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TOPICAL THERAPY OF VITILIGO USING SUNLIGHT EXPOSURE WITH 10% LACTIC ACID CREAM

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Abstract

OBJECTIVE: *To evaluate the efficacy of topical 10% lactic acid cream combined with controlled sunlight exposure as a therapeutic approach for the treatment of vitiligo.*

METHODOLOGY: *This observational cross-sectional investigation was undertaken within the Dermatology Department of JPMC, Karachi, spanning a duration of six months in the year 2024. A total of ninety-three patients diagnosed with vitiligo, aged 18 years or older, were recruited via non-probability consecutive sampling methodology. The participants were instructed to apply a 10% lactic acid cream on a daily basis and to engage in controlled sunlight exposure for a duration of 15 to 30 minutes. The dimensions of the patch were recorded monthly over a period of three months to evaluate the efficacy of the treatment. The data were subjected to analysis utilizing SPSS version 26, applying paired t-tests at a significance threshold of 5%.*

RESULTS: *The investigation encompassed a cohort of 93 individuals diagnosed with vitiligo, exhibiting a mean age of 31.65 ± 8.97 years; of this population, 57% were identified as female and 43% as male. A noteworthy diminution in the dimensions of vitiligo patches was documented subsequent to a three-month intervention involving 10% lactic acid cream combined with exposure to sunlight. The average size of the patches exhibited a reduction from 3.88 ± 0.60 cm^3 at the initial assessment to 0.96 ± 0.13 cm^3 after three months, with the observed alteration attaining statistical significance ($p = 0.000$).*

CONCLUSION: *Combination treatment of 10% topical lactic acid plus controlled sunlight exposure resulted in gradual and statistically significant improvement in clinical results in patients with vitiligo over 3 months. This economical, accessible, and well-tolerated methodology may represent a promising alternative therapeutic option, particularly in resource-constrained environments where conventional phototherapy is not readily attainable. These findings are*

encouraging, however larger randomized controlled trials with extended follow up are recommended to confirm the long-term effectiveness, safety, and durability of the treatment response.

INTRODUCTION

Vitiligo is one of the most frequently encountered acquired pigmentary diseases, and it is defined as well-characterized areas of skin that lose melanin content due to the gradual loss of melanocytes. The disease is irrespective of gender and ethnicity and affects around 0.5–2% of the worldwide population, and has a greater psychological impact when the symptoms are visible and as the disease course is unpredictable [1–3]. Its precise etiology remains unclear, but autoimmune mechanisms, oxidative stress, genetic predisposition, and neural factors have been proposed to be involved in the pathogenesis of this condition [4,5].

Treatment of vitiligo is challenging and rarely achieves satisfying results. Available treatments are topical corticosteroids, calcineurin inhibitors, phototherapy (narrowband UVB and PUVA), as well as surgical techniques and depigmentation therapy in widespread disease [6, 7].

Even with the wide range of treatments, many are constrained by side effects, accessibility, cost or variable outcomes. For example, while narrowband UVB phototherapy is widely accepted as the gold standard for generalized vitiligo, it requires specialized equipment, multiple clinic visits, and long treatment durations [8,9].

In recent years, there has been a growing interest in low-cost, accessible alternatives that may stimulate repigmentation through melanocyte stimulation and migration. Of these, the therapy based on natural sunlight (heliotherapy) has emerged as a potential alternative to artificial UVB sources, especially in those geographical conditions with limited resources [10,11]. Sunlight exposure, if properly timed and dosed, can induce melanogenesis and improve pigmentation with minimal infrastructure requirements [12].

Lactic acid is an alpha-hydroxy acid (AHA) that is studied for its keratolytic, hydrating, and mildly inflammatory effect on the skin. Based on recent studies, lactic acid may be involved in repigmentation through the stimulation of melanocyte activity and alterations to the local skin microenvironment [13,14]. In addition, 10% lactic acid formulations have demonstrated a favorable safety profile and can enhance the penetration of active ingredients, potentially augmenting the phototherapeutic effects of sunlight [15].

In light of the simplicity, low-cost, and potential synergistic effect of lactic acid and sunlight, this study investigates the potential efficacy of topical lactic acid cream at 10% in adjunct with controlled sunlight exposure for vitiligo. Through our exploration of this novel treatment, we aim to aid the development of affordable therapeutic strategies for patients with restricted access.

METHODOLOGY

A six month descriptive cross-sectional study was conducted at the Department of Dermatology, Jinnah Postgraduate Medical Centre (JPMC), Karachi from September 2024 till March 2025. Ninety-three subjects were recruited using a non-probability consecutive sampling approach. The study included both men and women aged ≥18 years with a clinical diagnosis of vitiligo. We did not include subjects with history of hypersensitivity to lactic acid or photodermatosis or patients who were undergoing systemic treatment for vitiligo at the same time. Vitiligo has been additionally defined as a chronic skin disease with well defined depigmented macules or patches due to localized destruction of melanocytes.The assessment was conducted via a comprehensive dermatological physical evaluation. The evaluation was performed by dermatological physical exam. This was followed by collection of background information pertaining to the patients, namely, the demography data such as age, gender, duration of the disease, previous treatment regimens, and family history of vitiligo.

The type of vitiligo (localized or generalized) and anatomical site involvement (face, trunk, upper and lower extremities, neck) for each participant were also determined.

These clinical and demographic variables were used to evaluate the pattern and response to treatment across

different subgroups. Patients were asked to smear a thin coat of 10% lactic acid cream once daily on areas of depigmentation. Controlled sunlight exposure was advised for 15–30 minutes daily on the treated areas, with the timing adjusted according to individual skin tolerance and environmental conditions to avoid phototoxicity. All patients were counseled on maintaining consistency with treatment and sun exposure while avoiding other topical or systemic therapies during the study period. Clinical response was assessed by measuring the size of vitiligo patches in a standardized and replicate manner at the baseline and then at the end of each month for three months. The principal outcome variable was the alteration in patch size over a specified duration. The dataset underwent rigorous examination to assess the incremental improvement and evaluate the efficacy of the treatment through the application of a Paired sample t-test at a 5% significance threshold. All analytical methodologies were executed utilizing SPSS software, version 26. Quantitative variables (continuous) were expressed as mean ± standard deviation, while frequencies and percentages were articulated for qualitative variables.

RESULTS

The study encompassed a sample of 93 participants with a mean age of 31.65 ± 8.97 years. A significant proportion of the participants (53.8%) fell within the age bracket of 20–30 years, whereas 46.2% were older than 30 years. The majority demographic within the sample was female (57.0%), with males comprising 43.0% of the cohort. The average duration of the condition was noted to be 43.55 ± 12.92 months, with 61.3% of individuals having experienced the pathology for a period exceeding 40 months. A considerable proportion (75.3%) had previously received treatment, while 24.7% had not undergone any prior therapeutic regimen. A familial occurrence of vitiligo was recorded in 29.0% of the cases. Regarding clinical presentation, localized vitiligo was found to be more prevalent (63.4%) in comparison to generalized vitiligo (36.6%). The anatomical regions most frequently involved were the upper extremities (32.3%), followed by the lower extremities (24.7%), face and trunk (16.1% each), and neck (10.8%) as delineated in table 1.

The investigation revealed a statistically significant reduction in the dimensions of vitiligo patches among patients who underwent lactic acid treatment over a duration of three months. The mean initial patch size was measured at 3.88 ± 0.60 cm^3. At the conclusion of the first month, the patch size had decreased to 2.76 ± 0.40 cm^3, evidencing a mean reduction of 1.12 ± 0.49 cm^3 (p=0.000). Continued improvement was noted in the second month, with the patch size further decreasing to 1.61 ± 0.41 cm^3 and a mean change of 1.15 ± 0.40 cm^3 (p=0.000). By the termination of the third month, the patch size experienced an additional decrement to 0.96 ± 0.13 cm^3, reflecting a further mean reduction of 0.65 ± 0.42 cm^3 (p=0.000). These results confirm a statistically significant and progressive improvement in patch size attributed to lactic acid treatment as illustrated in table II.

Table I: Demographic & Clinical Features of Patients (n=93)

Variable	**n** (%)
Age (Mean ± SD) = 31.65 ± 8.97 years	
20 – 30 years	50 (53.8)
>30 years	43 (46.2)
Gender	
Male	40 (43.0)
Female	53 (57.0)
Duration of Disease (Mean ± SD) = 43.55 ± 12.92 months	
20 – 40 months	36 (38.7)
>40 months	57 (61.3)
Previous Treatment	

Yes	70 (75.3)
No	23 (24.7)
Family History of Vitiligo	
Yes	27 (29.0)
No	66 (71.0)
Distribution	
Localized	59 (63.4)
Generalized	34 (36.6)
Site	
Face	15 (16.1)
Neck	10 (10.8)
Trunk	15 (16.1)
Upper Extremities	30 (32.3)
Lower Extremities	23 (24.7)

Table II: Comparison of Changes in Patch Size among the Lactic Acid (n=93)

Baseline Patch Size (Mean±SD) = 3.88±0.60

Follow-up interval	Patch Sizes (cm^3)	Change (Mean±SD)	P-Value
1st Month	2.76±0.40	1.12±0.49	0.000
2nd Month	1.61±0.41	1.15±0.40	0.000
3rd Month	0.96±0.13	0.65±0.42	0.000

DISCUSSION

The current study was designed to assess the effectiveness of 10% lactic acid cream with controlled sun exposure in the treatment of vitiligo during a 3-month period. In the mean patch size, showing gradual improvement from 1st month (1.12 ± 0.49) to 2nd month (1.15 ± 0.40) & to 3rd month, even more (0.65 ± 0.42), with a p value of 0.000, our combination topical-sunlight therapy could be an additional alternative choice in therapy of Vitiligo. The consistent decline in lesion size, especially from the 2nd to 3rd month, suggests that the combination becomes more effective with sustained application and regular phototherapy exposure.

When compared with a similar topical approach in another study by Aboelghait et al. [16], who assessed the efficacy of 15% lactic acid solution versus topical betamethasone valerate in treating alopecia areata, some interesting parallels and differences emerge. Although the disease condition in their study differs from vitiligo, the therapeutic mechanism of lactic acid and the skin's response to topical agents can be considered in context. In Aboelghait et al. [16], mean values decreased progressively from baseline (3.68±0.85) to 1st (2.38±0.61), 2nd (1.60±0.68), and 3rd month (0.96±0.37). Statistical significance was only achieved at the 3rd month (p=0.026). This contrasts with the current study where statistically significant improvement (p=0.000) was evident much earlier and more consistently, highlighting the potential additive benefit of sunlight exposure in enhancing the efficacy of lactic acid.

Additionally, other studies focused on diverse modalities for the treatment of vitiligo, like trichloroacetic acid (TCA) and methoxsalen. El-Shahid et al. [17] compared 70% TCA with 0.2% methoxsalen paint in the treatment of acral vitiligo and reported greater dermoscopic improvement in TCA treated lesions. Similarly, Sharquie et al. [18] explored intralesional lactic acid and triamcinolone acetonide, noting clinical repigmentation benefits. In yet another comparative trial by Sharquie et al. [19], lactic acid cream (10%) combined with sunlight was directly compared to methoxsalen, aligning closely with the methodology of the current study. Their findings supported lactic acid and sunlight as a viable,

low-cost alternative, reinforcing the present study's outcomes.

These comparisons underline that while other topical and intralesional agents show effectiveness, the combination of 10% lactic acid and sunlight exposure demonstrates an optimal balance between efficacy, safety, and cost. The notable reduction in vitiligo patch size in our study may be attributed to the keratolytic action of lactic acid, which enhances pigment penetration and potentially facilitates melanocyte migration, and the immunomodulatory effects of sunlight which support repigmentation.

Although these are promising findings, there are several limitations that should be noted. Firstly, the study lacked a control group or comparator arm, such as methoxsalen or placebo, which limits the ability to attribute efficacy solely to the treatment without considering placebo or natural remission effects. Secondly, the assessment was restricted to three months of active treatment, whereas vitiligo is a chronic disease and requires long-term follow-up to determine sustained improvement or relapse. Third, lesion size reduction, although useful, may not capture qualitative changes like color match, repigmentation density, or patient-reported outcomes, which could provide a more holistic evaluation. Moreover, while standardized measurements were attempted, the reliance on manual size assessment introduces potential inter-observer variability.

The use of non-probability consecutive sampling limits generalizability of findings to the wider population, and the single-center nature of the study limits external validity. Seasonal variations in sunlight exposure and environmental conditions were also not standardized or controlled, which may influence treatment response and consistency.

The recommendations includes, a need for a RCT with larger sample size and longer follow-up to better assess the long term efficacy and safety of this strategy. Future studies should consider incorporating objective tools like dermoscopy or digital image analysis for lesion evaluation, and patient satisfaction metrics should be included as a secondary outcome. Also, stratification by vitiligo type (e.g., segmental vs. non-segmental) and anatomical site involvement may yield insights into specific subgroup responses.

CONCLUSION

Combination treatment of 10% topical lactic acid plus controlled sunlight exposure resulted in gradual and statistically significant improvement in clinical results in patients with vitiligo over 3 months. This economical, accessible, and well-tolerated methodology may represent a promising alternative therapeutic option, particularly in resource-constrained environments where conventional phototherapy is not readily attainable. These findings are encouraging, however larger randomized controlled trials with extended follow up are recommended to confirm the long-term effectiveness, safety, and durability of the treatment response

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