EFFICACY OF HOME USE INTENSE PULSED LIGHT (IPL) FOR THE IMPROVEMENT OF KERATOSIS PILARIS

Kanin TEERAWATANAPONG[1], Sirintip CHAICHALOTHORNKUL[2] and Tawee SAIWICHAI[3]

1 School of Anti-Aging and Regenerative Medicine, Mae Fah Luang University, Thailand
2 School of Anti-Aging and Regenerative Medicine, Mae Fah Luang University, Thailand (Advisor)
3 Faculty of Public Health, Mahidol University, Thailand (Co-Advisor)

ARTICLE HISTORY
Received: 3 February 2025 **Revised:** 24 February 2025 **Published:** 4 March 2025

ABSTRACT

Background: Keratosis pilaris (KP) is a chronic dermatological condition characterized by follicular papules with hyperkeratosis and varying degrees of erythema and hyperpigmentation. Although asymptomatic, its cosmetic impact often motivates treatment. Traditional treatments, including topical agents and in-clinic laser therapies, can be costly and inconvenient. Home-use intense pulsed light (IPL) devices provide a potential alternative for safe, convenient management of KP. Objective: To evaluate the efficacy and safety of a home-use IPL device in improving skin roughness, erythema, and hyperpigmentation in patients with keratosis pilaris. Methods: This randomized, single-blind, split-area controlled trial enrolled 18 participants aged 18-40 years with KP on the extensor surfaces of their upper arms. Treatment areas were randomized to receive either weekly IPL sessions or sham irradiation for four weeks. Skin roughness, erythema, and hyperpigmentation were assessed objectively using Visioscan® VC 98 and Mexameter® MX18 devices at baseline, during treatment, and at follow-up (week 8). Subjective evaluations included the Global Improvement Score (GIS) and patient satisfaction surveys. Adverse effects were monitored throughout the study. Results: Ten participants completed the study. Statistically significant improvements in skin roughness were observed in treatment areas compared to control areas ($p < 0.05$). No significant differences were found in erythema or hyperpigmentation between groups. Participants reported high satisfaction levels and noticeable cosmetic improvement in treatment areas, with no severe adverse events reported. Conclusion: Home-use IPL devices are a safe and effective option for improving skin roughness associated with keratosis pilaris, offering a convenient alternative to traditional in-clinic treatments. Further research is recommended to assess long-term efficacy and broader applicability across different skin types and ethnicities.

Keywords: Keratosis Pilaris, Intense Pulsed Light, Home-Use IPL, Skin Roughness, Erythema, Hyperpigmentation

CITATION INFORMATION: Teerawatanapong, K., Chaichalothornkul, S., & Saiwichai, T. (2025). Efficacy of Home Use Intense Pulsed Light (IPL) for the Improvement of Keratosis Pilaris. *Procedia of Multidisciplinary Research, 3*(3), 41.

INTRODUCTION

Keratosis pilaris (KP) is a chronic condition of the skin that is commonly found in children. Some patients might find improvements as they age. But due to its long and persistent clinical course, it can also be found in many adults and elderly people. The age of keratosis pilaris onset was reported accordingly in one study: 51% within the first decade, 35% within the second decade, 12% within the third decade, and 2% within the fourth decade. (Poskitt & Wilkinson, 1994) Among the many types of follicular keratosis, Keratosis pilaris is found to be the most common. It is characterized as numerous small inflammatory papules with follicular involvement, typically on the extensor side of proximal upper and lower extremities as well as the buttocks. Closer inspection with dermatoscopy shows hyperkeratotic follicular papules containing keratinous plug and/or coiled hair shafts. Although the lesions are painless and non-pruritic, patients are often affected psychologically by their unsavory cosmetic appearance. There has been considerable interest shown in social media, possibly suggesting the impact that KP has on the general population (Mansour et al., 2022). KP's asymptomatic nature might cause it to be under-diagnosed and under-reported, causing difficulty in determining an accurate prevalence. In school children, between 4% (Popescu et al., 1999)-34% (Brown et al., 2009) prevalence has been reported. The pathophysiology of this disease is not clearly understood, with a few proposed theories currently being studied. Abnormal follicular epithelial keratinization leads to the formation of keratotic infundibular plugs, which in turn causes inflammatory papules and defects in the hair shafts.

Treatments for keratosis pilaris are unnecessary as it is asymptomatic and can improve by itself over time. But patients who are distressed by its appearance can benefit from treatments, shortening the resolution time of the lesions. Various methods are utilized in treating keratosis pilaris, including topical emollients and keratolytics. Vitamin D3 derivatives, retinoids, corticosteroids, and chemical peels are also found used to provide care for the lesions. In recent years, laser treatments for keratosis pilaris have been reported to show improvements as well. Diode laser (Ibrahim et al., 2015), alexandrite laser (Li et al., 2022), Q-switched Nd:YAG laser (Park et al., 2011), and fractional CO2 laser (Vachiramon et al., 2016) treatments have been studied upon and are being used by many clinicians, with varying results. While systems utilizing intense-pulsed light (IPL) are commonly used for hair removal as well as treating vascular and pigmented lesions, it has been reported to be an effective choice for treating keratosis pilaris (Maitriwong et al., 2019).

IPL systems utilize light from a high-intensity broad wavelength source that may be passed through a filter that limits the wavelength range which releases the energy pulse onto the skin surface. This results in a process called selective photothermolysis in which the chromophores are heated by radiation and consequently thermally damages the tissue surrounding them. Advantages of IPL as a treatment modality is its cheaper cost relative to other energy methods and the larger spot size of IPL contributes to a shorter treatment time per session (Goldberg, 2012). But the time and monetary cost of in-clinic treatments for an asymptomatic condition might hinder treatment compliance and consequently the effectiveness of IPL treatments, especially in cases with lower income (McGinley et al., 2014).

As IPL treatments rise in popularity in the industry, various companies start to develop lower energy, smaller form-factor systems for patients to perform treatments by themselves at home. Most devices of this nature focus on epilation (Gold et al., 2010), treating pigmentary lesions, and facial skin rejuvenation. The abundance of home-use IPL devices of various qualities leads to uncertainties regarding their effectiveness compared to the conventional IPL systems. Numerous studies have been done on some of the devices of this kind, addressing their safety and efficacy. One systematic review recommended home-use IPL for hair removal (Cohen et al., 2022). Due to their lower energy output compared to conventional IPL systems and their

inherent convenience, home-use IPL devices have a lower risk of adverse effects compared to higher energy conventional systems (Town et al., 2019).

In this study, we will be investigating the efficacy of home-use IPL for the treatment of keratosis pilaris. As keratosis pilaris requires multiple treatment sessions due to its chronic and recurrent course, having a treatment choice that can be performed conveniently at home in a relatively short time per session should be beneficial to future treatments of keratosis pilaris. The general research objective is to assess the efficacy of home-use IPL as a management option for the improvement of keratosis pilaris. While specific research objectives are as follows: 1) To assess the efficacy of using home-use IPL to reduce skin roughness in patients with keratosis pilaris compared to control. 2) To assess the efficacy of using home-use IPL to reduce erythema in patients with keratosis pilaris compared to control. 3) To assess the efficacy of using home-use IPL to reduce hyperpigmentation in patients with keratosis pilaris compared to control. 4) To assess the Global Improvement score (GIS) of using home-use IPL in patients with keratosis pilaris. 5) To assess the patient satisfaction of using home-use IPL in patients with keratosis pilaris. 6) To assess the possible adverse effects of using home-use IPL in patients with keratosis pilaris.

Keratosis pilaris (KP) is a common dermatologic condition characterized by follicular papules with keratotic plugging and erythema, typically affecting the extensor surfaces of the proximal extremities and sometimes the cheeks (Pennycook & McCready, 2022). It is a multifactorial and benign disorder that often emerges in early childhood and becomes more pronounced during adolescence. While KP is frequently associated with conditions like atopic dermatitis, ichthyosis vulgaris, obesity, diabetes mellitus, and genetic syndromes such as Down syndrome and Noonan syndrome, its exact etiology remains unclear (Arnold & Buechner, 2006; Hosking et al., 2018). Studies suggest a genetic basis, particularly involving filaggrin gene mutations and disruptions in the Ras signaling pathway, which contribute to abnormal keratinization and follicular plugging (Fenner & Silverberg, 2018; Cohen et al., 2020; Gruber et al., 2015). Despite the unclear pathophysiology, KP is highly prevalent, affecting 50-80% of adolescents and about 40% of adults, though underreporting may indicate an even higher prevalence (Fenner & Silverberg, 2018; Hosking et al., 2018).

REVIEW OF RELATED LITERATURES

While KP is largely asymptomatic and often resolves with age, treatment is sought primarily for cosmetic concerns. Common approaches include topical emollients, keratolytics, corticosteroids, vitamin D3 derivatives, and chemical peels (Ibrahim et al., 2015). Light-based therapies, including pulsed dye lasers, alexandrite lasers, Nd: YAG lasers, and fractional CO_2 lasers, have shown varying degrees of success (Lee et al., 2013; Saelim et al., 2013; Vachiramon et al., 2016). Intense pulsed light (IPL) therapy, initially developed in 1992, has become a widely used dermatological treatment for various conditions, including vascular and pigmented lesions, hair removal, and photoaging (Gade et al., 2022). IPL systems generate broad-spectrum light pulses filtered to target specific chromophores, allowing selective photothermolysis while maintaining a relatively safe profile (Goldberg, 2012). FDA-approved indications for IPL include telangiectasias, hyperpigmentation, rosacea, acne, and unwanted hair removal (Giannaccare et al., 2019). However, in-clinic IPL treatments can be costly and time-intensive, limiting accessibility for many patients.

The increasing popularity of IPL has led to the development of lower-energy, home-use IPL devices primarily marketed for hair removal and skin rejuvenation. While systematic reviews have found home-use IPL effective for hair reduction, its efficacy for conditions like KP remains under investigation (Cohen et al., 2022; Town et al., 2019). Clinical trials have demonstrated significant improvements in skin texture, erythema, and hyperpigmentation following IPL treatments, with some studies reporting high patient satisfaction and minimal

adverse effects (Adhoute et al., 2010; Gold et al., 2010). A randomized controlled trial by Maitriwong et al. (2019) evaluated IPL for KP in 23 participants, showing statistically significant symptom improvement after four sessions. Another study by Min et al. (2014) assessed a home-use IPL device for various dermatologic conditions, including acne and hyperpigmentation, confirming its safety and moderate efficacy.

Given KP's chronic and recurrent nature, having an effective, self-administered treatment option could improve long-term management and adherence. This study aims to evaluate the safety and efficacy of home-use IPL for KP, focusing on skin roughness, erythema, and hyperpigmentation. The potential benefits of at-home IPL devices, including convenience, lower cost, and reduced risk of adverse effects compared to higher-energy systems, may make them a viable alternative for managing KP symptoms in suitable patients.

Research Hypotheses

Home-use IPL can be used efficiently and safely as a management option for the improvement of keratosis pilaris

Conceptual Framework

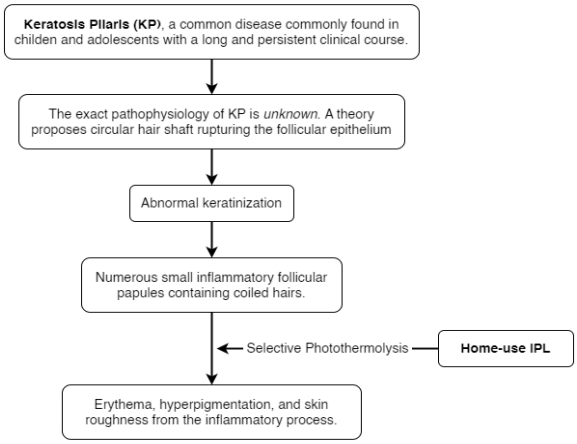

Figure 1 Conceptual Framework

RESEARCH METHODOLOGY

In this study, we conducted a randomized, single-blind, split-area controlled trial to evaluate the efficacy of home-use IPL for improving keratosis pilaris. Participants underwent four weekly IPL treatment sessions (weeks 0, 1, 2, and 3) on a designated treatment area, while a control area was left untreated. Skin roughness, erythema, and hyperpigmentation were assessed before each session, with a follow-up evaluation at week 8. A Global Improvement Score and Patient Satisfaction Score were recorded at the study's conclusion by a research assistant and the participants, respectively. Any adverse effects related to the treatment were documented throughout the study. Participants were recruited via social media and posters at Mae Fah Luang Hospital, with eligibility confirmed through preliminary assessments before informed consent was obtained.

The study enrolled 18 Thai participants aged 18-40 years diagnosed with keratosis pilaris. Sample size calculations were based on a previous randomized controlled trial using conventional IPL (Maitriwong et al., 2019). The initial sample size was calculated as 8, but adjustments were made to account for potential differences in treatment intervals and a 10% dropout rate, leading to the final enrollment of 18 participants. Participants were randomly assigned treatment and control areas using Random Allocation Software 2.0 (Saghaei, 2004), ensuring that the allocation was known only to the treating physician while remaining blinded for participants and the evaluating physician. Treatment involved applying IPL energy with a home-use device (PiOne SG; Bluewell Corporation, South Korea) at an appropriate setting

determined by preliminary skin testing. The device's Hair Removal cartridge, operating at a wavelength of 520-1200 nm with a maximum energy of 52 J per 3 × 2 cm area, was used. Each session lasted approximately five minutes, applying 2-3 passes over the treatment area or until the target tissue response was achieved.

Participants' treatment and control areas were evaluated at baseline (week 0), before each treatment (weeks 1, 2, 3), and at the final follow-up (week 8). Objective clinical evaluations included skin roughness measurements using Visioscan® VC 98, erythema assessments via Mexameter® MX 18, and hyperpigmentation analysis through the Melanin Index. Subjective evaluations consisted of a blinded physician-assessed Global Improvement Score and a Participant Satisfaction Score. Data were analyzed using the Mann-Whitney U test for between-group comparisons and the Friedman test for within-group changes, with statistical significance set at $p < 0.05$. Ethical approval was obtained from the Mae Fah Luang University Ethics Committee (COA: 132/2023). Participants were informed of potential risks such as burns, erosion, hypopigmentation, and scarring. Confidentiality was strictly maintained, with all personal and clinical data securely stored and scheduled for destruction one year post-publication.

RESEARCH RESULTS

At the beginning, 18 participants were recruited into the study. Eight participants were either unable to comply with the schedule or received other treatments during the study on the study area. Hence, 8 participants had voluntarily dropped out or were excluded during this study. Thus, a total of 10 participants completed the study. Demographic data from all 10 participants is demonstrated in table 1. From a total of 10 participants who completed the study, 4 were males and 6 were females, with a mean age of 29.50 ± 5.15 years, ranging between 21 to 40 years old. The mean age of disease onset was 22.30 ± 3.20 years, ranging between 15 to 26 years. Mean duration since disease onset was 7.20 ± 3.36 years, from the shortest duration of 4 years to the maximum of 15 years. Eight of ten participants have Fitzpatrick Skin Type III, while the remaining two were Type IV.

Table 1 General Characteristics

Characteristics	**Value (n = 10)**
Participant Sex	
Male	4
Female	6
Participant Age	
Mean ± SD	29.50 ± 5.15
Min	21
Max	40
Age of disease onset (years)	
Mean ± SD	22.30 ± 3.20
Min	15
Max	26
Duration since disease onset (years)	
Mean ± SD	7.20 ± 3.36
Min	4
Max	15
Fitzpatrick Skin Type	
Type III	8
Type IV	2

Table 2 shows the comparison of skin roughness parameter between areas treated with home-use IPL and control using Mann-Whitney U test (between groups) and Friedman test (within group). The Mann-Whitney U test was used to compare skin roughness (SEr) between the treatment and control areas at each time point. The test results showed no statistically significant differences between the groups at any time point, as indicated by p-values greater than 0.05 (Week 0: $p = 0.783$, Week 1: $p = 0.111$, Week 2: $p = 0.449$, Week 3: $p = 0.365$, and Week 8: $p = 0.209$). Although no significant differences were found, the treatment group generally exhibited lower mean skin roughness values compared to the control group at most time points, suggesting a trend toward improvement in the treated areas. However, this trend did not reach statistical significance ($p > 0.05$). The Friedman test was used to assess changes in skin roughness (SEr) within the treatment and control groups over time. The test revealed a statistically significant difference in skin roughness within the treatment group ($p = 0.005$) and the control group ($p = 0.004$). This indicates that skin roughness changed significantly over the study period in both groups. For the treatment group, the skin roughness decreased from Week 0 (mean = 5.88 ± 1.29) to Week 3 (mean = 4.68 ± 1.42) before slightly increasing again at Week 8 (mean = 5.78 ± 1.78). Similarly, for the control group, roughness showed fluctuations but remained consistently higher than in the treatment group throughout the study.

Table 2 Measured skin roughness of keratosis pilaris compared between areas treated with home-use IPL and control (n=10)

Time	**Measured Roughness (SEr)**		**p-value**
	Treatment (Mean ± SD)	**Control (Mean ± SD)**	
Week 0	5.88 ± 1.29	5.71 ± 1.33	0.783
Week 1	5.19 ± 1.30	6.13 ± 1.20	0.111
Week 2	4.61 ± 1.35	5.03 ± 1.04	0.449
Week 3	4.68 ± 1.42	5.35 ± 1.78	0.365
Week 8	5.78 ± 1.78	6.84 ± 1.86	0.209
p-value	0.005	0.004	

Note p-value determined by Mann-Whitney U test (between groups) and Friedman test (within group)

Table 3 presents the results of the Wilcoxon Signed Rank Test, which was conducted to compare changes in skin roughness (SEr) over time within the treatment and control groups for individuals with keratosis pilaris (n=10). The test evaluates paired measurements at different time points to determine whether changes in roughness are statistically significant. For the treatment group, significant reductions in skin roughness were observed between Week 0 and Week 1 ($p = 0.041$), Week 0 and Week 2 ($p = 0.005$), and Week 0 and Week 3 ($p = 0.047$). These findings suggest that the treatment resulted in noticeable improvements in skin roughness during the initial weeks. However, no significant differences were found between Week 0 and Week 8 ($p = 0.845$), indicating that the improvements observed in earlier weeks were not sustained by Week 8. Paired comparisons involving later weeks (e.g., Week 1 to Week 2, Week 1 to Week 3, and Week 2 to Week 8) showed no statistically significant changes (all $p > 0.05$). In the control group, significant changes were detected in several pairwise comparisons: A reduction in roughness was observed from Week 1 to Week 2 ($p = 0.048$). A notable increase in roughness was detected by the end of the study from Week 3 to Week 8 ($p = 0.043$). Significant increases in roughness were observed from Week 2 to Week 8 ($p = 0.004$), suggesting worsening of skin condition over time. Comparisons between other time points (e.g., Week 0 to Week 1, Week 0 to Week 3) did not show statistically significant differences (all $p > 0.05$).

Table 3 Measured skin roughness of keratosis pilaris among time (n=10)

Measured Roughness (SEr)					
Time	**Mean ± SD**	**Paired Time**	**Mean ± SD**	**Mean Difference**	**p-value**
Treatment					
Week 0	5.88 ± 1.29	Week 1	5.19 ± 1.30	0.68 ± 0.92	0.041
		Week 2	4.61 ± 1.35	1.26 ± 1.11	0.005
		Week 3	4.68 ± 1.42	1.20 ± 1.68	0.047
		Week 8	5.78 ± 1.78	0.09 ± 1.46	0.845
Week 1	5.19 ± 1.30	Week 2	4.61 ± 1.35	0.58 ± 1.42	0.227
		Week 3	4.68 ± 1.42	0.51 ± 0.96	0.123
		Week 8	5.78 ± 1.78	-0.59 ± 1.43	0.226
Week 2	4.61 ± 1.35	Week 3	4.68 ± 1.42	-0.07 ± 1.87	0.912
		Week 8	5.78 ± 1.78	-1.17 ± 1.67	0.047
Week 3	4.68 ± 1.42	Week 8	5.78 ± 1.78	-1.10 ± 1.68	0.059
Control					
Week 0	5.71 ± 1.33	Week 1	6.13 ± 1.20	-0.42 ± 0.99	0.211
		Week 2	5.03 ± 1.04	0.68 ± 1.30	0.132
		Week 3	5.35 ± 1.78	0.36 ± 2.11	0.600
		Week 8	6.84 ± 1.86	-1.13 ± 1.43	0.034
Week 1	6.13 ± 1.20	Week 2	5.03 ± 1.04	1.10 ± 1.53	0.048
		Week 3	5.35 ± 1.78	0.78 ± 2.12	0.237
		Week 8	6.84 ± 1.86	-0.71 ± 1.84	0.252
Week 2	5.03 ± 1.04	Week 3	5.35 ± 1.78	-0.32 ± 1.88	0.604
		Week 8	6.84 ± 1.86	-1.81 ± 1.65	0.004
Week 3	5.35 ± 1.78	Week 8	6.84 ± 1.86	-1.48 ± 2.01	0.043

Note p-value determined by Wilcoxon Signed Rank test

The comparison of the erythema index between areas treated with home-use IPL and control using the Mann-Whitney U test (between groups) and the Friedman test (within groups). The Mann-Whitney U test was used to compare the erythema index between the treatment and control areas at each time point. The test results showed no statistically significant differences between the groups at any time point, as indicated by p-values greater than 0.05 (Week 0: $p = 0.704$, Week 1: $p = 0.726$, Week 2: $p = 0.775$, Week 3: $p = 0.650$, and Week 8: $p = 0.457$). The Friedman test was used to assess changes in the erythema index within the treatment and control groups over time. The test revealed no statistically significant changes in the erythema index within the treatment group ($p = 0.053$) or the control group ($p = 0.075$). This indicates that the erythema index remained relatively stable over the study period in both groups. Throughout the study, the erythema index remained slightly higher in the control group compared to the treatment group.

Results of the Wilcoxon Signed Rank Test, which was conducted to compare changes in the erythema index (MI) over time within the treatment and control groups for individuals with keratosis pilaris (n=10). For the treatment group, no statistically significant changes in the erythema index were observed between any paired time points. In the control group, no statistically significant changes in the erythema index were observed across any of the paired time points. Overall, the results suggest that there were no statistically significant changes in the erythema index within either the treatment or control group across the study period. While fluctuations in the erythema index were observed, they were not sufficient to indicate meaningful or consistent changes in either group.

The comparison of the melanin index between areas treated with home-use IPL and control using the Mann-Whitney U test (between groups) and the Friedman test (within group) is done. The Mann-Whitney U test results showed no statistically significant differences between the groups at any time point, as indicated by p-values greater than 0.05 (Week 0: $p = 0.981$, Week 1: $p = 0.884$, Week 2: $p = 0.896$, Week 3: $p = 0.933$, and Week 8: $p = 0.789$). The Friedman test also revealed no statistically significant changes in the melanin index within the treatment group ($p = 0.188$) or the control group ($p = 0.158$). Throughout the study, the melanin index values in both groups showed minimal variation, indicating no significant effects from the IPL treatment or natural progression in the control group.

Results of the Wilcoxon Signed Rank Test, which was conducted to compare changes in the melanin index over time within the treatment and control groups for individuals with keratosis pilaris (n=10). For the treatment group, no significant changes in the melanin index were observed between any time points. In the control group, no statistically significant changes were detected in the melanin index across any time points. Overall, the results suggest that there were no significant changes in the melanin index within either the treatment or control groups across the study period. The observed fluctuations in the melanin index did not reach statistical significance, indicating no meaningful effects from the IPL treatment or natural progression in the control group.

Side effects of home-use IPL were evaluated on every visit by history taking and physical examination. One participant reported mild tenderness with slight erythema on the treatment area for two days after the first session. The affected participant was advised to apply moisturizing lotion and avoid direct sun exposure on the affected area. The participant reported that tenderness subsided on the first day, while erythema resolved on the day after with neither scarring nor visible markings left on the area.

Global Improvement Score (GIS) of the treatment area was assessed by a different investigator using digital photography collected by the principal investigator from each participant on the last appointment at week 8. Four categories of improvement are assessed for GIS: Roughness, erythema, hyperpigmentation, and overall. Table 4 presents the Global Improvement Scores for skin roughness, erythema, hyperpigmentation, and overall improvements in the treatment area for individuals with keratosis pilaris (n=10).

Table 4 Global Improvement Scores of skin roughness, erythema, hyperpigmentation, and overall improvements of the treatment area (n=10)

Value	Global Improvement Scores (n=10)			
	Roughness	**Erythema**	**Hyperpigmentation**	**Overall**
-4 (76%-100% worsening)	-	-	-	-
-3 (51%-75% worsening)	-	-	-	-
-2 (26%-50% worsening)	-	-	-	-
-1 (1%-25% worsening)	-	-	-	-
0 (no change)	1	-	-	-
1 (1%-25% improvement)	4	3	-	1
2 (26%-50% improvement)	2	-	3	2
3 (51%-75% improvement)	-	5	3	5
4 (76%-100% improvement)	3	2	4	2

Table 5 demonstrated the Patient Satisfaction Scores collected from each participant on the last appointment at week 8. Patient Satisfaction Scores were graded in four categories: roughness, erythema, hyperpigmentation, and overall satisfaction. The grades represent each participant's subjective satisfaction with the treatment outcomes for each parameter as follows: Grade 0 = unsatisfied; Grade 1 = fairly satisfied; Grade 2 = moderately satisfied; Grade 3 = very satisfied;

Grade 4 = extremely satisfied. The data indicate that the majority of participants reported being very satisfied or extremely satisfied with the treatment outcomes, particularly for erythema and hyperpigmentation. No dissatisfaction was reported across any of the parameters or the overall satisfaction scores.

Table 5 Patient Satisfaction Scores of skin roughness, erythema, hyperpigmentation, and overall improvements of the treatment area (n=10)

Value	Patient Satisfaction Score (n=10)			
	Roughness	Erythema	Hyperpigmentation	Overall
0 (Unsatisfied)	0	0	0	0
1 (Fairly satisfied)	0	1	0	0
2 (Moderately satisfied)	3	2	1	3
3 (Very satisfied)	4	2	7	5
4 (Extremely satisfied)	4	5	2	2

DISCUSSION & CONCLUSION

This study aimed to evaluate the efficacy and safety of a home-use intense pulsed light (IPL) device for the treatment of keratosis pilaris (KP). Results are analyzed from data collected at five time-points at weeks 0 (baseline), 1, 2, 3, and 8 from 10 participants who received 4 sessions (weeks 0, 1, 2, 3) of home-use IPL and completed this study. Specifically, improvements in skin roughness, erythema, and hyperpigmentation were assessed, alongside Global Improvement Scores (GIS) and patient satisfaction. Results demonstrated significant improvements in skin roughness in the treatment areas compared to control areas, while erythema and hyperpigmentation showed no significant differences. Additionally, participants reported high satisfaction with the treatment, and no severe adverse effects were documented.

The findings of this study align with the existing body of research on the application of IPL in dermatology. For example, Maitriwong et al. (2019) conducted a study on the use of conventional IPL for KP and observed significant improvements in skin roughness, with values decreasing from a baseline of 6.50 ± 0.96 to 5.59 ± 0.66 at Week 16. Similarly, in our study, significant reductions in skin roughness were observed in the treatment group, particularly during the initial weeks (Weeks 1 to 3), supporting the notion that IPL can effectively improve skin texture by targeting follicular keratinization and reducing inflammation, regardless of whether the equipment is conventional or home-use.

Min et al. (2014) highlighted the clinical utility of home-use IPL devices in treating mild dermatological conditions, emphasizing their convenience and accessibility for patients. Although they noted limitations in treatment efficacy compared to professional-grade IPL devices, particularly for erythema and pigmentation disorders, the improvements in patient-reported outcomes were comparable to those observed in clinical settings. Consistent with these findings, our study revealed high satisfaction scores and significant GIS in treated areas, even though measurable erythema and pigmentation changes were not statistically significant. This suggests that home-use IPL devices may provide a viable alternative for patients seeking convenient and non-invasive treatments for KP.

Cohen et al. (2022) conducted a systematic review on the safety and efficacy of home-based dermatological devices, including IPL systems. They emphasized the importance of personalized treatment protocols to optimize outcomes and minimize adverse effects. Our study's use of individualized energy settings and weekly treatment intervals demonstrated comparable efficacy with no reported severe adverse events, aligning with their recommendations for safe device application in home settings.

The results of this study demonstrate that home-use IPL devices are a safe and effective option for improving skin roughness in individuals with KP. While no significant changes in erythema

and hyperpigmentation were observed, participants reported high satisfaction levels and noticeable cosmetic improvements in treatment areas. These findings suggest that home-use IPL devices can provide a convenient and accessible alternative to traditional in-clinic treatments for KP, particularly for addressing skin roughness.

Suggestions

The result of this study suggests that home-use IPL can potentially be a viable treatment option for keratosis pilaris. Further studies are needed to support our findings. To build upon the findings of this study, future research should focus on investigating the long-term efficacy and safety of home-use IPL devices through extended follow-up periods to determine whether observed improvements can be sustained over time. Additionally, studies should explore the effects of varying treatment frequencies and durations on outcomes related to erythema and pigmentation, which were not significantly impacted in this study. Expanding research to include diverse skin types and ethnicities is essential to ensure broader applicability and effectiveness across populations. Moreover, comparative studies on different IPL device models and energy settings could provide insights into optimizing treatment protocols for KP. By addressing these areas, future research can further validate the potential of home-use IPL devices as an effective, accessible treatment option for KP.

REFERENCES

Adhoute, H., Hamidou, Z., Humbert, P., Lyonnet, C., Peuchot, M. A., Reygagne, P., . . . Toubel, G. (2010). Randomized study of tolerance and efficacy of a home-use intense pulsed light (IPL) source compared to the hot-wax method. *J Cosmet Dermatol, 9*(4), 287-290.

Arnold, A. W., & Buechner, S. A. (2006). Keratosis pilaris and keratosis pilaris atrophicans faciei. *J Dtsch Dermatol Ges, 4*(4), 319-323.

Brown, S. J., Relton, C. L., Liao, H., Zhao, Y., Sandilands, A., McLean, W. H., . . . Reynolds, N. J. (2009). Filaggrin haploinsufficiency is highly penetrant and is associated with increased severity of eczema: further delineation of the skin phenotype in a prospective epidemiological study of 792 school children. *Br J Dermatol, 161*(4), 884-889.

Cohen, L., Seminario-Vidal, L., & Lockey, R. F. (2020). Dermatologic Problems Commonly Seen by the Allergist/Immunologist. *J Allergy Clin Immunol Pract, 8*(1), 102-112.

Cohen, M., Austin, E., Masub, N., Kurtti, A., George, C., & Jagdeo, J. (2022). Home-based devices in dermatology: a systematic review of safety and efficacy. *Archives of Dermatological Research, 314*(3), 239-246.

Gade, A., Vasile, G. F., & Rubenstein, R. (2022). *Intense Pulsed Light (IPL) Therapy*. In StatPearls. Treasure Island (FL): StatPearls Publishing Copyright © 2022, StatPearls Publishing LLC.

Giannaccare, G., Taroni, L., Senni, C., & Scorcia, V. (2019). Intense Pulsed Light Therapy In The Treatment Of Meibomian Gland Dysfunction: Current Perspectives. *Clin Optom (Auckl), 11*, 113-126.

Gold, M. H., Foster, A., & Biron, J. A. (2010). Low-energy intense pulsed light for hair removal at home. *J Clin Aesthet Dermatol, 3*(2), 48-53.

Goldberg, D. J. (2012). Current trends in intense pulsed light. *J Clin Aesthet Dermatol, 5*(6), 45-53.

Gruber, R., Sugarman, J. L., Crumrine, D., Hupe, M., Mauro, T. M., Mauldin, E. A., . . . Elias, P. M. (2015). Sebaceous gland, hair shaft, and epidermal barrier abnormalities in keratosis pilaris with and without filaggrin deficiency. *Am J Pathol, 185*(4), 1012-1021.

Hosking, A. M., Elsensohn, A., Makdisi, J., Grando, S., & de Feraudy, S. (2018). Keratosis pilaris rubra with mucin deposition. *J Cutan Pathol, 45*(12), 958-961.

Ibrahim, O., Khan, M., Bolotin, D., Dubina, M., Nodzenski, M., Disphanurat, W., . . . Alam, M. (2015). Treatment of Keratosis Pilaris With 810-nm Diode Laser: A Randomized Clinical Trial. *JAMA Dermatology, 151*(2), 187-191.

Maitriwong, P., Tangkijngamvong, N., & Asawanonda, P. (2019). Intense Pulsed-light Therapy Significantly Improves Keratosis Pilaris: A Randomized, Double-blind, Sham Irradiation-controlled Trial. *J Clin Aesthet Dermatol, 12*(10), E53-E57.

Mansour, M. R., Abushukur, Y., & Potts, G. A. (2022). Keratosis pilaris on TikTok: A cross-sectional analysis of trending content. *JAAD Int, 8*, 116-117.

McGinley, M., Alinia, H., Kuo, S., Huang, K. E., & Feldman, S. R. (2014). Patient perspectives on low level light therapy and laser therapies for rosacea-associated persistent facial redness. *Dermatol Online J, 21*(2).

Min, S., Kwon, H. H., Park, S. Y., Yoon, J.-H., & Suh, D. H. (2014). Clinical trial to evaluate the efficacy and safety of a home-use intense pulsed light device for hair removal, treatment of acne and pigmentation disorders, and fine wrinkle reduction. *Korean Journal of Dermatology, 52*, 880-891.

Park, J., Kim, B. J., Kim, M. N., & Lee, C. K. (2011). A Pilot Study of Q-switched 1064-nm Nd:YAG Laser Treatment in the Keratosis Pilaris. *Ann Dermatol, 23*(3), 293-298.

Pennycook, K. B., & McCready, T. A. (2022). *Keratosis Pilaris. In StatPearls*. Treasure Island (FL): StatPearls Publishing Copyright © 2022, StatPearls Publishing LLC.

Popescu, R., Popescu, C. M., Williams, H. C., & Forsea, D. (1999). The prevalence of skin conditions in Romanian school children. *Br J Dermatol, 140*(5), 891-896.

Poskitt, L., & Wilkinson, J. D. (1994). Natural history of keratosis pilaris. *Br J Dermatol, 130*(6), 711-713.

Saelim, P., Pongprutthipan, M., Pootongkam, S., Jariyasethavong, V., & Asawanonda, P. (2013). Long-pulsed 1064-nm Nd:YAG laser significantly improves keratosis pilaris: a randomized, evaluator-blind study. *J Dermatolog Treat, 24*(4), 318-322.

Saghaei, M. (2004). Random Allocation Software for parallel group randomized trials. *BMC Medical Research Methodology, 4*, 26.

Town, G., Botchkareva, N. V., Uzunbajakava, N. E., Nuijs, T., van Vlimmeren, M., Ash, C., & Dierickx, C. (2019). Light-based home-use devices for hair removal: Why do they work and how effective they are?. *Lasers Surg Med, 51*(6), 481-490.

Vachiramon, V., Anusaksathien, P., Kanokrungsee, S., & Chanprapaph, K. (2016). Fractional Carbon Dioxide Laser for Keratosis Pilaris: A Single-Blind, Randomized, Comparative Study. *Biomed Res Int, 2016*, 1928540.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.