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Study of buffered 50% glycolic acid and 0.5% salicylic acid solution in acne vulgaris

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ABSTRACT:
Background: Acne vulgaris is an inflammatory disorder of the pilosebaceous unit, which runs a chronic course and it is self-limiting. Glycolic Acid (GA) peels need to be neutralized to have their action stopped. Neutralizing agents for alpha hydroxy acid (AHA) peels are basic solutions, such as ammonium salts, sodium bicarbonate, sodium hydroxide, or water. Buffered glycolic acid has been clinically proven to dilute the concentrated effect of acids when applied topically. Glycolic acid peels have anti-inflammatory, keratolytic, and antioxidant effects. GA targets the corneosome by enhancing breakdown and decreasing cohesiveness, causing desquamation. **Objective:** To assess buffered 50% GA (pH 3.0) and 0.5% salicylic acid (SA) solution in treatment of acne vulgaris. **Patients and methods:** A dermatological examination had been done for 24 participants. Acne severity was assessed as mild, moderate, and severe according to Global Acne Grading System (GAGS). For every case, treatment by buffered 50% GA and 0.5% SA solution was tested and evaluated. **Results:** After treatment with buffered 50% glycolic acid and 0.5% salicylic acid, 54.2% of acne lesion showed excellent improvement, 25.0% showed good improvement, 16.7% of acne lesion showed moderate improvement and 4.1% showed poor improvement. **Conclusion:** Buffered glycolic acid 50% and salicylic acid in treatment of mild to moderate degree acne vulgaris is very effective with few adverse effects.
Keywords: Acne Vulgaris, Glycolic, Salicylic.

INTRODUCTION

Acne vulgaris is an inflammatory disorder of the pilosebaceous unit, which runs a chronic course and it is self-limiting. Acne vulgaris is triggered by Cutibacterium acnes in adolescence, under the influence of normal circulating dehydroepiandrosterone (DHEA). It is a very common skin disorder which can present with inflammatory and non-inflammatory lesions chiefly on the face but can also occur on the upper arms, trunk, and back [(1)].

The etiopathogenesis of acne vulgaris involves a complex interaction between the main factors such as: Genetic predisposition; androgenic hormone stimulation leading to an increase in sebaceous secretion; alteration of the lipid composition; follicular hyper-keratinization; bacterial colonization mainly by Cutibacterium acnes (C. acnes) and periglandular dermal inflammation. Currently, inflammation is considered a key component and can be detected on histopathological and immune histochemical examination in apparently non-inflammatory acneic lesions such as comedones and even in perilesional areas, without lesions (subclinical) [(2)].

GA peels need to be neutralized to have their action stopped. Neutralizing agents for AHA peels are basic solutions, such as ammonium salts, sodium bicarbonate, sodium hydroxide, or water. The most used is a 10–15% sodium bicarbonate solution, and as it produces carbon dioxide in the process of neutralizing the acid, bubbling is seen on the surface of the skin, which is important as it assures the physician that they have neutralized the acid. After that, the patient should wash his or her face with a large amount of cool water. Failing to neutralize the peel at the proper moment can lead to dermal wound and scarring [(3)].

Buffered glycolic acid has been clinically proven to dilute the concentrated effect of acids when applied topically. For example, a buffered glycolic solution at 10% with a pH of 5.4 yields a 1.7% active contact versus the 3% of 10% free glycolic acid - significantly lowering the benefit to the skin. Buffered glycolic acid provides good, immediate exfoliation result with the added benefit of secondary results not found with other AHA solutions: [(4)] Antibacterial effect (as good as or better than salicylic acid). Opens pathways for deeper penetration of other treatment layers. Non-drying results without TEWL (transepidermal water loss). Stimulates cell turnover and cell growth. Improves micro-vascular blood flow

Glycolic acid peels have anti-inflammatory, keratolytic, and antioxidant effects. GA targets the corneosome by enhancing breakdown and decreasing cohesiveness, causing desquamation. The intensity of peel is determined by the concentration of the acid, the vehicle used to carry it, the amount of acid applied, and the technique used [(5)].

The hydroxy acids (HAs) were initially described by **Yu and Van Scott** [(6)] when they discovered that HA with a hydroxyl group at the α or β position applied on the skin would lead to an improvement of hyperkeratosis. They found that keratinization was affected, causing a thinning of the stratum corneum. The use of HAs in cosmetics happened years later, with the observation that they would also improve the clinical aspect and texture of photodamaged skin [(7)].

The HAs are classified as organic carboxylic acids as they are composed of carbon and hydrogen

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molecules. In dermatology there are four different groups of HA, classified according to the hydroxyl group position at the molecule: α-HA,β-HA, poly-HA, and bionics. Salicylic acid (SA) is a β-HA because it has a hydroxyl radical connected to a β position of the carboxylic molecule. The main physical–chemical difference between SA and the α-HAs is that SA is not water soluble, while the α-HAs are [8].

SA is a lipid-soluble agent, in contrast with the α-hydroxy acids (such as glycolic acid), and is therefore miscible with epidermal lipids and sebaceous gland lipids in hair follicles. In concentrations under 3%, SA has a keratoplastic effect, regulating the keratinization process, improving the photo damaged epidermis and increasing the dispersion of melanin granules. In concentrations of 3–5%, SA is keratolytic and facilitates the topical penetration of other agents. It can be used as a peel agent in concentrations from10 to 30%. SA has an antiseptic effect and has a high penetration capacity in the lipophilic skin and sebaceous glands, which makes it very useful in acne treatment. In addition, it has a low incidence of complications. The formulation vehicle is very volatile and evaporates fast, which prevents deeper penetration of the acid [7].

SA as a peeling agent has been studied by various dermatologists. **Aronsohn**[9] used 50% SA ointment with excellent results in 81 patients with pigmentation, freckles, and photoaging of the hands. **Swinehart** [10] used a 50% SA ointment paste containing buffered methyl salicylate and croton oil for the treatment of actinically damaged skin, lentigines, and pigmented keratosis on the forearms and dorsal aspect of the hands, and reported excellent results. Being a lipophilic agent and having an ability to concentrate in the pilosebaceous apparatus, SA peels are a good therapeutic option for comedonal acne, and can be a good adjunctive modality for treating open and closed comedones, post-acne erythema, and hyperpigmentation [11].

The efficacy of SA in the treatment of photoaging and acne has been described in patients with Fitzpatrick skin types I–III as well as in skin types V and VI. **Kligman and Kligman**[12] used SA as a superficial peeling agent in 50 women with mild to moderate photo damage, and reported improvement in surface roughness and pigmented lesions, along with a reduction in fine lines. **Arif** treated 25 patients from a darker racial ethnic group who had acne vulgaris, melasma, or post-inflammatory hyperpigmentation with 20% and 30% SA peels, and reported good efficacy with minimal side effects [13].

This study aimed to assess buffered 50% GA (pH 3.0) and 0.5% salicylic acid (SA) solution in treatment of acne vulgaris.

SUBJECTS AND METHODS

The study included 24 patients with mild to moderate degree acne vulgaris, they were collected from Zagazig University Outpatient clinic of Dermatology, Venerology and Andrology from January 2020 to September 2020.

Inclusion Criteria: Patients aged from 15 to 30 years old clinically diagnosed as mild and moderate degree acne vulgaris.

Exclusion Criteria: Patients with a history of treatment with systemic or topical antibiotics, retinoids, steroids or chemical peeling within one month, patients with other skin disorders in the face were excluded from the study, and pregnant or lactating women were also excluded**.**

Technical design:

This clinical trial study has been carried out in out-patient clinic of Dermatology, Venereology, and Andrology Department, Zagazig University Hospitals from January 2020 to September 2020 on 30 patients with mild to moderate degree acne vulgaris. Twenty-four patients completed this study, and 6 patients did not complete the study.

Methods:

A proper history was taken, and a dermatological examination had been done for all participants. Acne severity was assessed as mild, moderate, and severe according to Global Acne Grading System (GAGS). For every case, the face was treated by buffered 50% glycolic acid (pH 3) and 0.5% salicylic acid solution. The chemical peel was applied by cotton tipped applicator as a layer of glycolic acid followed by a layer of salicylic acid. After two minutes other layers were applied. Treatment sessions ranged from 2 to 6 sessions with 2 weeks interval. Before every session and after the end of sessions (maximum 6 sessions) patients were evaluated by using the acne severity index (ASI) and recorded in the data collection list. Daily emollients and sunscreen with SPF 30 or higher were requested after the procedure for 3 months.

Ethical considerations:

Written informed consent was obtained from all participants after clear explanation of the study and the study was approved by the Research Ethical Committee of Faculty of Medicine, Zagazig University (Institutional Research Board "IRB"). The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical Analysis: All data were collected, tabulated, and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA). Quantitative data were expressed as the mean ± SD and (range), and qualitative data were expressed as number and percentage. Percent of categorical variables were compared using Chi-square test or Fisher exact test when appropriate. All tests were two sided. P-value < 0.05 was considered statistically significant.

RESULTS

Table (1) shows mean age of studied group was 20.04 years with range (15-30) years.

Table (1): Demographic of studied group (n. 24):

Variables	
Age per years	
Mean± SD (range)	20.04±3.2 15-30

Most of the patients were females (Figure 1)

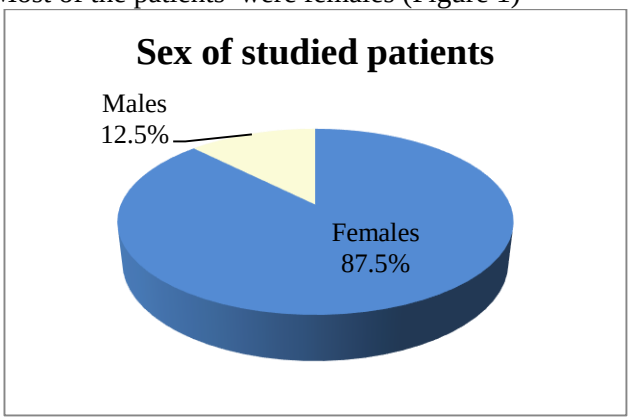

Figure (1): Pie chart showing sex distribution of studied patients.

Table (2) illustrates the skin types, acne degree, and the received treatment sessions of the studied patients.

Table (2): Frequency distribution of skin types, acne degree of studied group and number of treatment sessions (n. 24)

Variables	n.	%
Skin types		
II	1	4.2
III	13	54.2
IV	10	41.6
Acne degree		
Mild	11	45.8
moderate	13	54.2
Number of treatment sessions		
Two	9	37.5
Three	5	20.8
Four	5	20.8
Five	3	12.5
Six	2	8.4
Mean± SD (range)	3.3±1.3 2-6	

Figure 2 shows the effect of treatment on acne lesion.

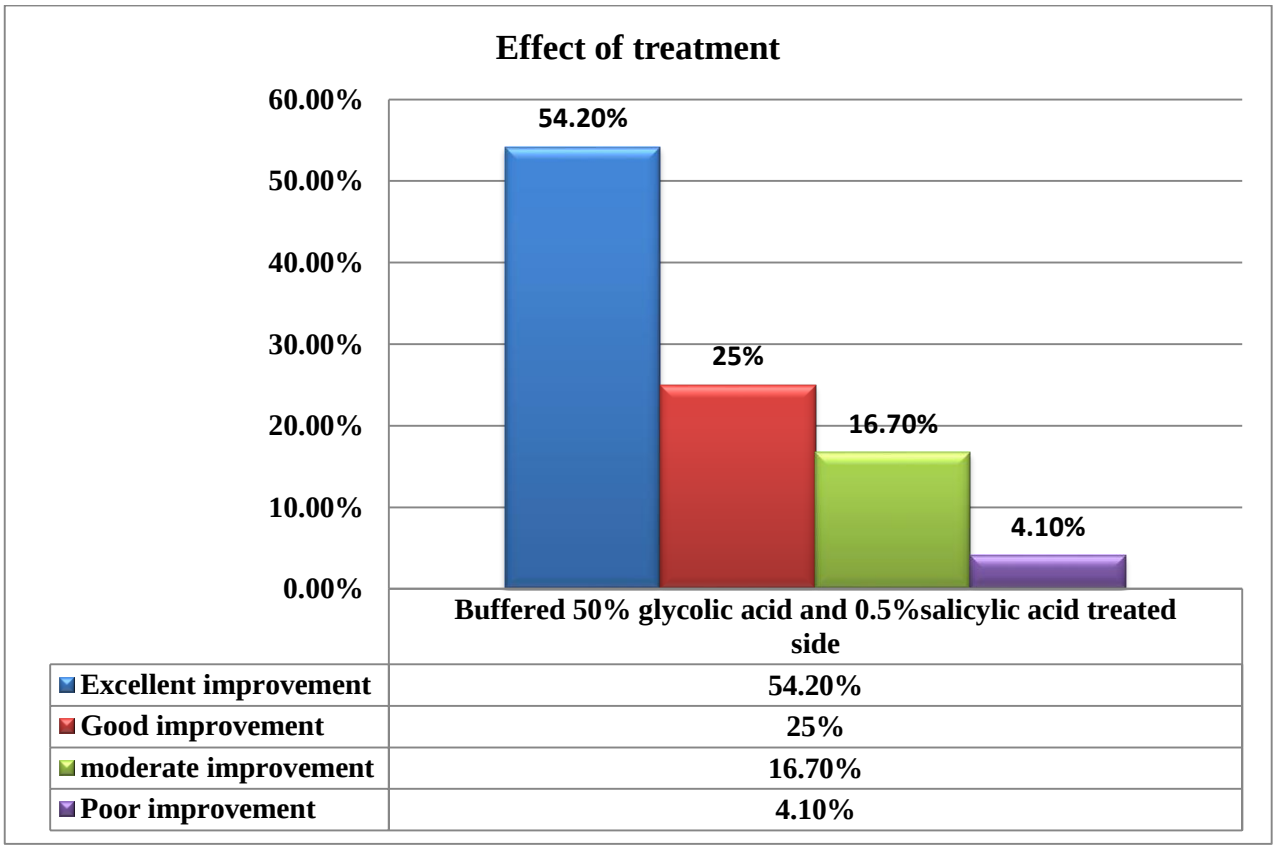

Figure (2): Improvement of acne lesion after buffered 50% glycolic acid and 0.5% salicylic acid treated side.

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Table (3) clarifies that, there was statistically insignificant difference between improvement of acne lesion treated with buffered 50% glycolic acid and 0.5% salicylic acid therapy side as regard demographic and clinical parameters of studied patients.

Table (3): Relation between improvement of acne lesion treated with Buffered 50% glycolic acid + 0.5% salicylic acid and demographic data and clinical parameters of studied patients (n.24)

Variables	Buffered 50% glycolic acid and 0.5%salicylic acid therapy side				n	p-value
	Excellent / good improvement		Moderate/ poor improvement			
Age per years						
<20 years	7	63.6	4	36.4	11	0.14
≥20 years	12	92.3	1	7.7	13	
Sex						
Females	17	81.0	4	19.0	21	0.52
Males	2	66.7	1	33.3	3	
Skin type						
II	1	100.0	0	0.0	1	
III	12	92.3	1	7.7	13	0.15
IV	6	60.0	4	40.0	10	
Acne degree						
Mild	10	90.9	1	9.1	11	0.33
Moderate	9	69.2	4	30.8	13	
Session						
2-3 session	9	64.3	5	35.7	14	0.053
4-6 session	10	100.0	0	.0	10	
Side effect of treatment						
Yes	5	71.4	2	28.6	7	0.61
No	14	82.4	3	17.6	17	

Table (4) demonstrates, there was statistically insignificant difference between satisfaction of acne treated and demographic, clinical parameters of studied patients.

Table (4): Relation between satisfaction of acne treatment and demographic data and clinical parameters of studied patients (n. 24).

Variables	Patients' Satisfaction				n.	p-value
	Satisfied		Not Satisfied			
	n.	%	n.	%		
Age per years						
<20 years	6	54.5	5	45.5	11	0.39
≥20 years	10	76.9	3	23.1	13	
Sex						
Females	15	71.4	6	28.6	21	0.52
Males	1	33.3	2	66.7	3	
Skin type						
II	1	100.0	0	0.0	1	
III	9	69.2	4	30.8	13	0.69
IV	6	60.0	4	40.0	10	
Acne degree						
Mild	9	81.8	2	18.2	11	0.21
Moderate	7	53.8	6	46.2	13	
Number of treatment session						
2-3 session	10	71.4	4	28.6	14	0.67
4-6 session	6	60.0	4	40.0	10	
Complication						
Yes	4	57.1	3	42.9	7	0.65
No	12	70.6	5	29.4	17	
Improvement buffered						
Excellent / Good improvement	14	73.7	5	26.3	19	0.29
moderate/ Poor improvement	2	40.0	3	60.0	5	

Table (5) shows the side effects frequency after treatment. 91.6% had no side effects.

Table (5): Side effects frequency after buffered 50% glycolic acid and 0.5% salicylic acid treated side.

	Buffered 50% glycolic acid and 0.5% salicylic acid treated side	
	n.	%
Erythema	1	4.1
Inflammation	1	4.1
Burn	0	0
Postinflammatory hyperpigmentation	0	0
Total number of side effects		
Yes	2	8.4
No	22	91.6

DISCUSSION

Our study was conducted to evaluate the efficacy and safety of buffered glycolic acid 50% and 0.5% salicylic acid solution in the treatment of mild to moderate inflammatory acne vulgaris.

This study showed that, the mean age of studied group in our study up was 20.04 years with range (15-30) years. This was in similarity to **Bagatin *et al.*** [14] who revealed that the odds of severe acne are higher in older teenagers compared to younger teenagers or preteens, as sebum production increases during puberty, older teenagers tend to have higher sebum production compared to younger teenagers.

This study showed that, 87.5% of studied group was females and 12.5% males with female to male ratio (7:1). This is in agreement also with **Janani and Sureshkumar** [15] who reported that the prevalence of acne is higher in females than males.

Our results revealed that 54.2% of acne lesions showed excellent improvement, 25.0% good improvement, 16.7% showed moderate improvement and 4.1% showed poor improvement after treatment by buffered 50% glycolic acid and 0.5% salicylic acid solution. **Jae *et al.*** [16] studied 20 patients with mild and moderate degree acne vulgaris treated by buffered glycolic acid 50% in combination with 0.5 % salicylic acid solution in one side of patients' faces and found that 35% of patients had mild improvement and 25% had moderate improvement and 0% had marked and near total improvement so that 40% didn't have any improvement. When comparing this results with our results, it was found that our results are better may be due to higher treatment sessions up to 6 sessions in some patients in comparison to 2 fixed sessions for all patients in the other study or due to racial differences.

Wiegmann and Haddad [17] in a recent study examined the efficacy of a wake up serum that consist of glycolic acid and salicylic acid in 66 patients who applied the serum at night for two weeks and found that over 90% of the patients reported that they had significant overall improvement in acne with decrease in comedonal and cystic acne. 70%-80% of the patients stated decrease in oiliness, even texture, and smoother looking skin. Their results is in agreement of our result but better than ours, may be due to method of application as they used serum form daily for 2 weeks, which lead to better results.

Regarding patients' satisfaction in this study we found that 66.7 % of patients were satisfied from our treatment, while 33.3% were not satisfied. In comparison with a study by **Rendon *et al.*** [18] who found that patients' satisfaction in over the counter (OTC) treatments containing benzoyl peroxide (BP) and salicylic acid (SA), which were the most frequently used acne treatment during their study, fewer than half were satisfied with their treatment (OTC BP, 47.0% and OTC SA, 43.0%). In comparison with that study we had better satisfaction percentage from our treatment.

As regard to adverse effects of peeling with buffered glycolic and salicylic only one patient suffered from erythema and one patient suffered from inflammation, which resolved spontaneously within days. **Ilknur *et al.*** [19] in their study of 24 patients received 12 serial peels (Glycolic acid (GA) and amino fruit acid (AFA), at concentrations from the lowest to the highest) on the two halves of the face at 2-week intervals for 6 months. They found that during the peeling sessions, not in all concentrations but at least in one concentration, of the 24 patients, all had erythema, 22 had edema and seven had frosting with GA, in disagreement with our study as there is minimal adverse effects that may be due to buffered form of GA.

Anwar *et al.* [20] studied 60 patients using glycolic acid peeling 10 % weekly for 6 weeks and found that glycolic acid was safe and cost effective treatment even in 10% strength without prior priming and without any post treatment sequela like hyperpigmentation, frosting or burning.

Based on our findings, it can be proposed that using buffered glycolic acid 50% and salicylic acid in treatment of mild to moderate degree acne vulgaris is effective with less adverse effects.

CONCLUSION

We concluded that in the treatment of mild and moderate acne vulgaris, a 50 percent buffered glycolic acid solution mixed with 0.5 percent salicylic acid solution is very effective and has few side effects.

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Conflict of Interest: Nil.

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