



Hydroquinone Amount in Selected Skin-Whitening Creams, Awareness and attitude among women in Palestine

Hiba Jaraiseh* Chemistry Department,

Faculty of Science Bethlehem University Bethlehem, Palestine

Sireen Radwan Chemistry Department

Faculty of Science Bethlehem University Bethlehem, Palestine

Minerva Jaraiseh Social Science Department

Faculty of Art Bethlehem University Bethlehem, Palestine

Hanan Hazboun Faculty of Nursing and Health Science

Bethlehem University Bethlehem, Palestine

Corresponding author:* Hiba Jaraiseh, tel: 00972597282500, Email address:hjaraiseh@bethlehem.edu.

Acknowledgments

Authors are grateful to the Deanship of Research-Bethlehem University for financial support through the Palestinian Ministry of Higher Education and Research.

Abstract: In this study, thirty samples of skin-whitening creams were analyzed for total hydroquinone by High Performance Liquid Chromatography. The samples were divided into four groups: group (1) samples from Raed Cosmetics Factory (local product), group (2) samples from different pharmacies in Bethlehem, group (3) products from black market and group (4) handmade product. The concentration of hydroquinone ranged from below 0.001% to 5.30%. It was realized that three percent of cream samples analyzed were contained amount of hydroquinone higher than the recommended World Health Organization (WHO) and Food and Drug Administration (FDA) maximum permissible limit of 2%.

Moreover, the second part of the study is to evaluate the knowledge, practice of skin-whitening as well as the perceptions of Palestinian women towards the practice. A total of 146 women participated in the study, the most represented group was women aged 24 years or younger (36.6%); half of participants (57.9%) were married, two thirds of women who had received Bachelor degree or above of education were also more likely

to use skin whitening cream. Urban women (80%) were more likely to engage in skin whitening practice than rural women to use skin-whitening products.

It was found that about 75% of the participants did not have any kind of awareness about the substance Hydroquinone, its damage or its percentage in the cream they use. They also purchase creams based on the experiences of other friends or family members. Most of the women also purchase such creams based on their degree of confidence in the vendor, such as a beautician or pharmacists. Not all participants read the information on the packages that they purchase or use. The findings will offer a baseline assessment of the practice of skin bleaching currently being used by Palestinian women.

Keywords: Hydroquinone, HPLC, Attitude, Awareness, Skin-whitening.

1. Introduction

Hydroquinone (HQ) is synonymous to 1,4-Benzenediol and also to 1,4-Dihydroxybenzene with the chemical formula $C_6H_6O_2$. Hydroquinone is the primary topical ingredient for inhibiting melanin production, the substance responsible for skin color (Lawrence et al.1988, Palumbo et al. 1991). It decreases melanocyte pigment production by inhibiting the conversion of DOPA to melanin through inhibition of the enzyme tyrosinase. Other mechanisms include the inhibition of DNA and RNA synthesis, degradation of melanosomes, and destruction of melanocytes. Hydroquinone is potentially carcinogenic and is known to be a skin and respiratory irritant (Petit et al. 2006, Huang et al. 2007). Recent studies reveal that hydroquinone can generate DNA damage and immunosuppressive responses especially when exposed to strong UV radiation or sunlight, which causes skin cancer (Brenner et al. 2008). However, hydroquinone has been banned in some countries because of fear of cancer risk.

Some concerns about hydroquinone's safety on skin have been expressed, but research has shown that when it comes to topical applications, it has minor negative reactions especially when used in low concentrations. White skin is often regarded as a characteristic that contributes significantly to the cultural value of feminine attractiveness and serves as a symbol of high social standing (Blay, 2011; Yousif, Ahmed, Idris, Elmustafa,

& Ahmed, 2014). Practices of skin whitening in the Middle East are not well documented (Alrayyes, Alrayyes, & Farooq Dar, 2020), and is very common among women living in the Middle East (Alrayyes, Alrayyes, & Farooq Dar, 2019). This is considered a serious concern where women who are engaged in skin whitening use the over the counter skin whitening creams containing hydroquinone. Furthermore, there is no data on skin whitening use among Palestinian women, so researchers were encouraged to investigate women's awareness and attitudes.

In Palestine, women purchase skin-whitening products from cosmetic companies, local convenient stores "herbal stores" and cosmetic outlets. Some women look for imported cream from USA, or from Europe. These products are expensive, thus a large number of women seek locally made products, or over the counter creams that contain skin whitening and are inadequately labeled and are potentially damageful to the health when used for long period and do not meet the FDA level of hydroquinone. In Palestine, the ministry of health monitors the safety of the cosmetic products and ensures compliance towards standards set for this purpose (International Trade Centre, 2015). Therefore, the Palestinian Ministry of Health limits the percentage of hydroquinone in soaps and cosmetics to 2% or less, but high concentrations can cause serious health hazards such as tinnitus, dizziness and nausea (Stoppler & Marks, 2009).

Side effects of hydroquinone are mild when used in low concentrations. Higher concentrations frequently may irritate the skin, and if used for prolonged periods, they cause disfiguring effects including epidermal thickening. Brown nails have been reported occasionally when 2% concentration is applied on the back of the hand (Considine et al. 2013). Skin whitening destroys the black pigment existing in the epidermis (top layer of the skin). Exposure of the dermis layer, underneath the epidermis layer, to harsh weather conditions will increase the incidence of skin cancer. The dermis cannot compensate for the absence of the epidermis and when coupled with the hot sun will increase the risk for cancer (Lewis, 1969). Furthermore, misuse of skin whitening products may occur among women who have low awareness to skin whitening product, as 50% of users of skin whitening products do not recognize the side effects if developed and do not report it (Yousif,

Ahmed, Idris, Elmustafa, & Ahmed, 2014). In 1986, the Cosmetic Ingredient Review (CIR) Expert Panel published a safety assessment of hydroquinone with the conclusion that this ingredient was "...safe for use in cosmetics at concentrations up to 1.0% in formulations designed for discontinuous, brief use followed by rinsing from the skin and hair." (Brandt, 1986). In 1994, an amended safety assessment of hydroquinone was published revealing that it is "...safe at concentrations of 1.0% or less for aqueous cosmetic formulations designed for discontinuous and brief use followed by rinsing from the skin and hair" (Belsito et al., 2014). Hydroquinone proved to be unsafe for use in leave-on, non-drug cosmetic products. In 2010, the Panel concluded that hydroquinone was "...safe at concentrations of $\leq 1\%$ for cosmetic formulations designed for discontinuous, brief use followed by rinsing from the skin and hair. Hydroquinone should not be used in other leave-on cosmetic products" (Andersen et al. 2010).

Considering the toxic effect of hydroquinone, it is important to control their contact with humans. This can only be achieved if their level in skin whitening creams is known. In Palestine, little work has been undertaken to determine the levels of hydroquinone in whitening creams, even though concerns have been expressed about the widespread of skin whitening creams (Voegborlo et al., 2008). The objectives of this research are to determine levels of hydroquinone in some selected skin whitening creams sold in the Palestinian market, to compare its level to the standard levels and to determine if Palestinian women are at risk. In addition, it aims to assess the practice of skin whitening and the attitude, awareness, and perception among Palestinian women about the skin whitening practice. The results will provide a baseline information on the current practice of skin whitening among women in Palestine. The study related to the use of skin whitening cream in Palestine is the first especially with regard to pertaining practice and awareness. This study was concerned about consumer safety.

In Palestine, this is considered the first study that aims to explore the use of skin whitening among women.

2. Methodology:

The research is of a dual purpose. First, to investigate the level of hydroquinone in the cream sold in Palestine and secondly to probe women perceptions and tendencies toward buying skin whitening products in Palestine by using a questionnaire to assess women awareness for safety and their practice. The results will provide baseline information on the current practice of skin whitening among women in Palestine. The study is related to use of skin whitening cream in Palestine comes first especially with regard to practice and awareness of skin whitening cream. This study was concerned about consumer safety and training was provided to women.

The methodology took two features of the research:

- a. Assessment of the level of hydroquinone in the laboratories.
- b. Studying Palestinian women awareness and attitudes by using a survey and focus group discussion and training.

2.1. Laboratory Materials and Methods

All the solvents used were HPLC grade. Ethanol and Acetonitrile were obtained from Merck Company.

Hydroquinone was obtained from Sigma-Aldrich Company. Thirty whitening creams were obtained randomly from pharmacies, beauty centers and cosmetic stores in Bethlehem, Ramallah and Hebron.

2.1.1. Determination of Hydroquinone in whitening Creams by HPLC.

For determination of hydroquinone in whitening creams, the reversed HPLC method was used with silica-based C18 bonded phase column (5 μm , 150 * 4.6 mm inner diameter). A mobile phase consisting of (acetonitrile: water) (50:50 v/v) at a flow rate of 0.8 ml/minute, temperature 25⁰ C and UV detection at 292.

2.1.2 Preparation of Hydroquinone standard solution

Standard solution of hydroquinone was prepared by dissolving 40.0 mg in 100.0 mL 20% ethanol, then 10.0 mL was diluted in 100.0 mL 20% ethanol.

2.1.3 Preparation of Sample Solutions

The cosmetic samples were cream (o/w emulsions) from different brands (Local products, imported products

and homemade products) and were purchased from local cosmetic stores and pharmacies in Palestine.

About 1.000 g of each cream was weighed accurately and transferred into 10 ml flask and 20% ethanol was added to 10 ml flask and heated at 40oC in a water bath and shaken occasionally until completely dissolved.

Then, it was allowed to cool and then filed with deionized water. The solution was filtered through a Whatman No. 1 filter (Whatman, UK) in order to have a clear solution.

For determination of Hydroquinone in all samples and standards reversed phase HPLC method was used with silica-based C18 bonded phase column (5 µm, 150 × 4.6 mm inner diameter) and a mobile phase consisting of acetonitrile/water (50:50 v/v) at a flow rate of 0.8 ml/minute and UV detection at 293 nm.

2.2. Awareness and attitude survey to skin whitening cosmetics

2.2.1. The questionnaire design and contents

The researchers designed a self-administered questionnaire to study the awareness, attitude and use of cosmetic cream and skin whitening cream. The questionnaire consisted of four sections:

Section 1 examined the sociodemographic background of participants (7 questions).

Section 2 investigated the use of cosmetic cream (10 questions).

Section 3 investigated the participants skin whitening awareness (5 questions – Likert scale yes, no and I have slight awareness). Moreover, Section 4 investigated the attitude of women towards skin whitening products (18 questions) and used a Likert scale (agree, disagree and do not know).

2.2.2. Content Validity

Content Validity was done through feedback from experts in research, and the researchers modified it according to their recommendation for clarity of questions.

Reliability of the study was done using SPSS V.20, and Cronbach Alpha (α) was measured for reliability of two domains awareness and attitude of cosmetic use and was $>70\%$ (Table 7 in questionnaire analysis).

Data collection was done online using a cross-sectional Google Survey platform and was conducted from July-August 2020. The call for participation was made on social media to complete an online survey because it was not practical to distribute the survey during the outbreak of covid-19 in Palestine.

2.3. Focus groups

The researchers conducted 5 focus groups (130 women) in three areas in Bethlehem and Hebron district and included the inhabitants of a city, village and refugee camp.

3. Results and discussion

3.1. Laboratory Sample analysis

Thirty whitening cream samples were collected from cosmetic stores and pharmacies from the local market. The samples were divided into four groups; group (1) contained three sample products from Raed cosmetics factory located in Beit-Sahour. The concentrations of the hydroquinone in those samples ranged from 1.36% - 1.63% (Table 1). The samples were less than 2%, which is the level permitted by WHO, FDA and the Palestinian Health Ministry.

Group (2) contained three samples, which were purchased from different Palestinian pharmacies in Bethlehem. The concentrations of Hydroquinone in those samples ranged from 1.37% to 1.98% (Table 2). Those samples also were less than 2%, which is the level permitted by WHO, FDA and the Palestinian Health Ministry.

Group (3) contains twelve samples purchased from black market. The concentrations of hydroquinone were zero except one Mediskin H5 cream. The concentration of hydroquinone in this product ranged from 4.9% to 5.3% (table 3) that is higher than the level permitted by WHO, FDA and the Palestinian Health Ministry.

Group (4) contained twelve products or samples prepared by the pharmacists and beauty specialists in their pharmacies and beauty centers, which are called handmade products. Pharmacies and beauty centers were selected randomly in Bethlehem, Hebron and Ramallah. The concentration of hydroquinone of seven products ranged from 1.50% to 1.99%. Those samples also were less than the level permitted by WHO, FDA and Palestinian Health Ministry of 2%. The other five products contained 0 % of hydroquinone. This means that the consumer should be careful when purchasing handmade cosmetic products from pharmacies and beauty centers (Table 4).

3.2. Cosmetic Label Analysis

The labels of cosmetic products are important to ensure health, safety and honesty. According to the Palestinian Ministry of Health, labels on cosmetic products should include the following: Name of the product, name of the importer and representative, name of the producer, country of origin, contents, percentage of content, important warning, storing method, optimal use and intent of use and expiry date.

Labels of group (1) include all requirements according to the Ministry of Health in details, which make the consumers proud and satisfied with their local products and local cosmetics factory (see table 1). In addition, it is clear that labels of imported products (group 2) that are sold in pharmacy also include all label requirements (see table 2).

The labels of group (3) did not meet all label requirements like products with sample codes (N,I, Ha, Hb, M, G, Ra, Rb) (see table 3) where the labels did not include the name of the producer, the name of the importer and representative, country of origin, important warning and storing method. In addition, the product with sample code G did not include the percentage content of the active ingredient, which is Hydroquinone. Labels on products with sample code P were written in Chinese, a language Palestinians usually do not understand. Products with sample codes (Ja, Ka, Kb, Kc,O, L) (see table 3) had labels with no important warning, storing conditions and percentage of content. Therefore, consumers should be cautious when purchasing

cosmetic products from the black market and must be educated how to read cosmetic product labels. No labels are placed on homemade products (group 4) (table 4). Pharmacists and beauty specialists prefer to keep formula of this kind of products secret. However, the consumer is entitled to know all about those products especially the whitening ones, which may contain specific material with special use and conditions such as hydroquinone.

3.3. Questionnaire analysis

3.3.1. Statistical treatment

After collecting the study data, the researchers reviewed it and did data entry by giving specific figures. The answer yes was given 3 points, I have slight awareness was given 2 points, and the no answer was given one point. So the higher the points represented the higher the level of the awareness of women toward use of skin whitening in Palestine. The data was statistically processed, by extracting numbers, the percentages, the averages, and the standard deviations. The hypotheses were examined at the level of $\alpha = 0.05$, by the following statistical tests: T-test, (One Way Analysis Of Variance, Tukey test, (Pearson Correlation), (Cronbach Alpha) using the computer with statistical packages for Social Sciences 22 (SPSS) (Allen, Bennett & Heritage, 2014). A total of 146 women participated in the study, and women who use skin-whitening products were distributed among all age groups, marital status, educational levels and geographical are (Table 5). The most represented group was women aged 24 years or younger (36.6%); half of participants (57.9%) were married, two thirds of women who had received Bachelor degree or above of education were also more likely to use skin whitening cream. Thus, other studies found that use of skin whitening products is among lower-educated women (Rusmadi, Syed Ismail, & Praveena, 2015). Urban women (80% were more likely to engage in skin whitening practice than rural women to use skin whitening products. The majority of the participants' users were younger women and this coincides with the study of Hamed and colleagues (2010) in Jordan.

Regarding leading age-range of participants who are currently practicing skin whitening products are 24 years and younger. This is in contrast to other studies where women in the age group of 20 – 30 are more active in using skin whitening products (Adebajo, 2002) (Table 5).

Table 6 indicated that all paragraphs correlation values with total points of the questionnaire are statistically significant, indicating that the internal consistency of the paragraphs of the tool and they share together in the measurement of the level of the awareness and attitude of women toward using skin whitening creams in Palestine.

3.3.2. Reliability of the study

The reliability calculation of internal consistency was calculated (Cronbach Alpha). Table (7) indicates the reliability of the questionnaire that was verified and the internal consistency of the paragraphs of it was examined by calculating the Cronbach alpha coefficient (Cronbach Alpha) on the total study sample as the value of consistency (0.71). Thus the tool i.e. questionnaire has a good degree of consistency.

In relation to skin texture, one hundred and six women (72.6%) were satisfied with their skin color, one-third (34.9%) were using skin cosmetics on a daily basis. The women choice to use skin whitening was when necessary (88.4%) and was upon the recommendation of a friend (26.0%), advertising (17.1%) and consultation with a dermatologist (15.8%). Furthermore, half of the women did not know the time permitted to use products containing hydroquinone (47.9%) (Table 8).

3.3.3. Inferential statistics

The study variables were analyzed to investigate if there was a statistical significance between the sociodemographic variables and dependent variables with respect to awareness and attitude toward skin whitening cosmetics.

The first hypothesis: There were no significant differences at $\alpha=0.05$ with respect to the level of the awareness and attitude of women toward use of skin whitening in Palestine according to age. We used (One-Way analysis of variance) to test hypotheses for the level of the awareness and attitude of women toward use of skin whitening in Palestine with respect to age. The results of analysis (Table 9) indicates that there is no significant differences at $\alpha=0.05$ for the level of the Awareness and attitude of women toward use of skin whitening in Palestine with respect to age. In our study, the participants were women aged 20 and above. Previous studies focused on young students using skin whiteners. Results of analysis in the (table 9) indicated that there were significant differences at $\alpha=0.05$ for the level of the Attitude of the ingredients of skin whitening products (according to the age).

To find the source of these differences, the researchers extracted (Tukey test) for bilateral comparisons posteriori hypotheses of the level of the attitude toward the ingredients of skin whitening products (creams) according to the age (Table 10). The Tukey test produced results for bilateral comparisons posteriori of the level of the attitude of the ingredients of skin whitening products (creams) with respect to age. The participating women who exercised skin whitening, showed age difference when compared to age group, of age 24 year and less and between women whose age was 25-34 year in favor of women whose age was 24 year and less (Table 10).

The second hypothesis: There were no significant differences at $\alpha=0.05$ of the level of the Awareness and attitude of women towards the use of skin whiteners in Palestine with respect to the social statuses. We used (One-Way analysis of variance) to test the hypothesis for the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the social statuses. The results of analysis in the table 11 indicated that there were no significant differences at $\alpha=0.05$ for the level of the Awareness and attitude of women toward the use of skin whiteners in Palestine according to the social status (Tables 12, 13).

The Third Hypothesis: There were no significant differences at $\alpha=0.05$ of the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the place of residence.

We used (t-test) to test hypotheses for the differences of the level of the awareness and attitude of women towards use of skin whiteners in Palestine with respect to the place of residence. The results of analysis in the (table 14) indicated that there were no significant differences at $\alpha=0.05$ for the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the place of residence.

The Fourth Hypothesis: There were no significant differences at $\alpha=0.05$ of the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the educational level.

We used (One-Way analysis of variance) to test hypotheses for the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the educational level. The results of analysis in the table 16 indicated that there were no significant differences at $\alpha=0.05$ for the level of the awareness and attitude of women toward using skin whiteners in Palestine with respect to the educational level (Tables 15, 16).

3.4. Focus groups analysis

It was found that about 75% of the participants did not have any kind of awareness about the substance Hydroquinone, its damage or its percentage in the cream they use. They also purchase creams based on the experiences of other friends or family members. Most of the women also purchase such creams based on their degree of confidence in the vendor, such as a beautician or pharmacists. Not all participants read the information on the packages that they purchase or use. The participants were made aware of the need to be more aware of their health by reading and understanding the nature of the contents of the cream used and the risk of the misuse of creams containing hydroquinone in particular and cosmetic products in general.

In addition, they were encouraged to use the national product, given that results of the laboratory test of some products of those factories indicated a moderate percentage of HQ and comply with the standards of the World Health Organization.

4. Conclusion

The study revealed that awareness differed between the different age categories and did not differ among other socio-demographic variables. The findings however disagree with those of Adebajo (2002) who found that women of age category of 20 – 30 had a higher awareness pertaining to the use of the skin whitening products.

This study has provides data about awareness and attitude towards skin whitening products among Palestinian women in Palestine. In general, awareness is usually necessary to make intelligent decisions upon which to act and is affected by cultural values. A random sample of women were surveyed via the social media. The data collection instrument was a questionnaire, which was designed by well-experienced researchers and assessed the awareness and attitude towards using skin whiteners.

In Palestine, the high demand for skin whitening products was remarked with different imported brands, or locally manufactured products. It was also noticed that young women in their 20s and teenagers use skin whitening products the most. Therefore, this study finding highlights the number of topical creams that are used in Palestine, the significance of investing in primary preventions to reduce potential long- term psychological, medical, and economic consequences on the people's health and healthcare in general.

5. Recommendations

- a. To develop special programs to raise awareness among Palestinian women of the dangers of using cosmetics and methods of application by the Ministry of Health and health institutions in Palestine.
- b. To emphasize the necessity of examining all imported and locally manufactured cosmetics and the need to focus on the label's information.

6. Challenges

Due to corona virus situation, we decided to reduce the number of women surveyed in each group. Therefore,

we added the questionnaire as a new tool to educate more women.

7. Ethical approval

Our study's methodology, information sheet, and consent statement have all been approved by Bethlehem University's ethics committee.

8. Tables

Table (1): Concentration of Hydroquinone in the local products produced by Raed Cosmetics Palestine (Beauty Code)

Sample Code	Sample name	Concentration of hydroquinone in samples
A	Hydrokeen Moisturizing (Bleaching Cream)	1.36% \pm 0.02
B	Hydrokeen-R (Triple action night cream)	1.45% \pm 0.03
F	Hydroheen Plus (Creamy Gel)	1.63% \pm 0.23

Table (2): Concentration of Hydroquinone in the imported products purchased from Palestinian pharmacies

Sample Code	Sample Name	Country	Concentration of hydroquinone in samples
C	Noreva (Laboratoire Dermatologique)	France	1.89% \pm 0.01
D	Derma (whitening cream)	Jordan	1.37% \pm 0.01
E	Philaquin with AHA Gel	Jordan	1.98% \pm 0.06

Table (3): Concentration of Hydroquinone in the imported products purchased from Black market in Palestine

Sample Code	Sample Name	Country	Concentration of hydroquinone in samples
Ha	The Russian doctor formula(white)	N/A	0%
Hb	The Russian doctor formula (yellow)	N/A	0%
I	The original Sabbouha formula	N/A	0%
Ja	Golden Pearl	Pakistan	0%
Ka	Feique lemon white for day use	China	0%
Kb	Feique lemon yellow for night use.	China	0%
Kc	Feique lemon off white	China	0%
L	Ideal crème	Lebanon	0%

M	The Korean Queen whitening cream	N/A	0%
N	The poliothe princess formula	N/A	0%
O	Eva cream (whitening cream)	N/A	0%
P	Beanne extra pearl cream	China	0%
G	Mediskin H5 cream	N/A	4.9%- 5.3%
Ra	Beauty face cream – off white – Day	N/A	0%
Rb	Beauty face cream – yellow – Night	N/A	0%

Table (4): Concentration of Hydroquinone in products purchased from pharmacies and beauty centers.

Sample Code	Sample Name	pharmacies /Beauty center	City	Concentration of hydroquinone in samples
S	Homemade cream1	Pharmacy	Bethlehem	1.51%±0.02
T	Homemade cream2	Pharmacy	Bethlehem	1.98%±0.01
U	Homemade cream3	Pharmacy	Hebron	0%
V	Homemade cream4	Pharmacy	Hebron	1.50%±0.04
W	Homemade cream5	Pharmacy	Ramallah	1.55%±0.01
X	Homemade cream6	Pharmacy	Ramallah	1.99%±0.03
Y	Homemade cream7	Beauty center	Bethlehem	0%
Ya	Homemade cream8	Beauty center	Bethlehem	1.87%±0.02
Z	Homemade cream9	Beauty center	Hebron	0%
Za	Homemade cream10	Beauty center	Hebron	0%
Zb	Homemade cream11	Beauty center	Ramallah	0%
Zc	Homemade cream12	Beauty center	Ramallah	1.88%±0.02

Table (5) Sociodemographic Variables (n= 146)

Variables	Number	Valid percent	System missing
Age			1
24 year and less	53	36.6	
25-34	36	24.8	
35-44	35	24.1	
45-54	13	9.0	
55 year and above	8	5.5	
Social statuses			1
Single	58	40.0	
Married	84	57.9	
Widowed	2	1.4	
Divorced	1	0.7	
Place of residence			1
City	116	80.0	
Village	29	20.0	
Education level			1
Less than Tawjihi (High school)	3	2.1	
Tawjihi (High school)	9	6.2	
Diploma	16	11.0	
B.A	93	64.1	
M.A and above	24	16.6	

Table (6): Results of Pearson correlation Matrix paragraphs study tool correlation with the total score of the instrument

N	Person correlation	Sig
1	0.255	0.002
2	0.278	0.001
3	0.306	0.000
4	0.180	0.030
5	0.130	0.119
6	0.276	0.001
7	0.375	0.000
8	0.495	0.000
9	0.453	0.000
10	0.528	0.000
11	0.560	0.000
12	0.479	0.000

N	Person correlation	Sig
13	0.253	0.002
14	0.522	0.000
15	0.426	0.000
16	0.564	0.000
17	0.513	0.000
18	0.577	0.000
19	0.659	0.000
20	0.186	0.024
21	0.137	0.099
22	0.167	0.043
23	0.306	0.000
24	0.342	0.000

Table (7) results of (Cronbach Alpha)

	number of cases	number of items	Cronbach Alpha
Awareness of the ingredients of skin whitening products (creams)	146	6	0.60
Attitude of the ingredients of skin whitening products (creams)	146	18	0.76
Total degree	146	24	0.71

Table (8): Cosmetic habits and skin whitening practices among women in Palestine

Variables	Number	Valid percent	System missing
Are you satisfied with your skin color?			
Yes	106	72.6	-
No	5	3.4	
Somewhat	35	24.0	
In general, do you use (cosmetics)			
Yes, on a daily basis	51	34.9	-
Yes, when necessary	95	65.1	
Do you use special creams to whiten the skin?			
Yes, on a daily basis	17	11.6	-
Yes, when necessary	129	88.4	
How often should you use skin-whitening products daily?			
Once a day	30	20.5	-
Twice a day	2	1.4	
when necessary	114	78.1	
Do you have a specific quality that you use frequently?			
Yes	66	45.2	-
I change the product frequently	80	54.8	
How long ago did you use whitening creams (the last one you used)			
One month	25	17.1	-
2- 6 months	33	22.6	
7 – 12 months	6	4.1	
More than one year	18	12.3	

Not sure of the period	64	43.8	
------------------------	----	------	--

Table (9): The results of one-way analysis of variance for the level of awareness and attitude of women toward the use of skin whiteners in Palestine with respect to age

		DF	Sum of squares	Mean Squares	F	Sig
Awareness of the ingredients of skin whitening products (creams)	Between groups	4	0.190	0.048	0.233	0.920
	Within groups	140	28.636	0.205		
	Total	144	28.826			
Attitude of the ingredients of skin whitening products (creams)	Between groups	4	1.246	0.311	3.071	0.018
	Within groups	140	14.198	0.101		
	Total	144	15.444			
Total degree	Between groups	4	0.660	0.165	2.352	0.057
	Within groups	140	9.815	0.070		
	Total	144	10.474			

Table (10): Tukey test results for bilateral comparisons posteriori hypotheses of the level of the Attitude towards the ingredients of skin whitening products (creams) with respect to age

Age	24 year & less	25-34	35-44	45-54	55 year & above
24 year & less		*0.23035	-0.08074	-0.00065	-0.04285
25-34			-0.14960	-0.22970	-0.18750
35-44				-0.08010	-0.03790
45-54					-0.04220
55 year & above					

Table (11): Numbers, means, and standard deviation for the difference of the level of the awareness and attitude of women toward using skin whiteners in Palestine with respect to age

	Age	Number	Mean	Std. Deviation
Awareness of the ingredients of skin whitening products (creams)	24 year and less	53	2.18	0.43
	25-34	36	2.18	0.42
	35-44	35	2.12	0.50
	45-54	13	2.08	0.48
	55 year and above	8	2.10	0.33
Attitude towards the ingredients of skin whitening products (creams)	24 year and less	53	1.74	0.34
	25-34	36	1.51	0.24
	35-44	35	1.66	0.35
	45-54	13	1.74	0.26
	55 year and above	8	1.70	0.35
Total degree	24 year and less	53	1.85	0.28
	25-34	36	1.68	0.20
	35-44	35	1.77	0.30
	45-54	13	1.83	0.22
	55 year and above	8	1.80	0.26

Table (12): The results of one-way analysis of variance for the level of the Awareness and attitude of women toward use of skin whitening in Palestine according to the social statuses

		DF	Sum of squares	Mean Squares	F	Sig
Awareness of the ingredients of skin whitening products (creams)	Between groups	3	0.368	0.123	0.607	0.611
	Within groups	141	28.459	0.202		
	Total	144	28.826			
Attitude towards the ingredients of skin whitening	Between groups	3	0.326	0.109	1.014	0.388
	Within groups	141	15.118	0.107		
	Total	144	15.444			
Total degree	Between groups	3	0.277	0.092	1.276	0.285
	Within groups	141	10.198	0.072		
	Total	144	10.474			

Table (13): Numbers, means, and standard deviation for the difference of the level of the awareness and attitude of women towards the use of skin whiteners in Palestine with respect to the social status

	social statuses	Number	Mean	Std. Deviation
Awareness of the ingredients of skin whitening products (creams)	Single	58	2.17	0.42
	Married	84	2.13	0.46
	Widowed	2	2.33	0.47
	Divorced	1	2.66	.
Attitude towards the ingredients of skin whitening products (creams)	Single	58	1.72	0.36
	Married	84	1.62	0.29
	Widowed	2	1.69	0.11
	Divorced	1	1.77	.
Total degree	Single	58	1.83	0.29
	Married	84	1.75	0.25
	Widowed	2	1.85	0.02
	Divorced	1	2.00	.

Table (14): The results of (t-test) for the differences of the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the place of residence

	Place	Number	Mean	Std. Deviation	DF	T	Sig
Awareness of the ingredients of skin whitening products (creams)	City	116	2.13	0.43	143	-1.255	0.211
	Village	29	2.25	0.50			
Attitude towards the ingredients of skin whitening products (creams)	City	116	1.65	0.31	143	-0.414	0.679
	Village	29	1.68	0.36			
Total degree	City	116	1.77	0.25	143	-0.897	0.371
	Village	29	1.82	0.32			

Table (15): The results of one-way analysis of variance for the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the educational level

		DF	Sum of squares	Mean Squares	F	Sig
Awareness of the ingredients of skin whitening products (creams)	Between groups	4	1.043	0.261	1.314	0.268
	Within groups	140	27.783	0.198		
	Total	144	28.826			
Attitude of the ingredients towards skin whitening products (creams)	Between groups	4	0.903	0.226	2.172	0.075
	Within groups	140	14.542	0.104		
	Total	144	15.444			
Total degree	Between groups	4	0.360	0.090		

Section A-Research paper

	Within groups	140	10.114	0.072	1.247	0.294
	Total	144	10.474			

Table (16): Numbers, means, and standard deviation for the difference of the level of the awareness and attitude of women towards using skin whiteners in Palestine with respect to the educational level

	Education level	Number	Mean	Std. Deviation
Awareness of the ingredients of skin whitening products (creams)	Less than Tawjihi	3	1.66	0.16
	Tawjihi	9	2.16	0.49
	Diploma	16	2.13	0.38
	B.A	93	2.15	0.44
	M.A and above	24	2.27	0.47
Attitude of the ingredients towards skin whitening products (creams)	Less than Tawjihi	3	1.77	0.11
	Tawjihi	9	1.63	0.19
	Diploma	16	1.84	0.33
	B.A	93	1.66	0.31
	M.A and above	24	1.54	0.36
Total degree	Less than Tawjihi	3	1.75	0.07
	Tawjihi	9	1.76	0.11
	Diploma	16	1.91	0.27
	B.A	93	1.78	0.26
	M.A and above	24	1.72	0.32

8. References

- a. Abd Wahil, M. S., Ishak, M. F. M., & Daud, F. (2020). Awareness of Health Effects From Skin Whitening Product Usage: A Systematic Review. *International Journal of Public Health and Clinical Sciences*, 6(6), 20-32.
- b. Adebajo, S. B. (2002). An epidemiological survey of the use of cosmetic skin whitening cosmetics among traders in Lagos, Nigeria. *Mercury*, 5(7), 43-8.
- c. Al-Qutob, M. A., Alatrash, H. M., & Abol-Ola, S. (2013). Determination of different heavy metals concentrations in cosmetics purchased from the Palestinian markets by ICP/MS.
- d. Alghamdi, K. (2010). The use of topical bleaching agents among women: a cross-sectional study of awareness, attitude and practices. *JEADV. Journal of the European Academy of Dermatology and Venereology*, 24(10), 1214-1219.
- e. Allen, P., Bennett, K., & Heritage, B. (2014). *SPSS statistics version 22: A practical guide*. Cengage Learning Australia.
- f. Alrayyes, S. F., Alrayyes, S. F., & Farooq, U. D. (2019). Skin-whitening patterns among female students: A cross-sectional study in Saudi Arabia. *International journal of women's dermatology*, 5(4), 246-250.
- g. Alrayyes, S. F., Alrayyes, S. F., & Farooq Dar, U. (2020). Skin- whitening practices behind the veil: An epidemiological study among Saudi women. *Journal of Cosmetic Dermatology*, 19(1), 147-153.
- h. Amponsah, D., Voegborlo, R., & Sebiawu, G. (2014). Determination of Amount of Hydroquinone in some selected Skin-whitening Creams sold in the Ghanaian Market. *International Journal of Scientific & Engineering Research*, 5(6), 544-550.
- i. Belsito, M. D., Hill, R. A., Klaassen, C. D., Liebler, D. C., & Marks Jr, J. G. (2014). Amended Safety Assessment of Hydroquinone as Used in Cosmetics.

- j. Blay, Y. A. (2011). Skin bleaching and global white supremacy: By way of introduction. *The Journal of Pan African Studies*, 4(4), 4-46.
- k. Dadzie, O. E., & Petit, A. (2009). Skin bleaching: highlighting the misuse of cutaneous depigmenting agents. *Journal of the European Academy of Dermatology and Venereology*, 23(7), 741-750.
- l. Hamed, S. H., Tayyem, R., Nimer, N., & AlKhatib, H. S. (2010). Skin- whitening practice among women living in Jordan: prevalence, determinants, and user's awareness. *International journal of dermatology*, 49(4), 414-420.
- m. Huang, P.Y. & Chu C.Y. (2007). Allergic contact dermatitis due to sodium metabisulfite in a bleaching cream. *Contact dermatitis* 56(2), 123-124.
- n. International Trade Centre (2015). Managing quality in state of Palestine. retrieved from https://www.intracen.org/uploadedFiles/intracenorg/Content/Exporters/Exporting_Better/Quality_Management/Redesign/FINAL%20FOR%20PRINT%20AND%20WEB-EQM%20Palestine-15March2016.pdf
- o. Lawrence, N., Bligard, C. A., Reed, R., & Perret, W. J. (1988). Exogenous ochronosis in the United States. *Journal of the American Academy of Dermatology*, 18(5), 1207-1211.
- p. Palumbo, A., d'Ischia, M., Misuraca, G., & Prota, G. (1991). Mechanism of inhibition of melanogenesis by hydroquinone. *Biochimica et Biophysica Acta (BBA)-General Subjects*, 1073(1), 85-90.
- q. Petit, A., Cohen-Ludmann, C., Clevenbergh, P., Bergmann, J. F., & Dubertret, L. (2006). Skin whitening and its complications among African people living in Paris. *Journal of the American Academy of Dermatology*, 55(5), 873-878.
- r. Sigma-Aldrich Corporation. Aldrich chemistry: handbook of fine chemicals. Milwaukee, WI :Sigma-

Aldrich.2012.

- s. Stoppler, M. C., & Marks, J. W. (2009). FDA proposes hydroquinone ban. *JENdA: A Journal of Culture and African Women Studies*, (14).
- t. Westerhof, W., & Kooyers, T. J. (2005). Hydroquinone and its analogues in dermatology—a potential health risk. *Journal of cosmetic dermatology*, 4(2), 55-59.
- u. Yousif, A. K., Ahmed, A. A., Idris, A. E., Elmustafa, M. O., & Ahmed, E. H. (2014). The use of bleaching creams among Central Sudan Students, 2010.