

Depigmentation And Antiaging of Hyaluronic Acid and Vitamin C

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ABSTRACT

Background: Cosmeceutical is a term used to describe cosmetics with antiaging and depigmentation effects these days. Hyaluronic acid is a naturally occurring biopolymer possessing numerous functions within the body including wound repair, cell migration, and cell signaling. Vitamin C and peptides are widely used in dermo cosmetics for their anti-aging properties.

The aim of the current study was to determine the efficacy of different directions, possibilities and type of using hyaluronic and vitamin c as antiaging and anti-pigmentation dermatological products based on prescribed by pharmacist in Iraqi pharmacy and to identify those driving factors that influence women's purchase of these products and to have an insight into their perception and knowledge about these products.

Patients/Methods: The study was based on an pharmacist questionnaire about how to prescribed hyaluronic acid and vitamin c as skin care locally product in pharmacy, study was conducted between January 15, 2024, and February 21, 2024. 80 responses were collected.

Results: The awareness and level of knowledge in this field of cosmetology among potential beauty salon clients are on the rise. Hyaluronic acid and vitamin c are used in injections, as well as in care cosmetics topical, and oral. Various areas of the face are injected, most often the lips. Face creams, gel, serum are among the most frequently purchased skincare products.

Discussion: It was observed in the study that such products do work to improve skin conditions but the claim as antiaging and de -pigmentation could be cured completely could not be determined.

Conclusions: The use of hyaluronic acid and vitamin c in cosmetology is multidirectional. It is mainly focused on skincare and specific anti-aging and depigmentation activities.

Keywords: cosmetology, face care, vitamin c, hyaluronic acid

1. INTRODUCTION

Aging is an intrinsic and continuous process that usually begins around the age of 25 and is referred to as chronological aging or intrinsic aging, depending on the time of day. Intrinsic aging is characterized by skin atrophy, loss of elasticity, and slowed metabolic activity. Signs of intrinsic aging include fine wrinkles, thin, transparent skin, loss of underlying fatty tissue, loss of facial bones, dry skin, inability to sweat to cool the skin, hair loss, and unwanted hair. Another type of aging, called extrinsic aging, is caused by environmental factors. Among the harmful environmental factors that cause extrinsic aging, the most important are the long-term effects of repeated exposure to ultraviolet light, known as photoaging. [1].

Cosmeceuticals are cosmetic products with biologically active ingredients having drug-like benefits [2]. Cosmeceuticals are cosmetics products that are said to actually vanish wrinkles [3]. Dermatological research suggests that the bioactive ingredients used in cosmeceuticals do indeed have benefits beyond the traditional moisturizer. Cosmetic industry always makes claims about antiaging products that can do miracles. [4].

Female population all over the world is exposed through media to an ideal image of beauty. Most of the products are applied locally for dermatological effects; these products contain ingredients which are naturally present in human skin during youth [5]. In addition, previously done marketing research published had revealed that women over the age of 50 are inclined to use antiaging products more and women at younger age are very likely to purchase these products to stop the aging [4]. The skin is protected from sunburn by the dark brown pigment eumelanin, which absorbs UV rays from the sun. Darker skin

tones are associated with higher levels of eumelanin, while lighter skin tones are associated with lower levels. Among its other benefits is eumelanin's ability to protect against skin cancer. People with higher levels of eumelanin have a lower risk of skin cancer than those with lower levels. Eumelanin also helps regulate body temperature by absorbing heat from the sun and keeping the body cool.[7] Pheomelanin pigments have a lighter yellow-red hue. Because pheomelanin does not absorb UV rays as effectively as eumelanin, people with higher levels have lighter skin and are more susceptible to skin damage and sunburn. Pheomelanin may also help protect against melanoma and other types of skin cancer.[8, 9]

The main causes of skin pigmentation are genetics, sun exposure (see Figure 1.1), and certain medications. By understanding the underlying causes of skin pigmentation, we can better understand how to treat and prevent it. Anti-inflammatory drugs, antioxidants, and drugs that inhibit tyrosinase [10].

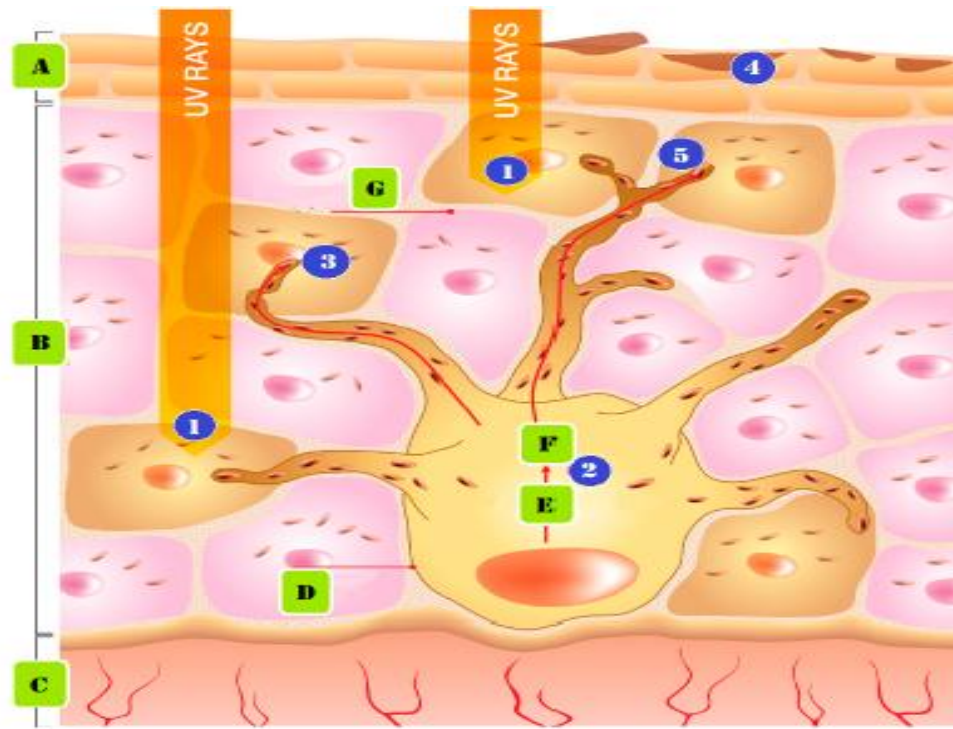


Figure 1.1. Pigmentation from prolonged UV exposure formed: (A) stratum corneum, (B) epidermis, (C) dermis, (D) melanocyte cell, (E) tyrosinase and tyrosine, (F) melanin, and (G) keratinocyte cell [10].

1.1 Role of combination of hyaluronic acid and vit c

The anti-aging formulation evaluated here contains pure vitamin C (10%), and hyaluronic acid (HA). Vitamin C and peptides are widely used in dermo cosmetics for their anti-aging properties. pure vitamin C (10%), and hyaluronic acid (HA) is effective in reducing visible signs of skin aging and is well tolerated. Previous *in vitro* studies have shown that this formulation of combination has antioxidant properties and protective effect against UVA and pollution [42,43]. Furthermore, clinical studies with combination showed significant results on improving facial wrinkles and radiance [44].

Ascorbic acid (vitamin C), an antioxidant, inhibits tyrosinase by binding to copper, and suppressing the oxidative polymerization of melanin precursors, which prevents melanin synthesis in the melanogenesis pathway [45]. **The objectives of this study were to:** Evaluate the efficacy of vitamin c, hyaluronic acid and combination of antiaging and anti-pigmentation cosmetics by self-evaluation of the participants in the private pharmacy as (survey question).

2. METHODS

2.1 Study design

A pharmacist in pharmacy survey comprising 45 questions concerning issues related to the use of HA, vit c and combination in cosmetology procedures, as antiaging and depigmentation care was conducted. In addition, the survey collected responses regarding the possible side effects after prescribed in pharmacy and the overall effect of the acid on the skin. 4 multiple-choice questions. pharmacist irrespective of gender, age, status, profession, Degree and income took part in the study. The survey was developed on Bagdad /Iraq /city included (Al Rusafa). Team members tested the quality and technical functionality of the questionnaire. The survey was conducted between December 15, 2023, and February 21, 2024.

2.2 Statistical analysis

The results of the survey were analyzed in SPSS 13.3, Microsoft Excel for calculation and draw figure, using the Pearson chi-square test. Chi-square ratio values of $p < 0.01$ were agreed as statistically significant. Data were statistically analyzed if a specific answer to a question was selected ($n = 80$) times. All of the study results were also presented in the form of descriptive statistical analyses [47].

3. RESULTS

3.1 Characteristic of the study group

The demographic characteristics of the respondents are presented in **Table 3.1**.

3.2 Hyaluronic acid (HA) and vitamin c (vit c) alone and combination survey

The next part of the survey was designed to evaluate the preferences for and the level of knowledge about HA and vit c treatments prescribed among potential pharmacist in pharmacy and physician in clinic. The survey was divided into three parts: HA fillers, topical HA preparations, vit c, topical vit c preparations and combination HA with Vit c

the pharmacist were asked to fill out a questionnaire in which they evaluated the treatment effects that they had observed and how prescribed in pharmacy. The questionnaire results showed that all participants noted a reduction in erythematous lesions, and 96% of them reported an overall improvement in skin condition, increased elasticity, and increased hydration. Between November 2023 and January 2024, 80 formula full by pharmacist in pharmacy were enrolled from different area in Baghdad /Iraq . age range (22- 50) years old, gender , degree and experience as shown in **table 3.1**

Tabel 3.1: Study group characteristics N= 80

Parameter	Question	Number	(Percentage %)
Gender	Male	29	36%
	Female	51	64%
Age	22-30	63	79%
	31-40	12	15%
	41-50	4	5%
	More than 51	1	1%
Specialization	Pharmacist	77	96%
	Physician	3	4%
Qualifications	Ph.D.	10	13%
	M.Sc.	8	10%
	Bachelor	60	75%
	Diploma	2	3%
Experience	1-3 year	35	44%
	4-6 year	28	35%
	7-10 year	9	11%
	More than 10 years	8	10%

In the question about receive training or course of pharmacist or physician about skin care, 47.5 % of yes and 52.5% no respondents in (**Figure 3.1**). Next question some pharmacist like to training on skin care 87.5% and another no need 12.5% in **Table 3.3** and **Figure 3.2**.

Have you ever received training or course about skin care and product?

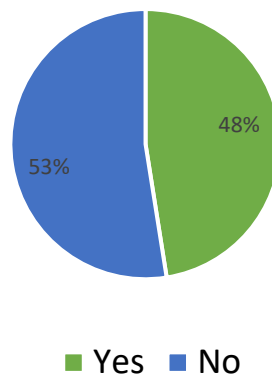


Figure 3.1 Have you ever received training or course about skin care and product?

Table 3.3. Do you like to receive training on skin care and product in the future? non =no significant

	Number	P value
Yes	70	P < 0.01
No	10	p > 0.01 non

Do you like to receive training on skin care and product in the future?

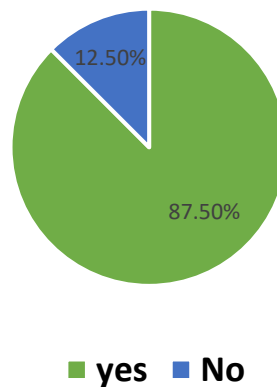


Figure 3.2 Do you like to receive training on skin care and product in the future? non =no significant

In this question about difference between the vit c and hyaluronic acid answer by pharmacist or physician ,93.75 % of yes and 6.25% no respondents in (Figure 3.3). Next question how to calculate dose of vit c and hyaluronic acid depended on? higher percentage depend on problem of skin 40% Table 3.5 and Figure 3.4

Do you know the difference between the vit c and hyaluronic acid?

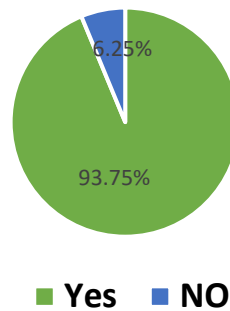


Figure 3.3 2d pie Do you know the difference between the vit c and hyaluronic acid?

Table 3.5 Do you know how to calculate dose of vit c and hyaluronic acid depended on? non =no significant

	Number	P value
Age	12	p > 0.01 non
Type of skin	16	p < 0.01
Skin condition	10	p > 0.01non
Problem of skin	32	p < 0.01
I don't know	10	p > 0.01 non

Do you know how to calculate dose of vit c and hyaluronic acid depended on

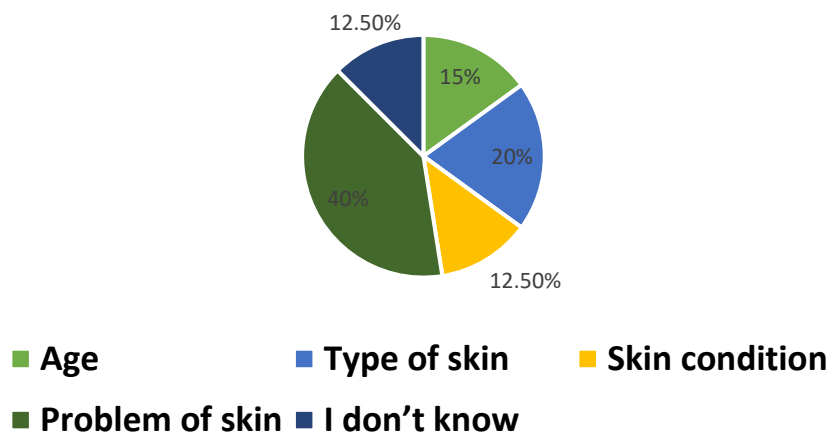


Figure 3.4 Do you know how to calculate dose of vit c and hyaluronic acid depended on? pie figure.

vitamin C serum to clean, dry skin. “As far as active ingredients go, vitamin C is quite unstable, and it’s easily affected by outside elements such as air, light and moisture,” “This is why you’ll see vitamin C serums packaged in dark brown glass bottles, rather than clear, to preserve its potency from being degraded by light.” By the same token, applying your vitamin C serum to wet or damp skin can dilute the product and even change the pH, which can affect the serum’s effectiveness. In this question about how to applied vit c on skin answer by pharmacist or physician ,55% at dry skin completely was higher percentage than other as shown in **Table 3.6** and (**Figure 3.5**). Next question how to use hyaluronic acid on skin? hyaluronic acid serums or creams, applying them to damp skin. Hyaluronic acid is one of the most popular hydrating ingredients in skin care, and applying it to skin while it’s still damp after cleansing, bathing or showering can help maximize its effectiveness.

higher percentage 66.25% of Wet skin after wash with water was answer, **Table 3.7 and Figure 3.6.**

Table 3.6 Do you know (pharmacist in pharmacy) how to applied vit c on skin? non =non-significant

	Number	P value
Dry skin completely	44	p is < 0.01
Wet skin after wash with water	26	p is < 0.01
I don't know	10	p is > 0.01 non

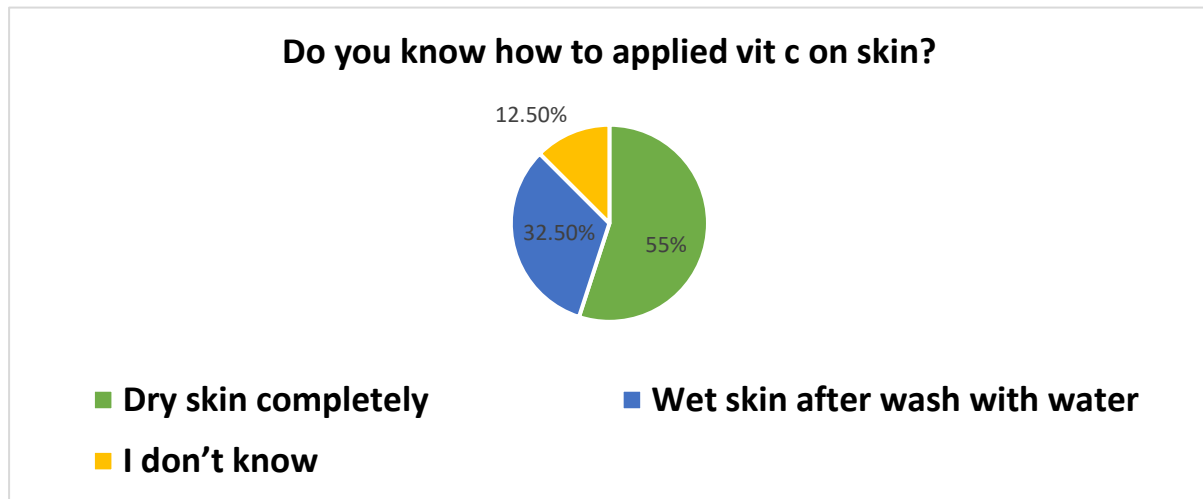


Figure 3.5 pie of (pharmacist in pharmacy) applied vit c on skin?

Table 3.7 Do you Know how to use hyaluronic acid on skin? non = no significant.

	Number	P value
Dry skin completely	20	p is < 0.01
Wet skin after wash with water	53	p is < 0.01
I don't know	7	p is > 0.01 non

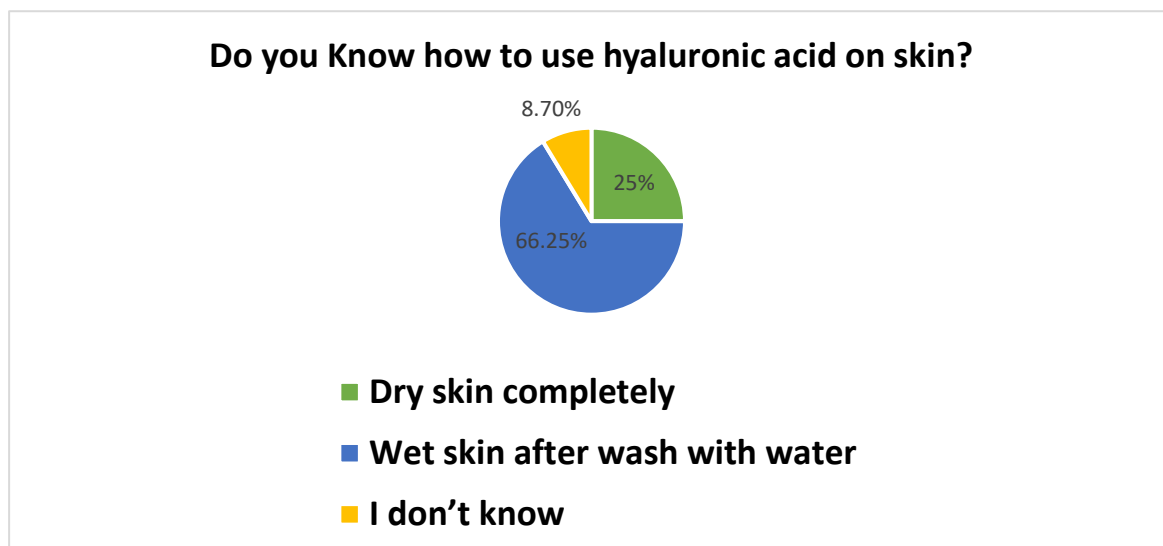


Figure 3.6 pie of use hyaluronic acid on skin.

Combination treatments, however, are far more effective for the skin. that proving to be even more effective at minimizing dark spots. These combination treatments include several acids, such as glycolic acid and lactic acid, hyaluronic acid which, when used together, and with vit c can be much more potent than when used separately. Since hyaluronic acid helps keep

skin moisturized and vitamin C protects from sun damage and can help fade skin discoloration, the two make an ideal pairing. Cosmetics incorporating HA also contain in their formulation different plant extracts, vitamins, amino acids, peptides, proteins, saccharides, probiotics, and even gold or malachite extract. Although these additional active ingredients can cause some minor side effects, they can raise the market price, and sustain additional claims of the cosmetic product containing HA or HA derivatives.

In this question about how to vit c and hyaluronic acid together are effectively was higher percentage than other 68.75% as shown in **Table 3.8** and **(Figure 3.6)**.

Next question believe that drugs must be dispensed through the community pharmacy without dermatologist, deepened on cases some need specialist but skin care cosmetics not need **Figure 3.7**.

Table 3.8 Do you believe that it used of vit c and hyaluronic acid together are effectively?

	Number	P value
Yes	55	p is < 0.01
No	25	p is < 0.01

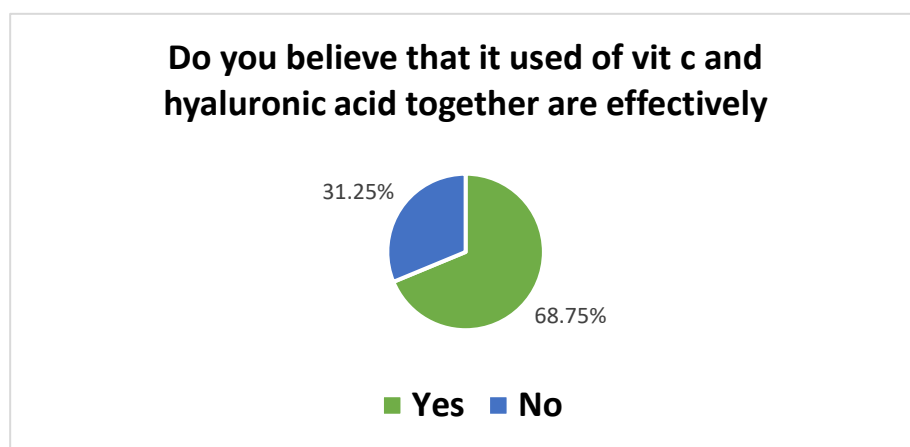


Figure 3.6 Pie of used of vit c and hyaluronic acid together are effectively

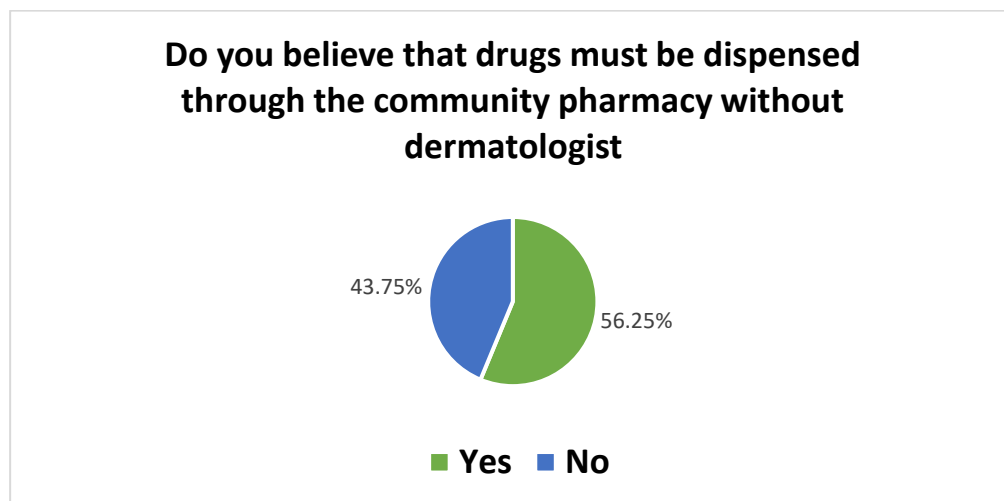
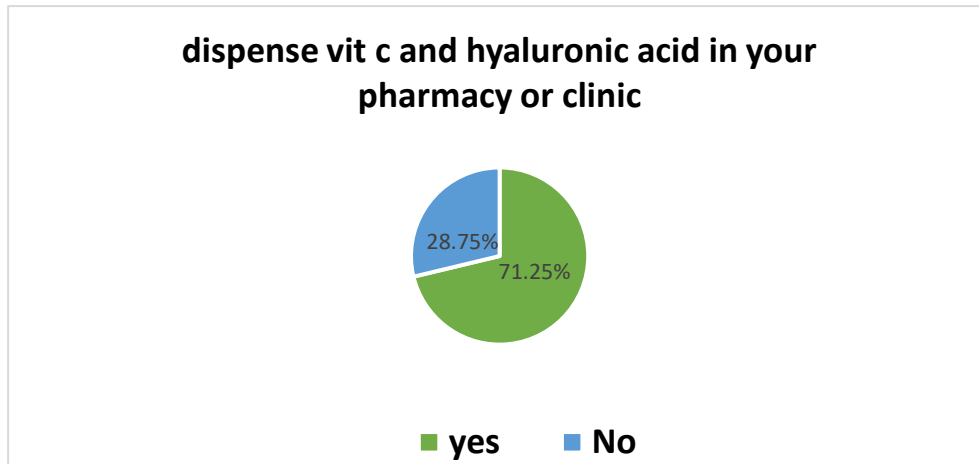


Figure 3.7 pie of that drugs must be dispensed through the community pharmacy without dermatologist.

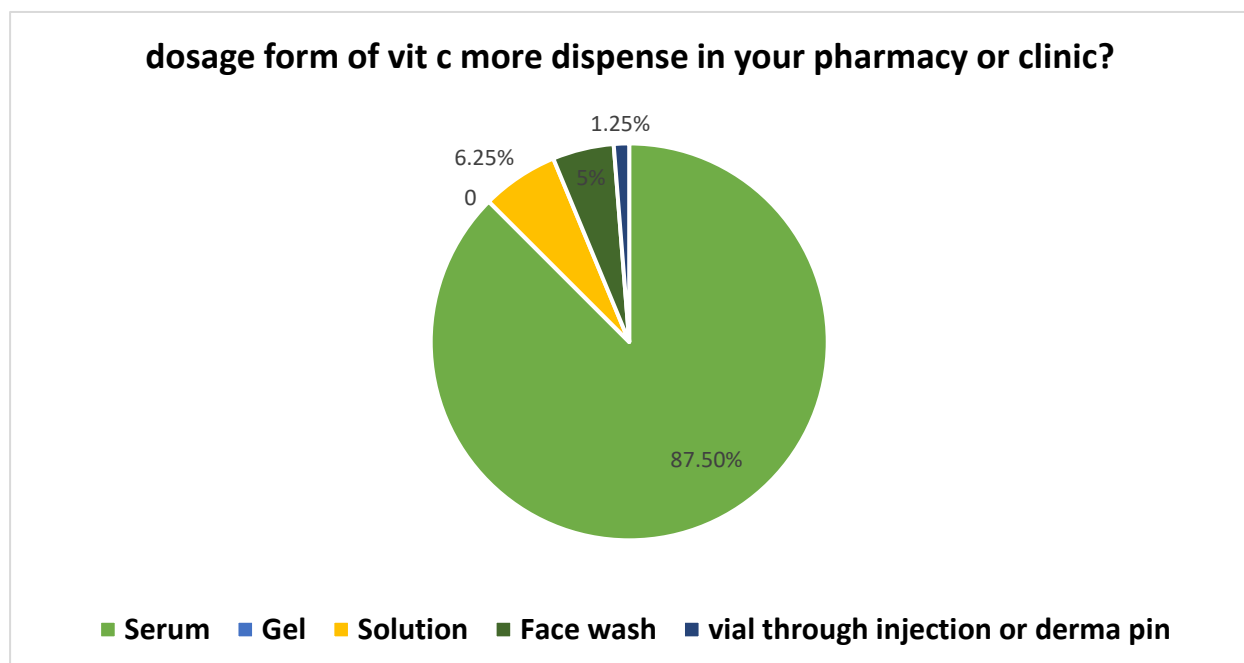
In this question about dispense vit c and hyaluronic acid in your pharmacy or clinic? greater percentage of pharmacist answer yes 71.25% , The use of hyaluronic acid and vit c in cosmetology is multidirectional. as OTC cosmetic drugs in **Table 3.10** and **(Figure 3.8)**. Next question believes that dosage form of vit c more dispense in your pharmacy or clinic? the application of ascorbic acid contributes to wrinkle reduction and increased skin elasticity by preventing collagen loss through photoaging and natural skin aging, higher percentage 87.5% of serum than other dosage form, **Table 3.11** and **Figure 3.9**.

Table 3.10 Do you dispense vit c and hyaluronic acid in your pharmacy or clinic?

	Number	P value
Yes	57	p is < 0.01
No	23	p is < 0.01

**Figure 3.8 pie dispense vit c and hyaluronic acid in your pharmacy or clinic****Table 3.11 which dosage form of vit c more dispense in your pharmacy or clinic?**

	Number	P value
Serum	70	p is < 0.01
Gel	0	
Solution	5	p is > 0.01 non
Face wash	4	p is > 0.01 non
vial through injection or derma pin	1	p is > 0.01

**Figure 3.9 pie of dosage form of vit c more dispense in your pharmacy or clinic.**

In this question about dosage form of hyaluronic acid more dispense in your pharmacy or clinic, they found a significant improvement in the treatment of tear trough deformity with HA gel filler with clinically effective and have high subject satisfaction, the anti-aging effect of HA gel as tear trough filler have also been investigated . The resulting findings showed a significantly higher effectiveness of HA gel in the tear trough rejuvenation with high level of patient tolerability and satisfaction, higher percentage of serum 81.25% than other dosage form, as shown in **Table 3.12** and (**Figure 3.10**).

Table 3.12 which dosage form of hyaluronic acid more dispense in your pharmacy or clinic?

	Number	P value
Serum	65	p is < 0.01
Gel	10	p is > 0.01 non
Solution	3	p is > 0.01 non
Face wash	2	p is > 0.01 non

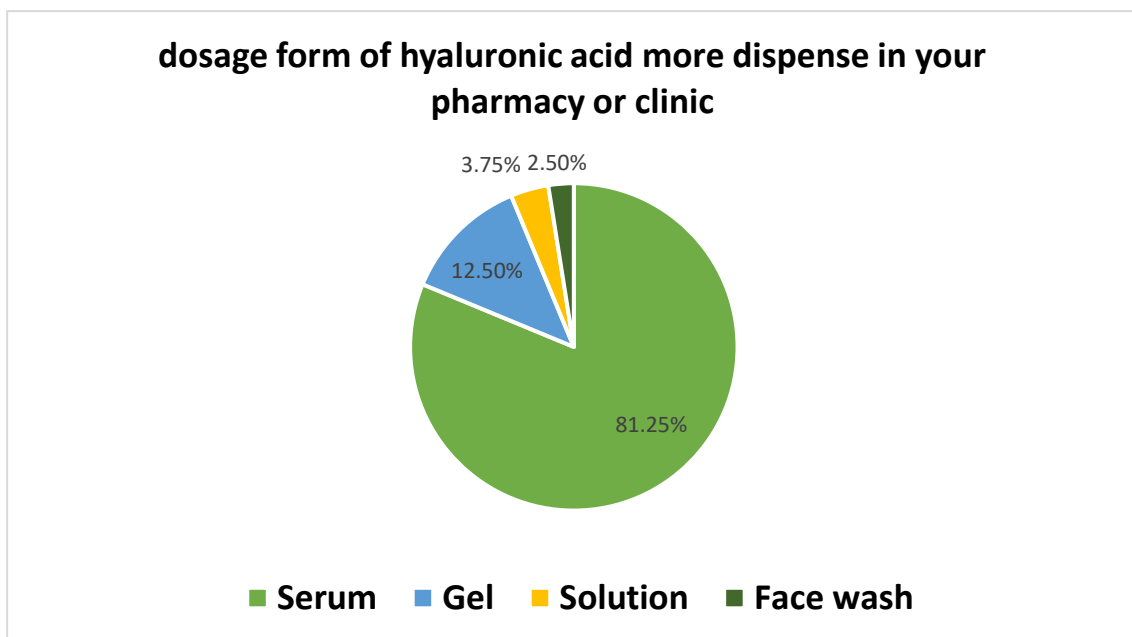


Figure 3.10 pie of HA dosage form.

In question about **dispense vit c and hyaluronic acid with other product?** Different vegetal extracts incorporated in HA and vit c available cosmetics can claim different additional effects such as antioxidant, anti-inflammatory, skin conditioning, hydrating, antiwrinkle, skin whitening, or photoprotective properties , vegetal extracts are mostly considered as safe for cosmetic use, but some minor adverse effects (e.g., irritation, sensitization, allergic contact reactions) have been reported. Literature data contains a wealth of information describing the aspects regarding composition, effects, and also adverse reactions of diverse bioactive ingredients incorporated into commercially available HA or HA derivates cosmetics **Table 3.13** show higher percentage 71.25% of yes can combination HA , vit c with other ingredients . HA, alone or in combination with lidocaine and other agents, produce promising cosmeceutical and nutricosmetic effects such as anti-aging, skin tightness and elasticity, face rejuvenation and improved aesthetic scores, reduced wrinkle scars, longevity of rejuvenating effects, and tear trough rejuvenation. The current critical appraisal and comparative analysis of various formulations of HA will enable scientists and researchers to understand pharmaceutical significance and therapeutic and clinical efficacy of HA-based formulations for skin rejuvenation.

Table 3.13 Do you dispense vit c and hyaluronic acid with other product?

	Number	P value
Yes	57	p is < 0.01
No	23	p is < 0.01

One of the active substances used in the photoaging treatments is ascorbic acid (vitamin C). It not only stimulates collagen synthesis but also acts as a cofactor for collagen-stabilizing lysine and proline hydroxylases and inhibits metalloproteinase-1 (MMP-1) activity. It also provides protection from elastin damage and inhibits the cross-linking effect that is formed in wrinkles. Vit C also inhibits melanogenesis, and, as a result, it can be used in reducing skin hyperpigmentation. Ascorbic acid indicates antioxidant properties and protects skin from UV radiation by neutralizing free radicals discussed above. 70% answer yes and 30% no as shown in **Table 3.14**

Table 3.14 Do you know mechanism of vit c and how to work locally?

	Number	P value
Yes	56	p is < 0.01
No	24	p is < 0.01

HA has been found at the periphery and at interfaces of collagen and elastin fibers where it facilitates holding collagen and elastin in a proper configuration. In the aged skin, these connections with HA are particularly absent, which may contribute to the disorganization of collagen and elastin fibers might lead to the presence of skin fine line, wrinkle and nasolabial folds. HA has become one of the most crucial ingredients in the cosmetic as well as nutricosmetic products. Almost all products having moisturizing, skin protective, and anti-aging properties consist of HA. It has been acknowledged for its ability to replenish moisture in the skin. The water holding ability of HA results in softer, smoother, and radiant skin. The hydration of the skin also leads to slow down the wrinkle formation and improves deep fine lines and already developed wrinkles which generally appear with age. The skin hydration and antioxidant effects of HA also promote cell regeneration and stimulate production of collagen due to its nutricosmetic effects. There are various products of HA being used as dermal filler for cosmetic procedure. HA is non-toxic and non-sensitizing, therefore it is safely used for all types of skin with no risk of allergic reactions, as shown in **Table 3.15**.

Table 3.15 Do you know mechanism of hyaluronic acid and how to work locally?

	Number	P value
Yes	53	p is < 0.01
No	27	p is < 0.01

An important effect of ascorbic acid and HA is the reduction in erythema. moisturization Sensitive, reactive, erythema-prone skin is a particular challenge for dermatologists, significantly alleviated redness and reduced skin reactivity as shown below **table 3.16**.

Table 3.16 Do you warn/advise patients about the expected adverse drug reactions associated with certain drugs (hyaluronic acid and vit c)?

	Number	P value
Yes	66	p is < 0.01
No	14	p is < 0.01

Hyaluronic acid has viscoelastic and hygroscopic properties with a capacity to retain skin moisture and help prevent skin dryness, atrophy, and loss of elasticity as shown in **Table 3.17**.

Table 3.17 what is the indication of hyaluronic acid in your pharmacy or clinic?

	Number	P value
Antiaging	31	p is < 0.01
Depigmentation	5	p is > 0.01 non
Moisturization	33	p is < 0.01
Skin regeneration	4	p is > 0.01 non
Others	7	p is > 0.01 non

Skin care training course very important to correct dispensing skin care drugs depending on cases, higher percentage was agree 53.75% as mention in **Table 3.18**.

Table 3.18 Physicians and pharmacists, must be trained on skin care product?

	Number	P value
Strongly agree	30	p is < 0.01
Agree	43	p is < 0.01
Disagree	3	p is > 0.01 non
Strongly Disagree	3	p is > 0.01 non
Not sure	1	p is > 0.01 non

In the “Before buying and performing a cosmetology treatment by a cosmetologist, do you ask about the properties and effects of the treatment?” question, 87.5% of the respondents answered “Yes” (Table 3.19) significant data.

Table 3.19 Before buying and performing a cosmetology treatment by a cosmetologist, do you know the properties and effects of the treatment?

	Number	P value
Yes	70	p is < 0.01
No	10	p is > 0.01 non

3.2.1 hyaluronic acid

In the next “Have you used any cosmetology services with hyaluronic acid and vit c before?” question, “agree” was selected by 80 % of the respondents as shown in Table (3.20).

Table 3.20 Have you advised patient to use any cosmetology services with hyaluronic acid and vit c before?

	Number	P value
Agree	64	p is < 0.01
Disagree	9	p is > 0.01 non
Other	7	p is > 0.01 non

In the question about post-treatment effects, (56.25%) of respondents noticed “skin hydration” Table 3.21 and (Figure 3.11). Filling wrinkles (20%), skin smoothing (11.25%) was second response “Firming (3.75%) and tightening of the skin (6.25%)” was the third most frequently indicated response, and other (2.5%) ,all by pharmacist answer.

Table 3.21 Indicate which effects have been noticed by you of hyaluronic acid?

	Number	P value
Skin hydration	45	p is < 0.01
Skin smoothing	9	p is > 0.01 non
Filling wrinkles	16	p is < 0.01
Skin firming	3	p is > 0.01 non
tightening	5	p is > 0.01 non
Other	2	p is > 0.01

effects have been noticed by you of hyaluronic acid

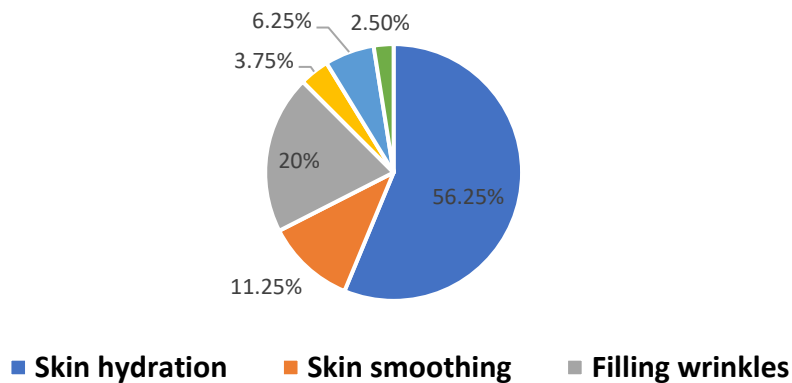


Figure 3.11 pie effects have been noticed by you of hyaluronic acid.

In the “What part of the face does the selected treatment apply *hyaluronic acid*?” question, the most frequent answer was the “cheeks” (72.5%) Table 3.22 and (Figure 3.12). This was followed by the “forehead” (10 %), nasolabial fold the (5 %), and the “nose” (3.75%). “lips” 3.75%, other 3.75% of responders while the “chin” obtained 1.25%. In the “other” category, respondents mentioned the whole face, lower jaw, chin, mouth corners, and the valley of tears.

Table 3.22 What part of the face does the selected treatment apply to of hyaluronic acid?

	Number	P value
lips	3	p is > 0.01 non
nosabial fold	4	p is > 0.01 non
cheeks	58	p is < 0.01
forehead	8	p is > 0.01 non
chin	1	p is > 0.01 non
nose	3	p is > 0.01 non
Other	3	p is > 0.01 non

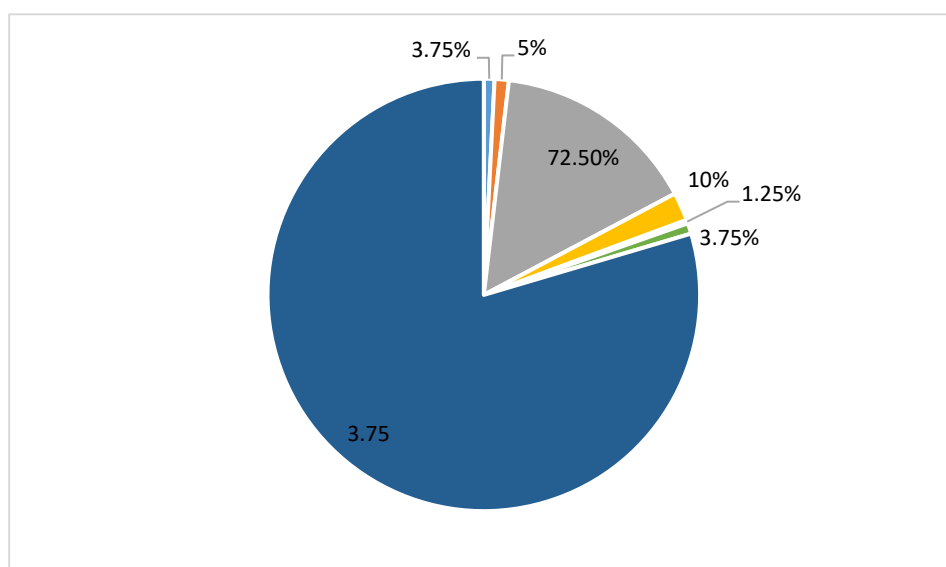


Figure 3.12 pie of part of the face does the selected treatment apply to of hyaluronic acid.

Respondents by pharmacist but most frequently chose “Yes” to the “*Did you have any knowledge of hyaluronic acid before the cosmetic procedure?*” question **Table 3.23 and (Figure 3.13)**. Statistical analysis showed that regardless of monthly earnings, respondents look for information about HA before a cosmetic procedure (p significant).

Table 3.23 Did you have any knowledge of hyaluronic acid before the procedure?

	Number	P value
Yes	65	p is < 0.01
No	15	p is < 0.01

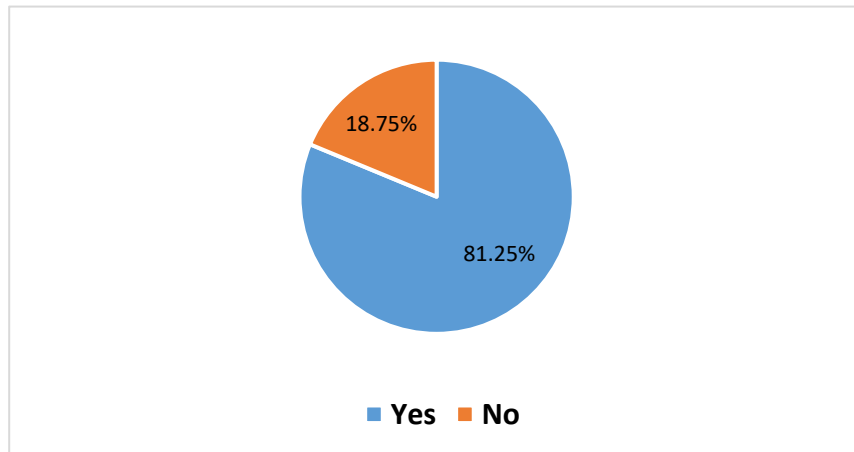


Figure 3.13 knowledge of hyaluronic acid before the procedure

Responses to the “*How do you assess the degree of hyaluronic acid interference in the skin?*” question were as follows: “average” (67.5%), “high” (17.5 %), and “low” (15 %), **Table 3.24 , (Figure 3.14)**. A similar correlation was shown for earnings, with the two lowest tiers of respondents most likely to indicate “average” (p was significant).

Table 3.24 How do you assess the degree of hyaluronic acid interference in the skin?

	Number	P value
Low	12	p is > 0.01
Average	54	p is < 0.01
High	14	p is < 0.01

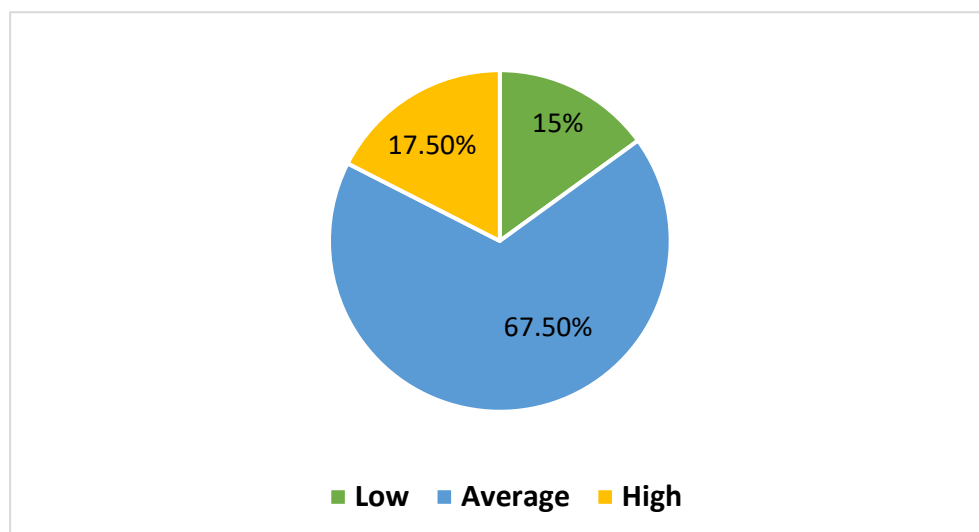


Figure 3.14 pie assess the degree of hyaluronic acid interference in the skin.

question 52.5% of respondents by pharmacist noticed answered “Yes” to the “*Have you experienced any side effects after the hyaluronic acid treatment?*” question (Table 3.25).

Table 3.25 Have you experienced any side effects after the hyaluronic acid treatment?

	Number	P value
Yes	42	p is < 0.01
No	38	p is < 0.01

Pharmacist answer. The most common side effects were Itchy” skin “52.5, “other” Joint pain ,Headache and Bleeding and bruising when taken orally (33.75%), “edema” 6.25% ,“bluish discoloration of the skin”(5%), and “Distoron of facial features”(2.5%), where the respondents additionally indicated pain, acid clumping in the mouth, and papules ,Table 3.26 and (Figure 3.15).

Table 3.26 Please indicate what these side effects of hyaluronic acid were?

	Number	P value
Edema	5	p is > 0.01
Itchy skin	42	p is < 0.01
Distoron of facial features	2	p is > 0.01
Bluish discoloring of the skin	4	p is > 0.01
Other	27	p is < 0.01

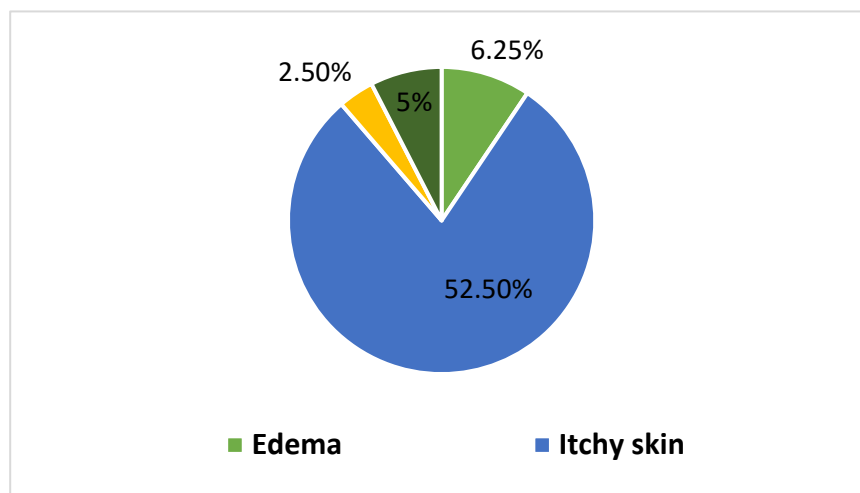


Figure 3.15 indicate what these side effects of hyaluronic acid were?

“In addition to performing treatments with hyaluronic acid, do you use external preparations containing this ingredient?”. 75 % of respondents answered yes affirmatively (Table 3.27) to this question. A statistical analysis showed that external preparations containing HA are used (*p less than 0.01*).

Table 3.27 In addition to performing treatments with hyaluronic acid, do you use external preparations containing this ingredient?

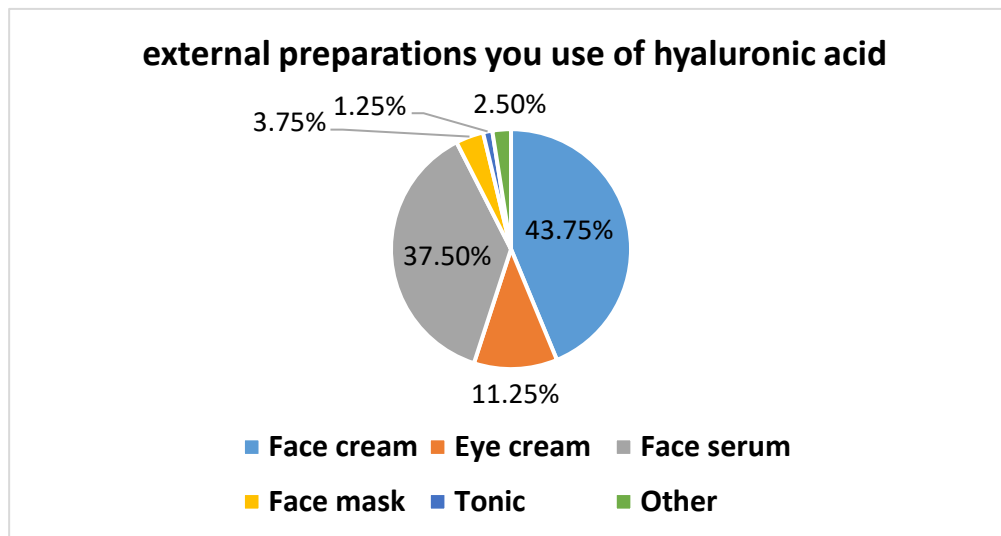
	Number	P value
Yes	60	p is < 0.01
No	20	p is < 0.01

3.2.1.1 Topical HA preparations

Preparations most frequently indicated by respondents were “face cream” and “face serum” with (43.75%) and (37.5 %), respectively (Table 3.28), (Figure 3.16) . The next most frequently chosen answer (11.25%) was “eye cream” 3.75% of respondents declared using “face mask” and 2.5% “other” the respondents indicated hair mask, lip gloss, essence, peeling, facial emulsion, drinking collagen, acid preparations, and intimate hygiene lotion. In the “tonic” answers (1.25 %),

Table 3.28 Indicate which external preparations you use of hyaluronic acid?

	Number	P value
Face cream	35	p is < 0.01
Eye cream	9	p is > 0.01
Face serum	30	p is < 0.01
Face mask	3	p is > 0.01
Tonic	1	p is > 0.01
Other	2	p is > 0.01

**Figure 3.16 pie of external preparations you use of hyaluronic acid**

In the next question, “*What motivates you to purchase such a product in patient on your pharmacy ?*”, the most frequent response was “promotion in social media” (43.75%). In turn, 25% indicated “own choice,” 10 % “recommended by doctor or pharmacist,” 7.5 % “advertising” and “other” (Table 3.29) and (Figure 3.17). and 5% suggest by friends, 1.25% proposed a beautician/cosmetologist's suggestion, the family's suggestion, and the simultaneous influence of all the abovementioned answers. It was also shown that it is women who are most likely to make purchases based on their own choice . Purchases on their own are being made mostly by women.

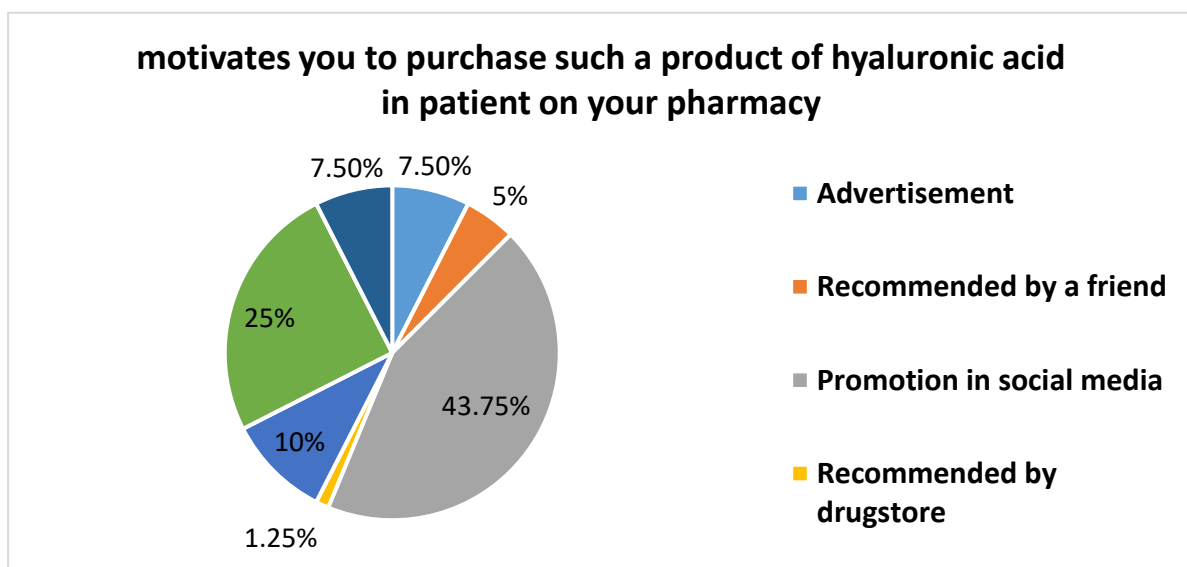
**Figure 3.17 motivates you to purchase such a product of hyaluronic acid in patient on your pharmacy.**

Table 3.29 What motivates you to purchase such a product of hyaluronic acid in patient on your pharmacy?

	Number	P value
Advertisement	6	p is > 0.01
Recommended by a friend	4	p is > 0.01
Promotion in social media	35	p is < 0.01
Recommended by drugstore	1	p is > 0.01
Consultant/ doctor or pharmacist	8	p is > 0.01
Own choice	20	p is < 0.01
Others	6	p is > 0.01

In relation to the previous question, respondents were asked “*Were the promises of the manufacturer of the given cosmetic fulfilled?*”. 60 % of respondents chose “Yes” while 28.75 % of pharmacist no opinion, 11.25% chose “No” (**Table 3.30**). It was also shown that people who previously used cosmetology services which entailed HA noticed compliance of the manufacturer's promise with the obtained effect when using a specific external preparation on the skin .

Table 3.30 Were the promises of the manufacturer of the given cosmetic fulfilled?

	Number	P value
Yes	48	p is < 0.01
NO	9	p is > 0.01
I have no opinion	23	p is < 0.01

72.5 % of the respondents answered yes in the affirmative to the “*Do you think that preparations used externally are able to penetrate deep into the skin?*” question and 27.5% answered No (**Table 3.31**).

Table 3.31 Do you think preparations used externally are able to penetrate deep into the skin?

	Number	P value
Yes	58	p is < 0.01
No	22	p is < 0.01

Most respondents (81.25%) in the last question “*Is regular use of anti-wrinkle preparations with hyaluronic acid able to replace cosmetology treatment with hyaluronic acid?*” answered “No” while 18.75% answered affirmatively (**Table 3.32**).

Table 3.32 Is regular use of anti-wrinkle preparations with hyaluronic acid able to replace cosmetology treatment with hyaluronic acid?

	Number
Yes	65
No	15

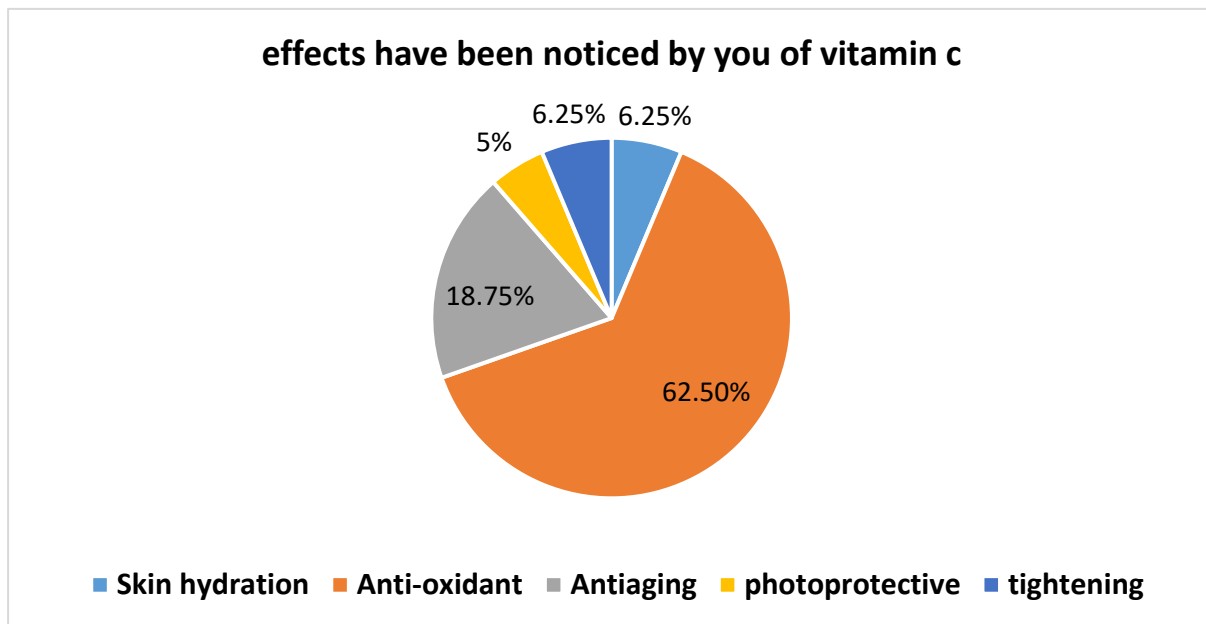
3.2.2 Vitamin c

vitamin C due to its anti-oxidant property and potentially beneficial biological activities for inhibiting aging and that can protect the cell from oxidative stress, disorganization of chromatin, telomere attrition, and prolong the lifetime also ascorbic acid (vitamin C). It not only stimulates collagen synthesis but also acts as a cofactor for collagen-stabilizing lysine and proline hydroxylases and inhibits metalloproteinase-1 (MMP-1) activity. It also provides protection from elastin damage and inhibits the cross-linking effect that is formed in wrinkles. Vitamin C also inhibits melanogenesis, and, as a result, it can be used in reducing skin hyperpigmentation. Ascorbic acid indicates antioxidant properties and protects skin from UV radiation by neutralizing free radicals [48].

In the question about post-treatment effects, 62.5 % of respondents noticed antioxidant (**Table 3.33 and Figure 3.18**). “antiaging” was 18.75%, “photoprotective “5%”, and skin hydration an tightening 6.25% ,“other,” where with lip augmentation (1.25% was indicated most frequently.

Table 3.33 Indicate which effects have been noticed by you of vitamin c?

	Number	P value
Skin hydration	5	p is > 0.01
Anti-oxidant	50	p is < 0.01
Antiaging	15	p is < 0.01
photoprotective	4	p is > 0.01
tightening	5	p is > 0.01
Other	1	p is > 0.01

**Figure 3.18 pie of Observed effects after vit c application**

The greatest reduction was observed on the cheeks after applying vitamin C. In the “What part of the face does the selected treatment apply to?” question, the most frequent answer was the “cheeks” (50 %), forehead” and “nose “(12.5%) In the “other” 7.5% category, respondents mentioned the whole face, lower jaw, chin, mouth corners, and the valley of tears. “lips” , “nasolabial fold” (6.25%) (Table 3.24) (Figure 3.19). This was followed by the, chin (5 %).

4. DISCUSSION

Dermal fillers have become one of the most frequently used products to improve the appearance of the skin. Their growing importance in recent years reflects the growing demand for new products on the market. According to the American Academy of Plastic and Aesthetic Surgeons, 2.9 million females worldwide received injections with soft tissue fillers in 2020. The distinguishing features of HA fillers are particle size, type of cross-linking agent used, degree and percentage of HA cross-linking, and amount of free (unmodified) HA present. All these physical and chemical characteristics influence the clinical characteristics of the filler, such as clinical indication, ease of injection, degree of tissue filling, longevity, clinical appearance, and side effects [49]. vit c Various mediators with anti-inflammatory and anti-oxidant properties might be probable competitors of vitamin C for the improvement of innovative anti-aging treatments. [50].

Process of HA reduction in the human body begins only after the age of 25. After the age of 40, its level decreases by 50% compared to its amount at the age of 20. Around the age of 80, HA is completely lost, resulting in a reduction in overall density and the volume of the extracellular matrix. The skin becomes rough, dull, and less nourished, and wrinkles appear on its surface [51,51,52]. None of the persons reported any adverse effects. Their occurrence depends on the causative factor belonging to one of three categories: depending on the person performing the procedure, depending on the preparation used during the procedure, and depending on the person who undergoes the procedure [53]. Preparations containing HA applied externally were an important issue also raised in the survey. As well as the price difference (preparations used externally Face creams), play a significant role here. This is by far the easiest way to improve the quality of the skin on the entire face because we can apply such a cream strictly to its entire area, not individual parts. Face serum of HA had a slightly smaller share in the survey than vit c serum more response absorption [52]. survey that increasing awareness of pharmacist in

pharmacy about prescribed skin care to consumers. The so-called “influencers,” as the name suggests, are influential people who build an envelope of authority in their respective areas. In this case, it is the beauty sphere. Such people usually test various types of cosmetics to be able to form an opinion and propose appropriate conclusions by pharmacist depend on case and disease of skin. This is a controversial issue, especially when it comes to skincare.

As a result, the purchased products may not meet the requirements of proper care for their skin type consultants by pharmacist. The same applies to product recommendations by friends. It may not always be the right choice, due to possible differences in the requirements of a given skin type. The least important for the respondents are advertisements, recommendations from drugstore consultants, or other, for example, recommendations by family members. The packaging, and above all, the manufacturer's promises, which are usually placed on the outside of the package play an important role in making a decision to buy a specific product in pharmacy by pharmacist [55].

This result may be due to the achievement of a specific result, attachment to a specific brand, or the “high price equals high quality” mechanism. Respondents were split evenly when it came to the question on the ingredients found in preparations for external use penetrating deep into the skin.

5. CONCLUSIONS

As shown, the efficacy of hyaluronic acid and vitamin c depends largely on the molecular weight, claiming different effects like hydrating, regenerating, and anti-ageing. therefore , there have been a multitude of commercially available cosmetic formulations which incorporate HA or HA derivatives. Categorized from mass-market to prestige or luxury products, it is important to mention that finished products containing HA represent only a small percentage, and the majority of the total products contain sodium hyaluronate. Cosmetics incorporating HA or NaHA also contain in their formulation different plant extracts .HA plays a significant role in both cosmetology procedures related to injections (dermal fillers) and non-invasive skin care (topical preparations). Regular use of HA topical care preparations will not replace the injection of HA, but it will help maintain proper skin hydration and prevent excessive dryness.

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