionnaire. For the questions sent through the Google survey form, the informed consent form page will be opened, and only after consenting to answer the questions by marking a check box voluntarily were the respondents directed to the main survey instrument.

Participants were informed that the study was voluntary, and we assured them of the anonymity and confidentiality of the responses. Sufficient time (approximately one week) and email reminder was provided to each participant to complete and submit the questionnaire. The investigator re-checked every submitted response to ensure the collected data's quality and to avoid any incomplete information in the questionnaire. Questions that might reveal the personal identity of the study subject were not included in the tool.

### **Questionnaire development and scoring system**

A self-administered or interviewer-assisted survey knowledge, attitude, and practice questionnaire related to hair dye use was prepared by referring to previous literature and similar studies and modified as per study requirements.<sup>5,6,8,9</sup>

Three content experts reviewed the initial drafted question to examine the content validity. The questionnaire was pilot-tested by using a convenient sample on ten randomly selected representative samples of the general population to assess the internal consistency and reliability, and no further modifications were carried out in the questionnaire.

The survey instrument consists of 16 questions divided into two sections. The first section includes the respondents' demographic information, including age, gender, nationality, marital status, and employment. The second section consists of questions (items 1 to 16) related to the type of hair dyes, frequency of use, experiencing adverse reactions/side effects, and reason for using hair dyes. The response for the section mentioned above of the questionnaire was provided as 'yes,' 'no,' and 'I do not know.' Every correct answer and positive response were given a score of '1', and the negative response and incorrect answer were given a score of '0'. Few questions were designed to select more than one option so that subjects could select multiple choices.

### **Data Analysis**

Participants' responses to the questions were coded, entered into the Excel spreadsheet, and analyzed using the SPSS version 27 (IBM Corp., Armonk, N.Y, USA). Descriptive statistics were employed to assess the mean and standard

deviation for continuous variables and the percentages and frequencies for categorical variables to narrate the demographic factors. The chi-square test was used to test the association between the frequency of HD use and demographic variables. Binary logistic regression was used to relate HD use to various sociodemographic variables. A value of  $P < .05$  was considered statistically significant.

## Results

The questionnaire was distributed among 405 participants. In total, 333 subjects (82.20%) fully completed and returned the study questionnaire. Among the remaining 72 participants, 57 did not respond to the emails, and 15 responses were partially completed and not considered for the analysis. Among the 333 participants who have completed the study, 99 responses were received via Google Forms and the remaining 234 responses were collected through face-to-face interviews.

### Socio-demographic details of the study participants

Of the total study participants, female (68.5%) predominance was noted over males, and the study population's median age was 30.0 (in years). Most of the study participants were in the age group 21-40 years. Majority of the study participants were non-Arabs (74.2%), and nearly half of study subjects were unmarried (48.9%). More than one-third of the participants were working employees (39.9%), and almost half of the participants were students (47.4%) (Table 1). Analyzing the responses to the questions related to knowledge, attitude, and practice among the HD users, only 8.4% responded that they had experienced allergic reactions related to HD preparations. When asked about performing an allergic test before using hair dye, 72.97% answered that they had never performed an allergic test before using HD.

Regarding the ingredients in the HD, only one-third (34.53%) of study participants read the list. Among the total participants, only 45.64% agreed that they seek advice or suggestions before buying HD. Almost 70% indicated that providing educational advice regarding HD would benefit the users. Less than 10% of the study participants stated that available HD preparations in the market are safe and can be used in all age groups. Most of the study participants acknowledged that they were unaware of the hair dye's hazardous chemicals/toxic ingredients, did not get enough information when buying HD products, and neither consulted nor received pharmacist advice (Table 2). Concerning the types of HD preferred by the study participants, more than half (52.85%) favored the use of natural dye, while 42.93 would opt for synthetic dyes of different types, and the remaining 4.20% answered for others consisting of egg, hibiscus and other natural substances. (Figure 1).

### Adverse effects related to HDs

Fewer adverse effects such as fizzy hair 6(11.53%), rashes over the face and forehead 14( 26.92%), headache 10 (19.23%), hair fall 6(11.53%), and itching 16 (32%) associated with HDs use were reported among the study participants (Figure 2).

The response for the motivation for hair dye use varied considerably among the study participants. Most of them reported (30.59%) that using HD helps them get rid of grey hair, while 18.76% believe it makes them look more beautiful (Figure 3).

Regarding the source of information about hair dyes, most (30%) of study subjects reported 'the internet' while 26.19% choose 'advertisement' as the major source of information related to HD (Figure 4).

### Associations between socio-demographic variables and hair dyeing practices

Participants with female gender ( $p < 0.0001$ ), aged between 21 and 40 years ( $p = 0.032$ ) and employees ( $p = 0.042$ ) are inclined to use HD more frequently compared to other age groups, which was found to be statistically significant. (Table 3). Despite the fact that the frequency of HD use was greater among highly educated participants, this difference was not statistically significant ( $P = 0.052$ ).

Correlation between sociodemographic characteristics with the frequency of hair dye use using binary logistic regression analysis after adjusting for all the other variables has shown that gender, marital status and employment were significantly associated with HD use (Table 4). In the adjusted model, age (in years), nationality and education were not significantly associated with the frequency of HD use.

## Discussion

Hair care has gained considerable importance, and hair dye use has increased globally to enhance youth and beauty. Additionally, significant growth and rapid development in the cosmetic industry and the limited evidence on safety profiles related to hair dyes influence guidance on the safe and effective use of hair dye preparations.<sup>5,6</sup> The present study assesses the knowledge, attitude, and practice regarding hair dye and its adverse effects among HD users.

The study's results point out that more than half of the study participants were females, indicating their predominance in using HDs at least once to have a smart and young look in the work field. The increased percentage is insignificant as the prevalence of HD use among females in earlier studies ranged from 60 - 90%.<sup>10-12</sup> A previous study conducted in Riyadh, Saudi Arabia reported that 82.6% of their female participants had used HD at some point.<sup>13</sup> In the present study, the median age at first using HD was 29.5 years, expressing HD is high among

teenagers and young adults, echoing the previous studies, which have reported that the median age started hair dyeing ranged between 22 - 36 years, respectively.<sup>12-14</sup>

Concerning the different types of HDs used by the study participants, more than 50% preferred natural (henna) dye, indicating its popularity in the community. It must be noted that henna dye is traditional in Islamic countries and has religious and social significance. The growing popularity that natural dye provides the best normal results without any chemical ingredients and the increased concern that synthetic dyes are likely to cause mild - serious adverse effects could also be why we prefer natural dyes. Regarding safety, fewer adverse effects related to HDs were reported, shadowing the previous study results.<sup>12,15</sup> This emphasizes the need for performing an allergy test before using any HD products to improve safety and for the secondary prevention of avoidable side effects in the future. The most common motive for using the HDs was to cover the grey hair, making them more self-confident. In the modern world, the desire to be youthful is most common, and people prefer to conceal their grey hair at an early age, which is supported by the study responses and would like to be more beautiful, fashionable, and stand out young look. The above findings correlate with earlier studies, which reported that HD's principal purpose was to cover the grey hair and have a youthful appearance.<sup>9,13,14</sup>

Regarding the source of information about HDs, most of the study participants expressed that the internet, social media, and newspaper advertisements are the primary sources of information to understand HD preparations. This talks about the fast-growing online information technology, including the internet and media, which has opened the way to reach out quickly and can be an effective platform for consumers to know more about hair dye products. However, sometimes, making sense of overwhelming information from the online platform becomes difficult, which can be untrue or misleading to negative health outcomes.

Nearly two-thirds of the study sample reported that they never experienced any adverse effects associated with using HDs, and almost the same revealed that they never carried out allergy tests before using HD. Appropriate advice must be reinforced in HD users as sometimes mild-moderate adverse effects are underreported because of self-diagnosis and self-medication, which are more common in cosmetics products.<sup>6,16</sup> It is important to highlight that severe reactions can sometimes cause permanent disability or life-threatening. Only less than half of the study sample declared that they usually read or check the ingredients before using HD or seek advice while buying the HDs. A study in Saudi Arabia reported that more than half of the women who developed adverse effects from cosmetics did not seek medical advice nor consulted a pharmacist.<sup>5</sup>

More than 60% of the study sample reports that they are unaware of the hazardous chemicals/ toxic ingredients present in the hair dye. Understanding the ingredients in HDs, adhering to the instructions for proper use, and looking for medical advice from healthcare professionals will benefit in ensuring the safe and effective use of HDs. Misuse or overuse of HDs is likely to damage the hair. Furthermore, few published literature have documented conflicting findings that some compositions in permanent HDs are linked with the development of certain malignancies, but the evidence was weak and could not prove causality.<sup>10,17,18</sup>

Additional studies about the carcinogenic potential of hair dyes should resolve public concerns. Many study participants expressed their view that HDs available in the market are unsafe and not recommended for use in all age groups. This is more important, especially in pregnancy and in young children. Concerns about its safety during pregnancy have been raised, a matter of active debate. Studies evaluating the association of HD use with pregnancy and neonatal outcomes have concluded that the strength of evidence is limited to moving the needle on recommendations for the safety of HDs during pregnancy and might cause neonatal health problems.<sup>19,20</sup>

The presence of toxic ingredients such as Para-phenylenediamine (PPD), the most potent and key ingredient in HD formulations, raises an important public health concern. Exposure to these product can induce local as well as systemic toxic effects when applied topically and/or ingested orally and the outcome depends mainly on the dose taken. Acute (short-term) exposure to high levels of p-phenylenediamine may cause angioedema leading to dysphasia and respiratory distress, rhabdomyolysis, intravascular hemolysis, acute renal failure and hepatic necrosis whereas chronic (long-term) exposure in humans results in Eczematous contact dermatitis. Studies have demonstrated that children are susceptible to PPD allergy, and their use might increase the risk of carcinoma and infertility problems in the future.<sup>21-23</sup>

The different types of HD usage and the motivation justify the increased frequency of HD use observed in the present study. Participants aged between 21-40 years and employed individuals tend to use HDs more frequently, which was statistically significant. This observation highlights that individuals aged between 21 and 40 years will be either job seekers or employees who would like to continue to maintain a fresh look, believe that it will add shine and dimension to hair, make it more beautiful in appearance and perception that it is an integral part of self-expression and fashionable.

## **Limitations**

Firstly, the study relied on self-reporting information provided by the HD users through survey questionnaires in which the data obtained reflected the respondents' personal opinions. However, self-reporting is a common and practical way of collecting data. The information provided may not mirror real-life practice, as some respondents may be unwilling to reveal practice deficiencies, while the possibility of recall bias cannot be excluded entirely. Secondly, the study sample represents the participants from the northern emirate of the United Arab Emirates, where the result may not be indicative of the entire emirate of UAE. Third, providing the online questionnaire through Google Forms to the participants rather than face-to-face meeting recalls for the possibility of sharing or discussing the questionnaire with their friends or relatives, puts the study data's trustworthiness and authenticity in danger.

### Conclusions

The present highlights the extensive use of hair dyes by individuals aged between 21 and 40, emphasizing the importance given to their aesthetic value. The focus should be on providing appropriate information to HD users concerning safe use and the chemical ingredients of HD products. Performing a patch test before HD use and adhering to usage instructions may help choose safer HD products and avoid possible adverse reactions. Conflicting results regarding the safe use of HDs in pregnancy warrant further investigation with more accurate data on neonatal health issues in the future.

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**Table 1. Socio-demographic characteristics of the study populations (n=333)**

Variables	Frequency	Percentage
<b>Gender</b>		
Female	228	68.5
Male	105	31.5
Median Age	30.0 (range: 17 -76) (in years)	
<b>Age group (in years)</b>		
< 20	26	7.8
21 – 40	179	53.8
41 – 60	84	25.2
>61	44	13.2
<b>Nationality</b>		
Arabs	86	25.8
Non-Arabs	247	74.2
<b>Marital status</b>		
Married	146	43.8
Unmarried	163	48.9
Divorced	24	7.2
<b>Education</b>		
School level	37	11.1
Graduate level	136	40.8
Postgraduate and above	160	48.0
<b>Occupation</b>		
Working	133	39.9
Not working	28	8.4
Student	158	47.4
Home maker	14	4.2

**Table 2. Results of questionnaire on hair dye related knowledge, attitude and practice**

Sl no	Questions	n=333 (%)		
		Yes (%)	No (%)	I don't know (%)
1	Have you ever experienced any allergic reaction with the use of any hair dye	28 (8.40)	237 (71.17)	68 (20.42)
2	Have you ever performed an allergy test before using a hair dye	51 (15.31)	243 (72.97)	39 (11.71)
3	Do you usually read / check the list of ingredients present in the hair dye	115 (34.53)	124 (37.23)	94 (28.22)
4	Do you seek any advice or suggestion before you buy your hair dye	152 (45.64)	43 (12.91)	138 (41.44)
5	Do you think educational advice regarding your hair dye would be beneficial for you	233 (69.96)	30 (9.0)	70 (21.02)
6	Do you think that all the available hair dye in the market are safe	29 (8.70)	139 (41.74)	165 (49.54)
7	Is it safe to use all available hair dye in all the age groups	20 (6.0)	240 (72.07)	73 (21.92)
8	Are you aware of any hazardous chemicals/toxic ingredients present in the hair dye	99 (29.72)	207 (62.16)	27 (8.10)
9	Did you ever consult or received pharmacist advice while buying your hair dye	91 (27.32)	148 (44.44)	94 (28.22)
10	Do you think you get enough information when you are buying your product	71 (21.32)	145 (43.54)	117 (35.13)

**Table 3. Association between frequency of hair dye use and socio-demographic characteristics**

Characteristics	Frequency of hair dye use ( per year)			P value
	Once	2 – 5 times	>5 times	
<b>Gender</b>				
Female	142	68	18	<b>0.0001*</b>
Male	55	19	31	
<b>Age group (in years)</b>				
< 20	12	6	8	<b>0.032*</b>
21 – 40	108	51	20	
41 – 60	55	14	15	
>61	22	16	6	
<b>Nationality</b>				
Non - Arabs	142	66	39	0.526
Arabs	55	21	10	
<b>Marital status</b>				
Married	76	40	30	0.075
Unmarried	105	41	17	
Divorced	16	6	2	
<b>Education</b>				
School level	19	11	01	0.052
Graduate	76	32	28	
Post graduate and above	102	44	14	
<b>Occupation</b>				
Working	75	35	23	<b>0.042<sup>£</sup></b>
Not working	2	6	0	
Student	88	44	26	
Home maker	12	2	0	

\*p value <0.05 is statistically significant; \* chi-square test; £ - Fischer's exact

**Table 4. Socio-demographic characteristics with frequency of hair dye use using binary logistic regression analysis**

Characteristics	Odds ratio (OR)	95% confidence interval for Odds ratio	P value
<b>Age (in years)</b>			
≤40	1.905	0.650 – 5.588	0.240
>40	1.0	Reference	--
<b>Gender</b>			
Female	0.068	0.024 – 1.199	<b>0.0001*</b>
Male	1.0	Reference	--
<b>Marital status</b>			
Married	0.242	0.098 – 0.602	<b>0.002*</b>
Single	1.0	Reference	--
<b>Nationality</b>			
Non - Arabs	1.090	0.460 – 2.580	0.845
Arabs	1.0	Reference	--
<b>Education</b>			
School level	0.789	0.476 – 1.308	0.358
Graduate and above	1.0	Reference	--
<b>Occupation</b>			
Employed	1.737	1.058 – 2.851	<b>0.029*</b>
Unemployed	1.0	Reference	--

\*p value <0.05 is statistically significant.

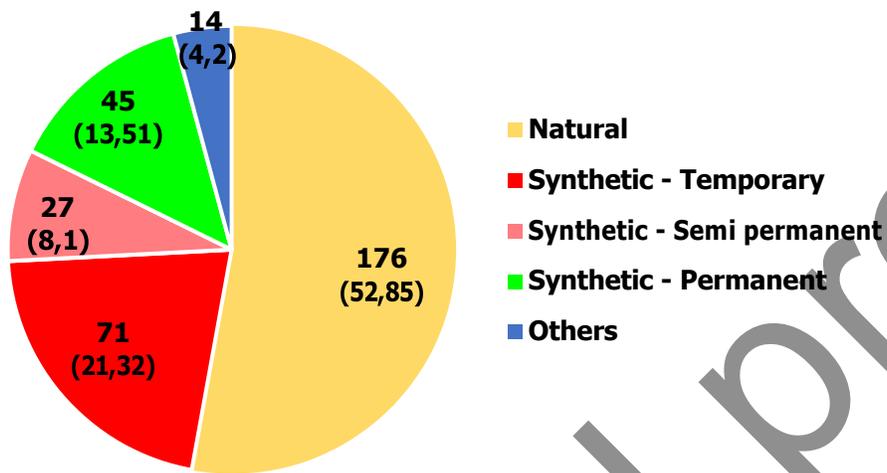


Figure 1. Different types of hair dyes used by the study participants (n=333)

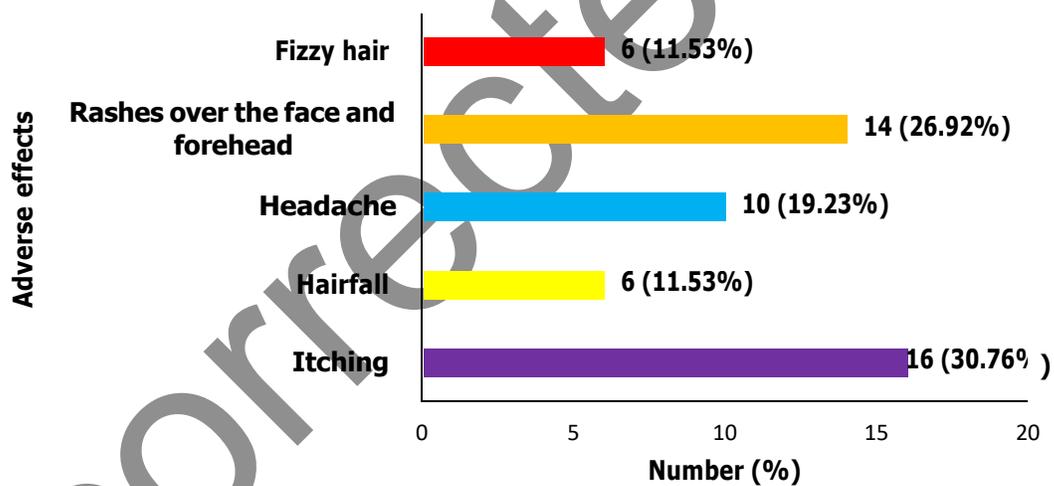


Figure 2. Adverse effects reported by the study participants associated with hair dyes (n=52) [The adverse effect percentages were calculated by dividing to the total adverse effects]

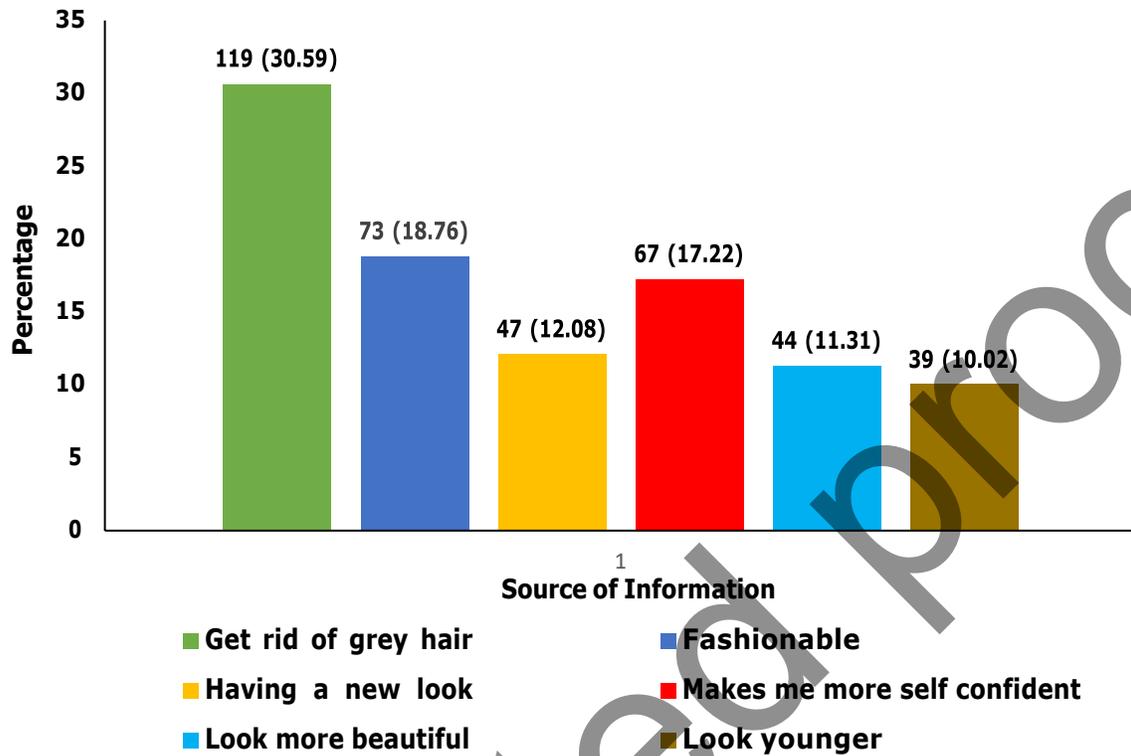


Figure 3. Motivation behind the use of hair dyes

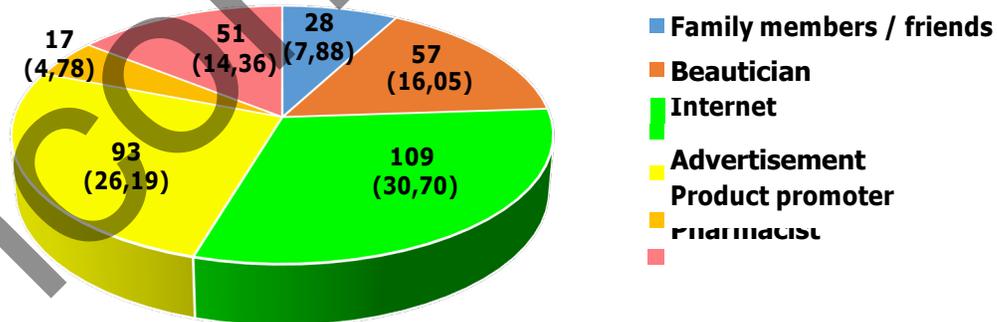


Figure 4. Source of information about hair dyes