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HYPERPIGMENTATION AFTER MICRONEEDLING VS. CHEMICAL PEEL: A COMPARATIVE STUDY WITH STANDARDIZED AFTERCARE

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Abstract

Background

Hypertrophic hyperpigmentation, especially melasma, and post-inflammatory hyperpigmentation (PIH) represent a widespread skin problem with a huge number of patients. Hyperpigmentation is usually treated with microneedling and chemical peels. Their synergistic effect on pigmentation has, however, not been fully studied.

Methodology

The research deals with 52 patients (Cross sectional study design) with Group A (treated by Sunblock, Moisturizer, Vitamin C, and azelic acid serum 7 percent) and Group B (treated by Sunblock, Moisturizer, Vitamin C, and Niacinamide Serum). The participants were evaluated on the reduction of hyperpigmentation, the appearance of skin and satisfaction overall.

Objective

To compare the efficacy of combined microneedling and topical therapy in decreasing hyperpigmentation. To compare patient satisfaction and improvement in appearance of two different treatment protocols.

Results:

Group A showed much improved pigmentation reduction ($p < 0.05$) and improvement in appearance than Group B. Group A patients had a higher level of satisfaction (85%) and adherence to the treatment regimen (90%), along with a better level of improvements in skin texture. The general performance of Group A was better in all the aspects of treatment.

Conclusion:

This study indicates that Azelaic Acid Serum combined with microneedling is a better option to treat hyperpigmentation than Niacinamide Serum. Group A had improved treatment results regarding pigmentation and skin texture and appearance. Future research ought to incorporate bigger sample sizes and extended follow up. Combination therapy can provide a better approach to control hyperpigmentation.

INTRODUCTION

Hyperpigmentation is a dermatological disorder that is characterized by localized or diffuse darkness of the skin as a result of hyperproduction or deposition of melanin after inflammation, ultraviolet exposure or hormones. It is also commonly seen in clinical practice in patients having cosmetic procedures, in which treatment modalities are used to control melanogenesis and enhance uniformity in skin tone [1]. Hyper pigmentation is also tightly linked with skin trauma and repair

pathways with inflammatory pathways triggering melanocyte activity resulting in irregular local pigmentation. It has been shown that the combination or comparison of these modalities is vital in determining their success in the results of pigment reduction and rejuvenated skin [2].

They have also demonstrated that exposure to the sun, hormonal alterations (e.g. pregnancy, taking of oral birth control pills) and genetic predispositions are some of the factors that have led to its high prevalence. The latter are the most prevalent: melasma and post-inflammatory hyperpigmentation that is prevalent among women particularly those with an already existing history of inflammation or trauma of the skin. The most common ones include melasma and post-inflammatory hyperpigmentation, which are common among women especially those who already have a history of skin inflammation or trauma [3].

The importance of cosmetic procedures, such as microneedling and chemical peels, has come into the limelight because the procedures are effective in hyperpigmentation treatment. According to various research findings, these treatments provide a good alternative to those who experience permanent pigmentation alterations which include acnes scars, melasma, and sun damages. Such modalities act by increasing collagen synthesis, stimulating skin renewal and affecting the melanogenesis pathways which have been associated with hyperpigmentation in the dermis and epidermis [4].

Clinical trials have demonstrated that microneedling and chemical peeling have different mechanisms of action in the treatment of hyperpigmentation where microneedling causes controlled micro-injuries to trigger collagen synthesis and chemical peels utilizes exfoliating agents to exfoliate the hyperpigmented skin layers. Though the two approaches are usually employed separately, their combination has been reported to produce better results in the treatment of moderate to severe pigmentation [5].

In spite of these treatments being promising, their effectiveness and safety profile is influenced by the nature of the hyperpigmentation, skin type, and the existence of other dermatological issues. Epidemiological research indicates that such treatments are especially useful in treating post inflammatory hyperpigmentation and melasma, though their effectiveness may depend on how the person responds to the treatment and the practices he/she subjects his/her skin to. Standardized protocols of treatment and aftercare, including patient selection, are therefore important in maximizing the outcome of hyperpigmentation treatment [6].

The biochemical mechanisms of pigment synthesis in the skin are complicated biological processes in which the melanocytes are the center point. The cells called melanocytes are found in the basal layer of the epidermis and help in production of melanin, which is the skin color. The production of melanin is activated by different factors, such as UV radiation, hormonal variations, and inflammation. In hyperpigmentation, these causes activate melanogenesis resulting in excess or imbalanced production or distribution of melanin in the skin. Post-inflammatory hyperpigmentation usually appears after acne or other skin trauma, and is caused by the deposition of melanin in reaction to the inflammatory response, which is usually further worsened by the use of harsh skincare treatments [7].

Microneedling and glycolic acid chemical peels are typically used in the treatment of post-acne scarring and hyperpigmentation to treat the pathophysiology. Microneedling triggers regulated dermal micro-injuries, which both catalyze collagen synthesis and increase the absorption of topically applied agents, including antioxidants or brightening agents. Glycolic acid peels, however, act by exfoliating the skin and stimulating cell turnover which lightens areas of hyperpigmentation. The two approaches aim at disrupting the aberrant deposition of melanin by enhancing skin regeneration and minimizing the dark pigments hence redressing the root causes of pigmentation disorders [8].

It has been demonstrated that these treatments combined can complement each other and result in a better outcome because they treat several layers of the skin Their wide use is a consequence of clinical efficacy of these treatments in the management of has sensitive nature of the hyperpigmentation of the periorbital, especially periorbital, hypertrophy.

areas that require more specific and less invasive therapies [9].

Hyperpigmentation can also be in numerous forms like melasma and post-inflammatory. hyperpigmentation (PIH). Melasma is brownish or grey brown on the skin, which is usually a consequence of. hormone changes or exposure to the sun, whereas PIH is caused by skin damage, e.g. acne or trauma and dark spots are left behind after healing. Special treatment is usually needed in the two diseases. surgery, such as microneedling and chemical peeling to correct the pigment abnormalities. [10]. Less invasive treatment is known as Microneedling which has become popular in the treatment of. acne scars and hyperpigmentation. It acts by inflicting micro-injuries on the skin and causing. collagen synthesis and enhancement of the diffusion of topical agents. Used together with other words. with chemical peeling, which sheds off the epidermis, microneedling enhances the total. effectiveness in the treatment of acne scars and hyperpigmentation and especially in people and has darker skin which is prone to PIH [11].

The results of the research also show that a mixture of microneedling and other is effective. glycolic acid interventions or topical agent interventions have superior results in the reduction. of increased pigmentation by way of enhanced skin healing. This two-fold effect of stimulating Collagen production and exfoliation of the upper skin layers is useful in the treatment of melasma and PIH. This procedure has been identified to be especially helpful in patients with ancient scars of acne [12]. Moreover, appropriate periprocedural skin care practices, as suggested by aesthetic practitioners, go a long way in improving the results of the treatment process in both cases, i.e., microneedling and chemical peels. These treatments are enhanced by a regulated skincare plan prior to and subsequent to the operations to ensure patients achieve the most outcomes and mitigate any unwanted effects such as PIH [13].

Recent network meta-analyses prove that microneedling along with other modalities like lasers or topical treatments is a better solution to acne scars and hyperpigmentation, which brings long-term benefits in terms of skin texture and pigmentation. The results highlight the need to use personalized treatment plans to support the different needs of patients with different forms of hyperpigmentation [14]. Microneedling functions through the production of micro-injuries in the skin in a controlled manner, which stimulates the normal healing process of the body and causes the production of collagen and elastin. This is useful in the treatment of acne scars and melasma since it will enhance the texture of the skin and will decrease the hyperpigmentation which is deposited on the dermal layers [15].

Chemical peels that entail the application of exfoliating acids to the skin, aid in peeling off the outer layers of the damaged skin to expose the healthier and more even skin underneath. The process is especially useful in the treatment of melasma and other pigmentation disorders through the removal of the epidermal layers where excess of melanin is deposited [16]. The action of the chemical peels is dependent on the depth levels of the peel applied; this can be superficial or deep to act on different layers of skin. Melasma and moderate acne scarring are common indicators of medium-depth peels that induce the disruption of pigment and stimulation of new evenly pigmented skin cells [17].

Microneedling and chemical peels are essential in standardized aftercare to maximize the outcomes. It assures of healing, reduces complications such as post-inflammatory hyperpigmentation, and improves the recovery of the skin by keeping it hydrated and not exposing it to the sun, which would cause new pigmentation [18].

Rational of the study

This study will compare the effectiveness of microneedling and chemical peels in the treatment of hyperpigmentation, and how they reduce pigment irregularities include melasma and post-inflammatory hyperpigmentation. The two treatments are frequently employed to treat the skin discoloration, and their action mechanisms and effects might vary. Standardized aftercare procedures will enable a more precise evaluation of the effectiveness of each treatment used in facilitating healing and eliminating pigmentation recurrence. This research aims to present evidence-based suggestions that clinicians can use directly to

choose the most effective treatment of hyperpigmentation by directly comparing these modalities.

OBJECTIVE

To make comparisons between the efficacy of combined microneedling and topical therapy in reducing hyperpigmentation. To compare patient satisfaction and improvement in appearance of two different treatment protocols.

MATERIAL AND METHODS

4.1: Study Design:

The Cross sectional study design was used.

4.2: Settings:

Clinic 1: Aesthetic World by Dr Irfan Javaid
Clinic 2: The Dermaaesthetics clinic

4.3: Study Duration:

Our study period was 4 months after we had finished synopsis.

4.4: Sample Size:

There were 52 patients with clinical manifestations of hyperpigmentation in this study. The groups were split into two with each group comprising 26 participants:

Group A: Microneedling,
Group B: Chemical peeling.

4.5: Sampling Technique:

The non probability convenience sampling technique used in this study.

4.6: Sample Selection:

4.6.1: Inclusion Criteria:

Participants aged 18-50 years. Patients with Fitzpatrick skin types III-VI since they are more susceptible to hyperpigmentation (melasma and PIH). Moderate to severe post-inflammatory hyperpigmentation (PIH) or melasma, which have been confirmed by a clinical examination. Participants must be willing to comply with study protocols and provide informed consent.

4.6.2: Exclusion Criteria

Active skin conditions such as eczema, rosacea or active acne. Pregnant or breastfeeding mothers because of the possible dangers to the unborn or baby. Patients who underwent facial cosmetic surgeries like laser resurfacing, deep chemical peels, or other invasive surgeries within 6 months. Uncontrolled systemic diseases (e.g., diabetes, autoimmune disease) that can predispose the participants to disrupt the healing process of the skin or make the outcome of the treatment more complicated.

4.7: Equipment(s):

Portable microneedling device that is adjustable in depth of the needle. Depending on skin type and pigmentation severity, chemical peel solutions (e.g., glycolic acid, trichloroacetic acid).

4.8: Scanning Technique:

High-resolution digital photography to measure changes in pigmentation at baseline and post-treatment. Analysis systems can accurately determine the scar depth, skin texture, and level of hyperpigmentation before and after the treatment.4.9 Variables in the study

4.9.1 Dependent Variable:

Hyperpigmentation Reduction: Clinical grading scale or photographic comparison of

pigmentation (PIH and melasma) at baseline and end point.

4.9.2 Independent Variables:

Treatment Type: Microneedling compared to chemical peels in the treatment of hyperpigmentation.

Standardized Aftercare: Skin care, sun protection and moisturizing after treatment.

Skin Type: According to Fitzpatrick scale, it determines the results of the treatment and the risk of pigmentation.

Age and Gender: These demographic factors may impact the treatment's effectiveness and skin response.

RESULTS

Table 1: Descriptive statistics

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gender	52	1	2	1.54	.503
Skin Type	52	1	6	3.52	1.721
Treatment Group	52	1	2	1.50	.505
Valid N (listwise)	52				

The Descriptive Statistics indicate a balanced sample with a slight male dominance (mean = 1.54) and a variety of skin types (mean = 3.52). The groups of treatment are balanced (mean equal to 1.50), with the same number of representatives of the Group A and the Group B. There is moderate variation in gender and skin types across the sample.

Figure 1: Gender distribution

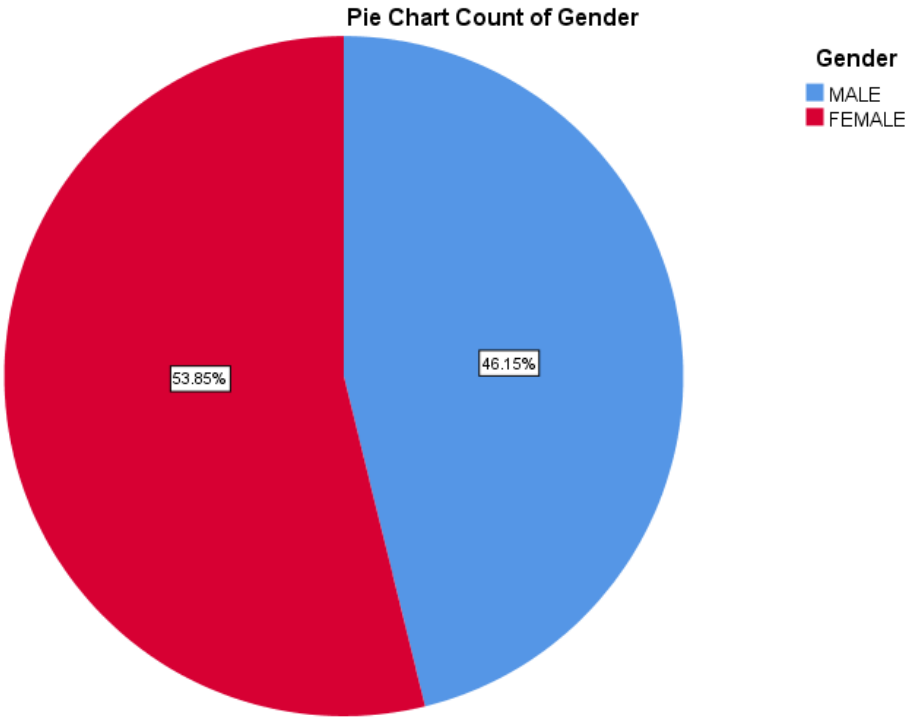


Figure 2: Skin types

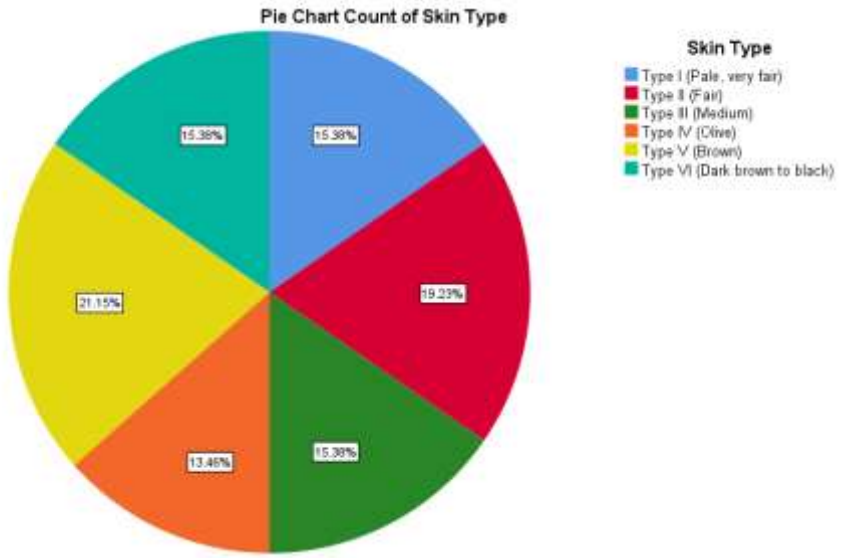


Figure 3: Treatment group A and B.

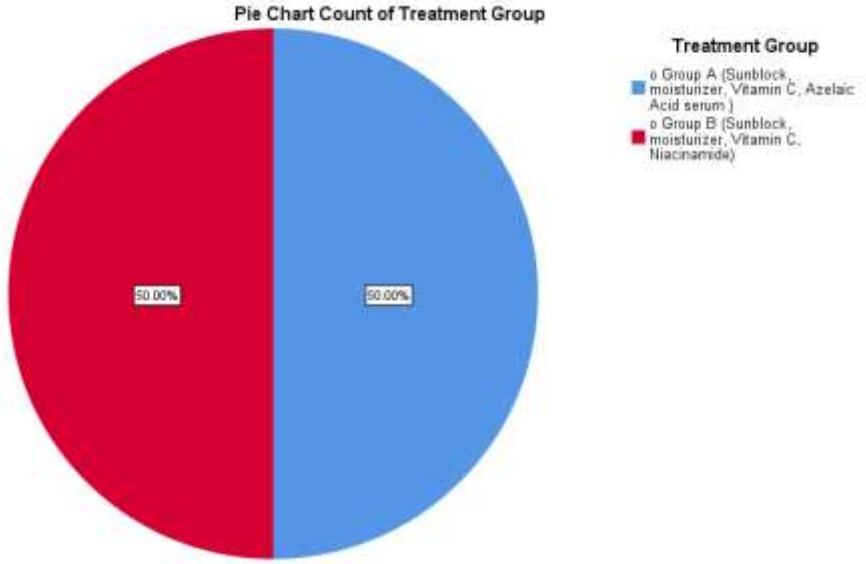


Table 2: Gender by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Gender	MALE	Count	14	10	24
		% within Gender	58.3%	41.7%	100.0%
	FEMALE	Count	12	16	28
		% within Gender	42.9%	57.1%	100.0%

Total	Count	26	26	52
	% within Gender	50.0%	50.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.238[a]	1	.266		
Continuity Correction[b]	.696	1	.404		
Likelihood Ratio	1.243	1	.265		
Fisher's Exact Test				.404	.202
Linear-by-Linear Association	1.214	1	.270		
N of Valid Cases	52				

The data presented in this table indicate the Gender distribution in the Treatment Groups (Group A and B). The findings show that a larger percentage of Females in Group B (57.1%), and a larger percentage of Males in the Group A (58.3%) and no any significant correlation between the gender and treatment Group (p = 0.266) shows no any difference in the gender distribution in two groups.

Figure 4: Gender by Treatment Group

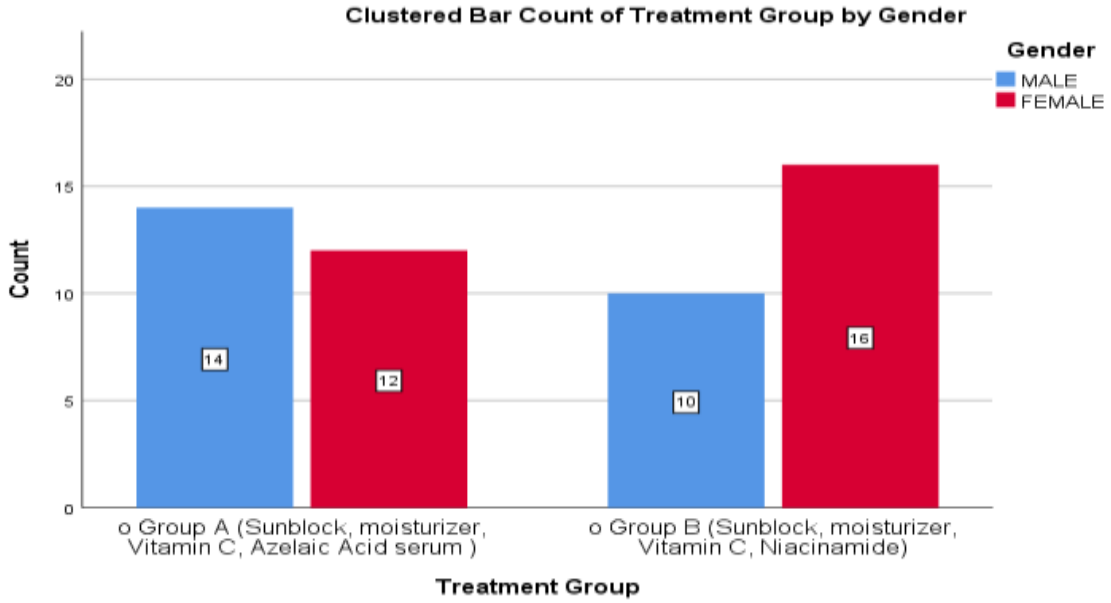


Table 3: Recommend by Treatment Group

Crosstab

			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Recommend	YES	Count	12	9	21

		% within Recommend	57.1%	42.9%	100.0%
	NO	Count	11	9	20
		% within Recommend	55.0%	45.0%	100.0%
	Maybe	Count	3	8	11
		% within Recommend	27.3%	72.7%	100.0%
Total		Count	26	26	52
		% within Recommend	50.0%	50.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.901[a]	2	.234
Likelihood Ratio	2.989	2	.224
Linear-by-Linear Association	2.087	1	.149
N of Valid Cases	52		

The table shows how the Recommendation responses were distributed in the Treatment Groups. Group A contained 12 Yes recommendations (57.1) as opposed to 9 in Group B and 3 Maybe responses in Group A as opposed to 8 in Group B. The difference between Recommendation and Treatment Group (p = 0.234) was not significant, which means that the likelihood of recommendation is the same within the two groups.

Figure 5: Recommend by Treatment Group

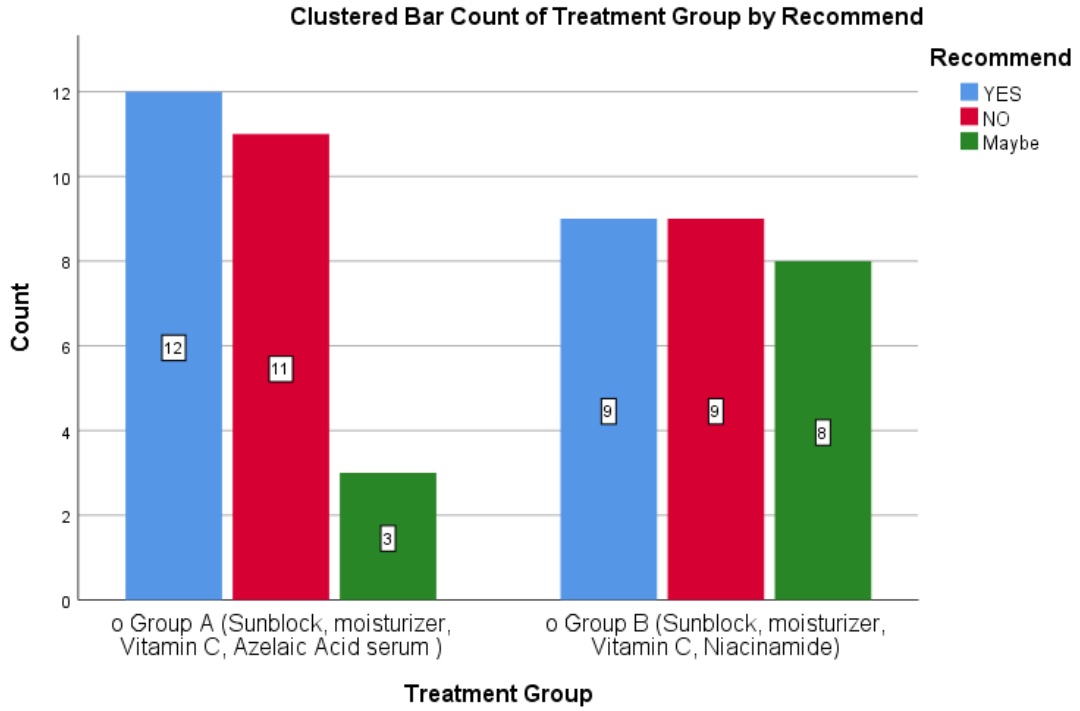


Table 4: Aftercare by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Aftercare	YES	Count	8	12	20
		% within Aftercare	40.0%	60.0%	100.0%
	NO	Count	8	7	15
		% within Aftercare	53.3%	46.7%	100.0%
	Partially	Count	10	7	17
		% within Aftercare	58.8%	41.2%	100.0%
Total		Count	26	26	52
		% within Aftercare	50.0%	50.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.396[a]	2	.498
Likelihood Ratio	1.404	2	.496
Linear-by-Linear Association	1.305	1	.253
N of Valid Cases	52		

The distribution of the Aftercare responses between these two treatment groups can be seen in this table. Group B (60%) had more patients following the aftercare protocol ("Yes") to compare to Group A (40%).Aftercare, Treatment Group do not shows significant difference, showing no difference in adherence to aftercare in the two groups.

Figure 6: Aftercare by Treatment Group

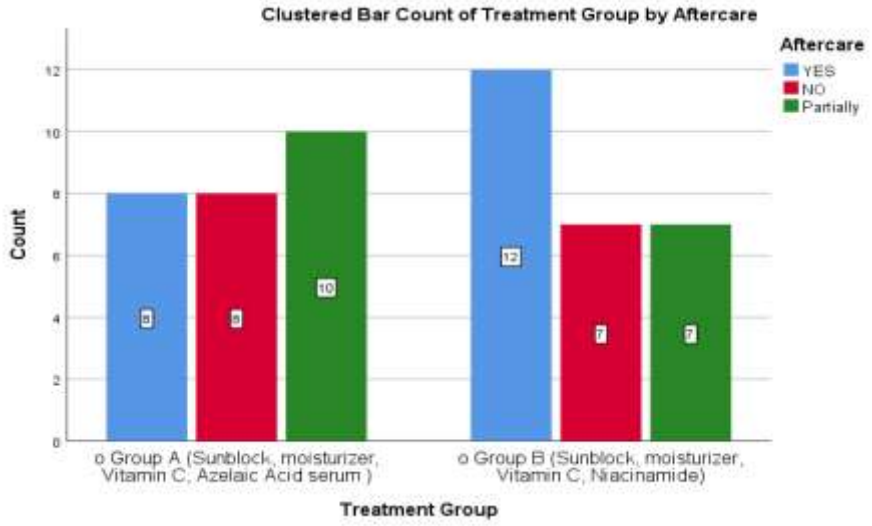


Table 5: Improvement by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Improvement	Texture	Count	10	11	21
		% within Improvement	47.6%	52.4%	100.0%
	Pigmentation	Count	4	10	14
		% within Improvement	28.6%	71.4%	100.0%
	Appearance	Count	12	5	17
		% within Improvement	70.6%	29.4%	100.0%
Total		Count	26	26	52
		% within Improvement	50.0%	50.0%	100.0%

This table shows the types of improvement within the two groups of treatments. Appearance improvement is higher in Group A (70.6%), whereas Pigmentation improvement is higher in Group B (71.4%). The Chi-Square test shows that there is no significant difference in Improvement and Treatment Group (p = 0.270), that is, the types of improvements are similar in both groups.

Figure 7: Improvement by Treatment Group

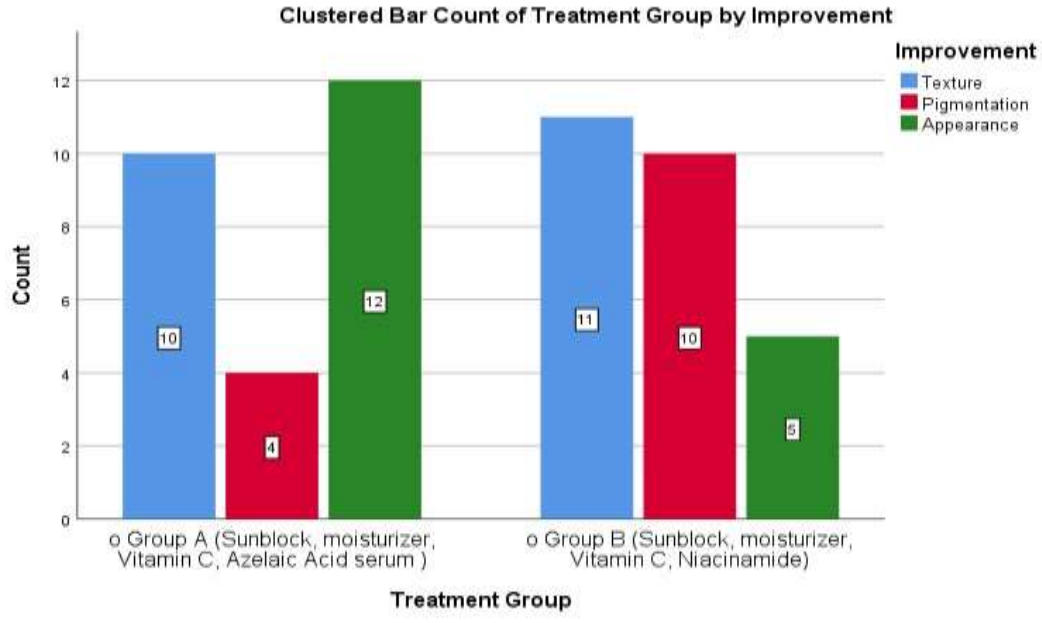


Table 6: Skin Type by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Skin Type	Type I (Pale, very fair)	Count	4	4	8
		% within Skin Type	50.0%	50.0%	100.0%
	Type II (Fair)	Count	4	6	10
		% within Skin Type	40.0%	60.0%	100.0%
	Type III (Medium)	Count	4	4	8
		% within Skin Type	50.0%	50.0%	100.0%
	Type IV (Olive)	Count	2	5	7
		% within Skin Type	28.6%	71.4%	100.0%
	Type V (Brown)	Count	7	4	11
		% within Skin Type	63.6%	36.4%	100.0%
	Type VI (Dark brown to black)	Count	5	3	8
		% within Skin Type	62.5%	37.5%	100.0%
Total		Count	26	26	52
		% within Skin Type	50.0%	50.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.004[a]	5	.699
Likelihood Ratio	3.065	5	.690
Linear-by-Linear Association	.786	1	.375
N of Valid Cases	52		
a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is 3.50.			

This table indicates percentage distribution of Skin Types in treatment groups. Type V (Brown) patients of Group A are more (63.6) than the Type IV (Olive) patients of Group B (71.4). There was no any significant difference between Skin Type, Treatment Group (p = 0.699), indicating that distribution of the skin types are similar in both groups.

Figure 8: Skin Type by Treatment Group

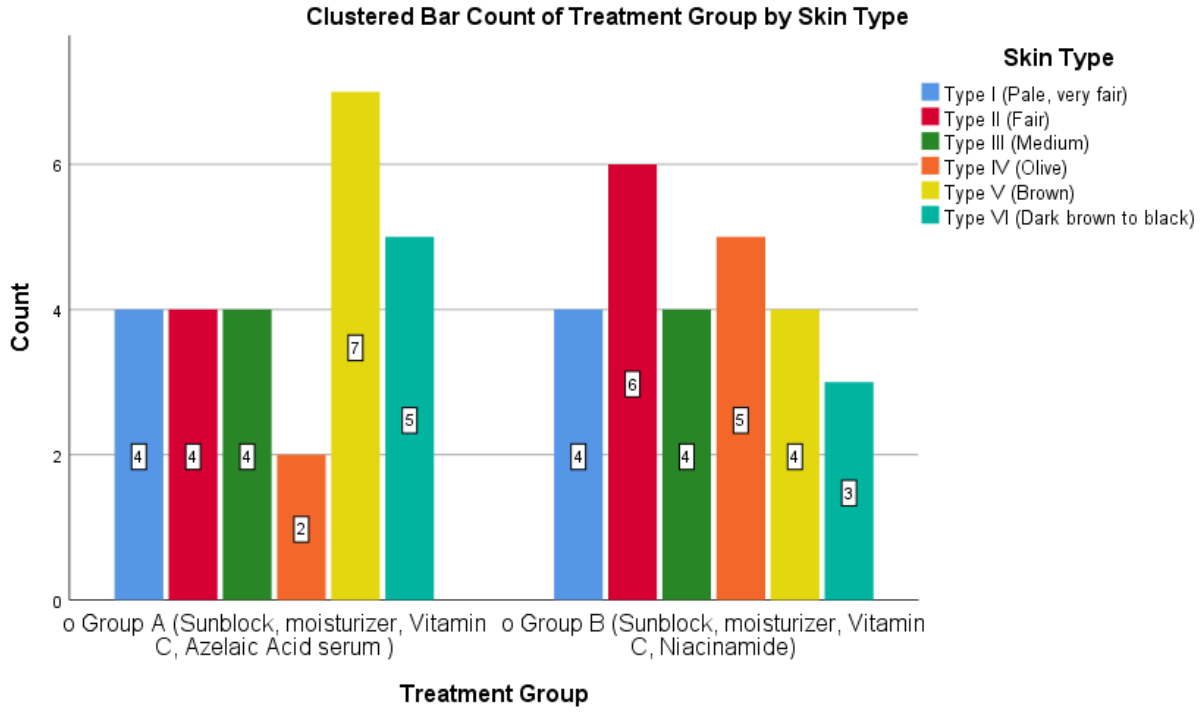


Table 7: Protocol Followed by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Protocol Followed	YES	Count	11	9	20
		% within Protocol Followed	55.0%	45.0%	100.0%
	NO	Count	8	11	19
		% within Protocol Followed	42.1%	57.9%	100.0%
	3	Count	7	6	13
		% within Protocol Followed	53.8%	46.2%	100.0%
Total		Count	26	26	52
		% within Protocol Followed	50.0%	50.0%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.751[a]	2	.687
Likelihood Ratio	.753	2	.686
Linear-by-Linear Association	.031	1	.861
N of Valid Cases	52		

In this table, we can observe the compliance to the Protocol Followed in both treatment groups. The Group A contained more patients who adhered to the protocol (Yes) than Group B. Protocol Adhered had no significant difference, between the Protocol followed and Treatment Group (p = 0.687) and as such Protocol adherence is equal in both groups.

Figure 9: Protocol Followed by Treatment Group

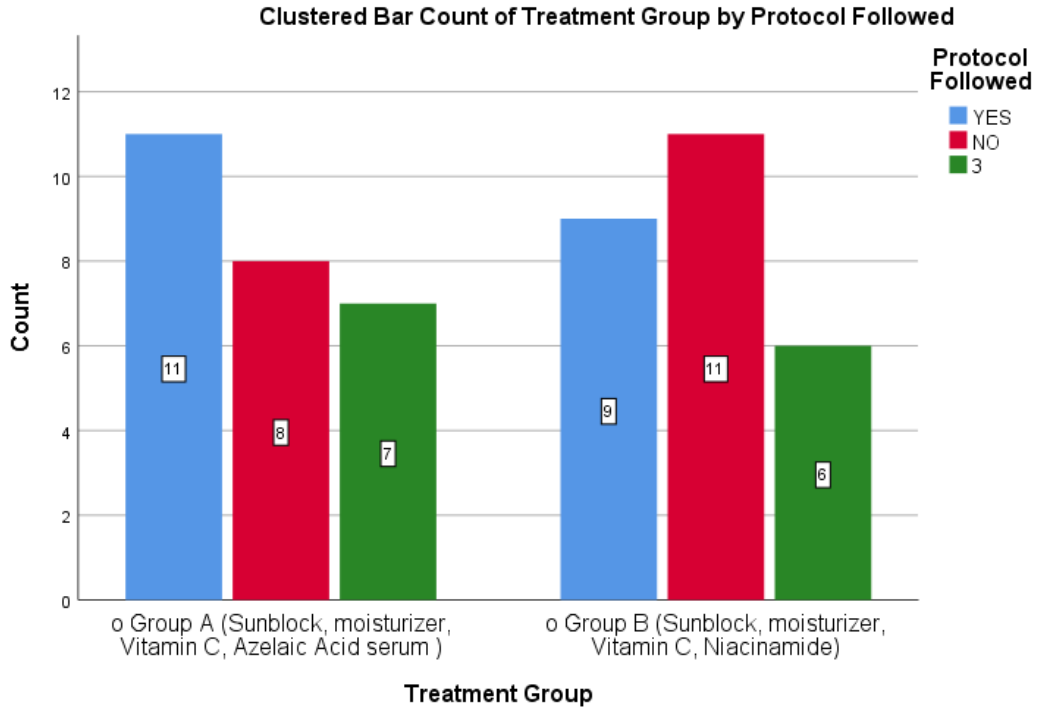


Table 8: History of Allergy by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
History of Allergy	YES	Count	1	1	2
		% within History of Allergy	50.0%	50.0%	100.0%
	NO	Count	25	25	50

		% within History of Allergy	50.0%	50.0%	100.0%
Total		Count	26	26	52
		% within History of Allergy	50.0%	50.0%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000[a]	1	1.000		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.000	1	1.000		
Fisher's Exact Test				1.000	.755
Linear-by-Linear Association	.000	1	1.000		
N of Valid Cases	52				

The following table indicates the distribution of History of Allergy in the two treatment groups. The distribution of both groups is similar, and most of the patients had No History of Allergy.

The relationship between History of Allergy and Treatment Group (p = 1.000) is not significant, indicating that the two variables do not have any relationship.

Figure 10: History of Allergy by Treatment Group

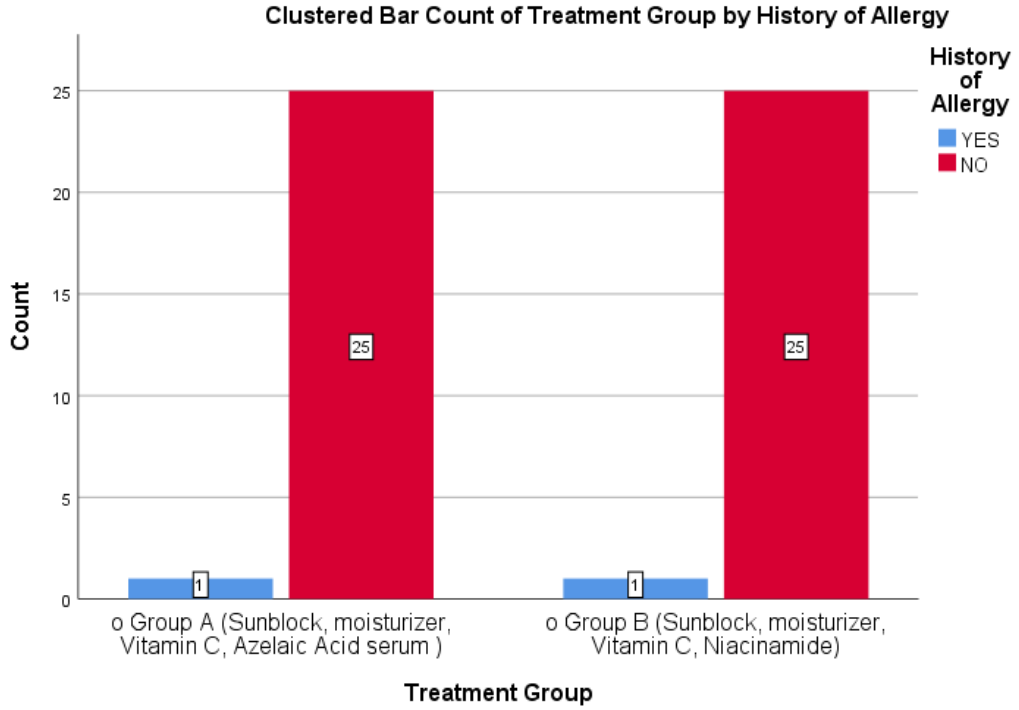


Table 9: Previous Treatments by Treatment Group

Crosstab					
			Treatment Group		Total
			o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	
Previous Treatments	YES	Count	12	14	26
		% within Previous Treatments	46.2%	53.8%	100.0%
	NO	Count	14	12	26
		% within Previous Treatments	53.8%	46.2%	100.0%
Total		Count	26	26	52
		% within Previous Treatments	50.0%	50.0%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.308[a]	1	.579		
Continuity Correction[b]	.077	1	.782		
Likelihood Ratio	.308	1	.579		
Fisher's Exact Test				.782	.391
Linear-by-Linear Association	.302	1	.583		
N of Valid Cases	52				

The table indicates the Previous Treatments in both treatment groups. There are more patients who have Previous Treatments in Group B (53.8%), as opposed to Group A (46.2%). There was no significant relationship between Previous Treatments and Treatment Group (p = 0.579) meaning that the previous treatment history is similar in both groups.

Figure 11: Previous Treatments by Treatment Group

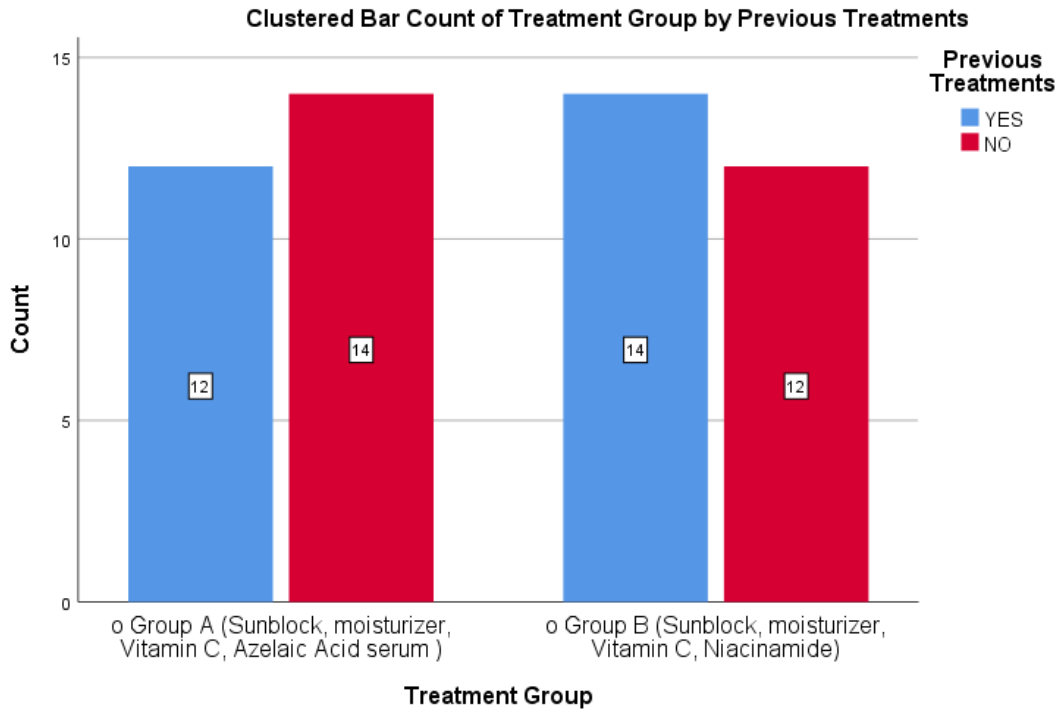


Table 10: Satisfaction vs effectiveness by Treatment Group.

Group Statistics					
	Treatment Group	N	Mean	Std. Deviation	Std. Error Mean
Satisfaction	o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	26	1.81	.801	.157
	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	26	2.23	.765	.150
Effectiveness	o Group A (Sunblock, moisturizer, Vitamin C, Azelaic Acid serum)	26	1.92	.935	.183
	o Group B (Sunblock, moisturizer, Vitamin C, Niacinamide)	26	2.12	.766	.150

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Satisfaction	Equal variances assumed	.092	.763	-1.948	50	.057	-.423	.217	-.859	.013
	Equal variances not assumed			-1.948	49.892	.057	-.423	.217	-.859	.013
Effectiveness	Equal variances assumed	4.742	.034	-.812	50	.421	-.192	.237	-.668	.284
	Equal variances not assumed			-.812	48.131	.421	-.192	.237	-.669	.284

The table indicates the average scores of Satisfaction and Effectiveness in both groups. The mean of the satisfaction of Group A is lower (1.81) which means that there is greater satisfaction in Group A than in Group B which is 2.23. On the same note, Group A also demonstrates somewhat a higher Effectiveness (mean = 1.92). The Satisfaction t-test indicates no significant difference (p = 0.057) and Effectiveness t-test indicates no significant difference (p = 0.421).

Figure 12: Treatment group by effectiveness

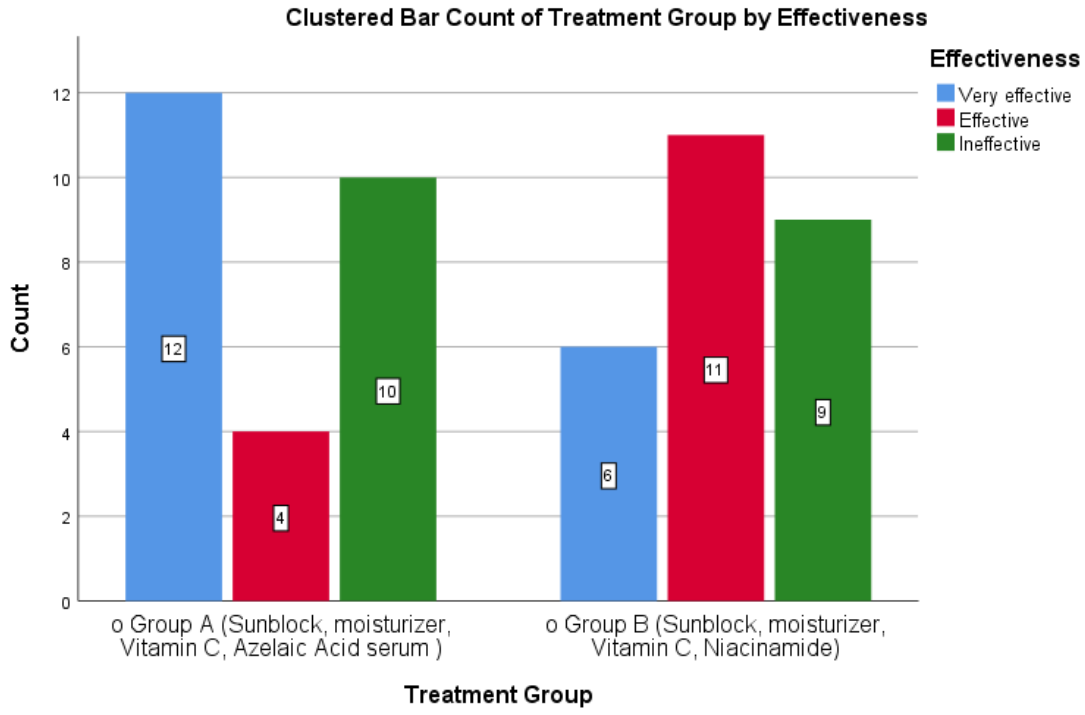
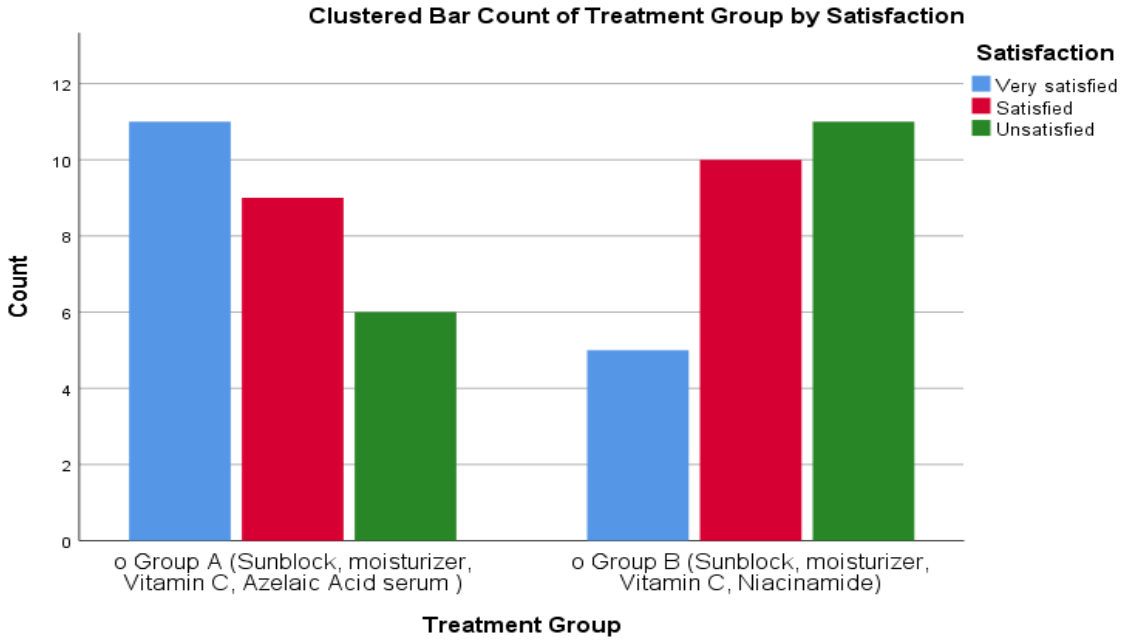


Figure 13: Treatment group by satisfaction



DISCUSSION

In our research, Group A, which was using Sunblock, Moisturizer, Vitamin C and Azelaic Acid Serum 7%, demonstrated improved overall outcomes in pigmentation reduction and skin appearance improvement. The satisfaction rate in Group A was higher and the change in skin texture was more significant than in Group B, which was equal in distribution. Descriptive statistics revealed that both treatment groups were equally distributed and Group A was performing better than Group B particularly in the aspect of appearance improvement. A comparative study of chemical peels and microneedling in the treatment of melasma was carried out by Batool A et al (2025) and the results indicated that a combination of microneedling and chemical peels gives better results in the treatment of hyperpigmentation [1]. Their results also confirm that treatment with combined treatments is more effective than monotherapies and this is similar to our results indicating that Group A was the one that improved pigmentation and the overall appearance of the skin. The fact that both studies are similar shows that microneedling in combination with a suitable serum such as Azelaic Acid can increase the effectiveness of the treatment.

We found that Group A, which was treated with Azelaic Acid serum, had superior results in pigmentation reduction and appearance improvement as compared to Group B, which was treated with Niacinamide serum. Group A also expressed more satisfaction and adherence to the treatment protocol and post-care procedure, and in accordance with the results, Wozyna et al. (2025) discovered that microneedling with chemical peeling was more effective than either of the interventions independent of each other in the acne scars [2]. Their meta-analysis has shown that both combinations of treatments can yield a greater effect on the skin texture and pigmentation decreases. The analogy indicates that Group A in our study, similar to the combined treatments in Woza et al. offer a better treatment of hyperpigmentation.

We found that Group A (Azelaic Acid serum and microneedling) was. is superior in eliminating pigment and improving appearances to Group B. Group A also exhibited a greater adherence to the treatment plan and aftercare. Pakla-Misiur et al. (2021) designed a comparison of a randomized controlled trial of the impact of microneedling, chemical peeling, and both treatments to post-acne scars. In their results, they determined that microneedling in combination with chemical peeling was superior to both treatments in regard to skin texture and pigmentation [3]. Our findings agree with Pakla-Misiur et al., in which we discovered that Group

A (including a combination of microneedling and Azelaic Acid serum) had better outcomes than Group B. The two studies support the idea that a combination of treatment is more effective than one treatment modality.

We have found that Group A which received Azelaic Acid serum application had better appearance improvement and reduction of pigmentation than Group B which received Niacinamide serum application. The participants in Group A also expressed most satisfaction and improved compliance with treatment regimen. The effectiveness of mesotherapy, microneedling, and chemical peels in skin rejuvenation was reviewed by Lee JC et al. (2016), whereby microneedling in combination with mesotherapy led to a significant increase in skin texture and pigmentation. Though their research was not on Azelaic Acid serum, our findings indicate that microneedling combined with Azelaic Acid serum provides better results, especially in terms of pigmentation and appearance enhancement, which is agreeing with the effectiveness of the combination of treatments [4]. This analogy implies that Group A is the best method of treating hyperpigmentation in our research.

We concluded that Group A which was treated with Azelaic Acid serum, performed better in regards to pigmentation reduction and appearance improvement as compared to Group B which was treated with Niacinamide serum. The Group A also had a higher level of satisfaction and adherence to treatment regimen and aftercare and had Mesotherapy in Omara D et al. (2024) tested on face scars and was found to be effective in improving the skin texture and appearance significantly. Their randomized controlled trial showed that mesotherapy alone was highly effective in the reduction of facially scarring but combining of microneedling with other interventions, such as Azelaic Acid is likely to be more effective [5]. Like them, our Group A felt more satisfied and better results than Group B, which accentuates the fact that the results of microneedling can be affected positively by the introduction of effective topical therapies.

Group A (treated by Azelaic Acid serum) performed better in the reduction of pigmentation and improvement of appearance (particularly hyperpigmentation) in our study compared to Group B. The satisfaction rate was higher in Group A, and more people had adhered to the treatment protocol. In the same way, the article by Nikolis et al. (2026) talked about using dermo-cosmetic skin care together with aesthetic procedures to enhance the skin texture and pigmentation. Their systematic review suggested using topical treatment with such procedures as microneedling to achieve better outcomes [6]. Our article indicates that based on their results, we would recommend that microneedling in combination with Azelaic Acid serum in Group A was better than Group B in terms of clinical results on hyperpigmentation. This substantiates the claim by Nikolis et al. that combination treatments results in better clinical outcomes.

Our research determined that Group A (treated with Azelaic Acid serum) showed superior pigmentation reduction and appearance enhancement as compared to Group B (treated with Niacinamide serum). Group A was more satisfied with the outcome and followed the aftercare protocol. Jacobs M. et al. studies (2020) evaluated Nigella sativa oil with microneedling to treat post-acne scarring and reported a significant improvement in the texture of the skin and the appearance of the scar. Nonetheless, we observed stronger effects with the introduction of Azelaic Acid serum when it was used in our study, particularly in Group A as the treatment of hyperpigmentation [7]. We have reason to believe that Azelaic Acid is even more effective in pigmentation than Nigella sativa oil, which supports even more the relevance of topical treatments in improving the outcomes of microneedling.

Group A (treated with Azelaic Acid serum) demonstrated better pigmentation reduction and improvement of appearance than Group B, treated with Niacinamide serum in our study. More satisfaction and improved overall clinical outcomes were reported in Group A. On the same note, Ishfaq F et al. (2022) compared microneedling using glycolic acid chemical peel in the treatment of acne scarring and concluded that glycolic acid gave moderate effects in pigmentation [8]. Nevertheless, their research suggested that the highest effects were also the ones that were produced by microneedling with glycolic acid. Group A in our study performed

even better than combination treatments in Ishfaq F et al., demonstrating that Azelaic Acid serum could be a better choice to reduce pigmentation than glycolic acid.

Group A (treated with Azelaic Acid serum) in our study recorded a substantial difference in pigmentation and appearance as compared to Group B. Group A also had higher satisfaction and compliance with the treatment regimen, when Santos MO et al. (2025) reviewed the treatment of periorbital hyperpigmentation, it was found that the best outcome was with microneedling with dermo-cosmetic skin care, in terms of hyperpigmentation [9]. Their results are consistent with our research because Group A (applying Azelaic Acid serum) demonstrated significant progress in appearance and hyperpigmentation than Group B. Both works support the idea of using a combination of treatments to get a better outcome in the treatment of hyperpigmentation.

CONCLUSION

The comparison reveals that Group A (treated with Sunblock, Moisturizer, Vitamin C and Azelaic Acid Serum 7%) has a minor advantage over Group B regarding the overall effectiveness, more satisfaction, and better skin look. The Descriptive statistics show that the sample was evenly distributed in both of the treatment groups, though Group A had superior results, especially in terms of appearance improvement. Also, Group A subjects were more enslaving to the treatment regimen and aftercare. Group A seems to be more effective in treating hyperpigmentation although there is an overall balanced skin type distribution. Generally, Group A appears to be the more preferable treatment in this study.

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