

Determination of the Minimal Erythema Dose to Excimer Light in Filipino Skin: A Prospective Interventional and Cross-sectional Study in a Tertiary Government Hospital in the Philippines

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Abstract

Introduction: Excimer light is a targeted phototherapy that uses 308-nanometer wavelength ultraviolet radiation to treat photoresponsive dermatoses such as psoriasis, vitiligo, and alopecia areata. Ideally, the minimal erythema dose (MED) should be determined to guide the initial treatment dose. However, due to convenience, estimation based on skin phototype is more commonly used.

Objectives: To determine the MED to excimer light in adult Filipinos using a visual erythema scale.

Materials and Methods: A prospective interventional, cross-sectional study was conducted among adult Filipinos in a tertiary government hospital in the Philippines. Participants underwent phototesting with six incremental doses of excimer light. MED was defined as the lowest dose that produced uniform, well-defined erythema over the exposed area. Descriptive statistics summarized clinicodemographic data, MED, and adverse events. Fisher's exact test assessed associations between MED, sex, and skin type.

Results: A total of 149 adult Filipinos with Fitzpatrick skin types III to V were enrolled. MED values ranged from 150 to 400 mJ/cm², with 200 mJ/cm² being the median and mode (33.56%). No association was found between MED and skin phototype. Sex correlated with MED, with females having higher MEDs than males.

Conclusions: The median MED was 200 mJ/cm² in Filipino patients with skin types III to V. This may serve as the initial starting dose for phototherapy (except in vitiliginous skin). With the variation in the MED within the population, MED determination is still the ideal method to identify the most appropriate initial treatment dose.

Keywords: Asian skin, excimer light, Filipino skin, minimal erythema dose, phototesting, phototherapy, skin phototype, ultraviolet therapy

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Submitted: 23-07-2025, **Revised:** 26-10-2025, **Accepted:** 15-11-2025, **Published:** 20-12-2025.

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How to cite this article: Gonzalez MC, Ty CG, Carpio VM, Tumulad LL, Encarnacion MR. Determination of the minimal erythema dose to excimer light in Filipino skin: A prospective interventional and cross-sectional study in a tertiary government hospital in the Philippines. J Philipp Dermatol Soc 2025;34:68-73.

Access this article online

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DOI:

10.4103/JPDS.JPDS_31_25

INTRODUCTION

Three hundred eight-nanometer (nm) excimer light treats localized lesions in conditions such as psoriasis, vitiligo, and atopic dermatitis.^[1] The minimal erythema dose (MED) helps determine the optimal starting dose, but many phototherapy centers use skin phototype-based protocols, which may not reflect actual ultraviolet (UV) sensitivity. This can lead to delayed treatment response and suboptimal outcomes. Although more accurate, MED-based dosing is underutilized due to time constraints.^[2,3] There is also limited local data on MED for Filipino patients.

This study aimed to address this gap by determining the MED to excimer light in Filipinos, providing a safer and more effective basis for individualized phototherapy dosing.

MATERIALS AND METHODS

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki, Data Privacy Act 2012 and National Ethical Guidelines for Research involving Human Participants (NEGRIHP) 2022. The protocol was reviewed and approved by the Technical Review Board and the Institutional Ethics Review Board.

Written informed consent was obtained from all participants, including consent for medical photography. The consent form outlined study objectives, procedures, risks, benefits, confidentiality, and the right to withdraw at any time.

Participant data were anonymized using control numbers. Identifying features in photographs were excluded. The data gathered were strictly confidential, and only the research investigators had access to the files.

Study design

This was a prospective interventional and cross-sectional study involving adult Filipino patients seen at a tertiary-level government institution from July to December 2023.

Population and sampling method

This study included all adult Filipinos willing to participate in the study, including patients with skin diseases being seen at the outpatient department (OPD), Department of Dermatology, their companions, and hospital staff.

Convenience sampling was employed in this study. Participants were invited via personal correspondence as they came to the OPD.

Sample size

Minimum sample size requirement was computed using R version 4.0.3 (R Core Team, Vienna, Austria). A sample size of at least 100 participants was needed to have an estimate of the proportion of cases with MED at 400 mJ/cm² with 5% half-width precision and 95% level of significance in a population expected to have 6.98% MED at 400 mJ/cm².^[4] A minimum sample size of 81 and 143 were needed to detect significant difference with medium-to-large effect size (Cohen's $w = 0.4$), in the distribution of rate of MED (six levels) stratified according to sex (two categories), and Fitzpatrick skin phototype (six categories), respectively, with 80% power and 5% level of significance. Overall, this study needed 143 participants to estimate the distribution of MED among Filipinos and to achieve 80% power in hypothesis testing of the association of MED with the different clinicodemographic factors. This sample size requirement was inflated to 158 participants (10% more) to account for possible drop-outs.

Inclusion criteria

Adult participants (≥ 19 years old) who were Filipino citizens by birth or descent, with at least one Filipino parent, and had no active skin lesions on the lower back were recruited for this study.

Exclusion criteria

1. Ancestries other than Filipino
2. Patients who underwent phototherapy on the lower back during the preceding 6 months
3. Previous diagnosis of systemic lupus erythematosus, dermatomyositis, or genodermatoses such as xeroderma pigmentosum
4. Known history of photosensitivity
5. Personal history of melanoma
6. Application of topical corticosteroids and calcineurin inhibitors on the phototesting site within 2 weeks prior
7. Intake of systemic corticosteroids and immunosuppressants within 4 weeks prior
8. Intake of oral antihistamines within 1 week prior
9. Patients who are pregnant or breastfeeding.

Data gathering procedures

Minimal erythema dose testing

On day 1, MED testing was conducted. The participant should not have applied anything on the treatment area at least 2 h prior to MED testing. An MED test patch was applied on a sun-protected area on the lower back. The test patch had six windows of uniform sizes (2 cm $\times$ 2 cm) that were opened and exposed one at a time to incremental doses of excimer light. The location of the windows was indicated at the corners with a permanent marker.

The participant and the investigators wore protective goggles during the administration of the excimer light. The smallest reduction tip was attached to the excimer device to protect the skin around the MED test site from UV radiation. The tips were cleaned and disinfected with alcohol before and after each procedure.

The participant's skin was irradiated with excimer light (Exciplex UV 308 nm, Clarteis, France). The Exciplex software has three preprogrammed MED test settings depending on the skin type. For Fitzpatrick phototypes III and IV, which is the predominant skin type in Filipinos, the Exciplex M2 MED test program was used. Excimer light was given at the following doses: 150, 200, 250, 300, 350, and 400 mJ/cm². Duration of exposure to excimer light ranged from 1 to 4 s for each dose (1 s per 100 mJ/cm²).

After irradiation of the skin with excimer light, the MED test patch was removed. The participants were instructed to not expose the phototesting site to any natural or artificial UV light and to not wash the area until the MED readings were obtained. Any activity that may elicit sweating on the testing site was avoided.

Minimal erythema dose reading

After 24 h, the participants were asked to follow-up for MED reading. The investigators examined the irradiated skin to identify the minimum dose which produced well-defined erythema. Photographs of the MED test site were taken for documentation.

Data collection methods

Demographic profile

Patient age, sex, and Fitzpatrick skin phototype were collected and tabulated. Skin phototype was determined using the Fitzpatrick Skin Phototype Classification, based on visual skin color assessment and patient-reported history of response to sun exposure.

Minimal erythema dose to excimer light phototherapy

MED was recorded by the investigators based on the Visual Erythema Scale. The MED is defined as the lowest UV radiation dose that produces well-defined erythema [Figure 1].^[4]

Adverse events

Adverse events such as pruritus, pain, burning sensation and blistering were listed and classified using the local skin reaction assessment scale as follows: 0 – None, 1 – Mild, 2 – Moderate, and 3 – Severe.^[5]

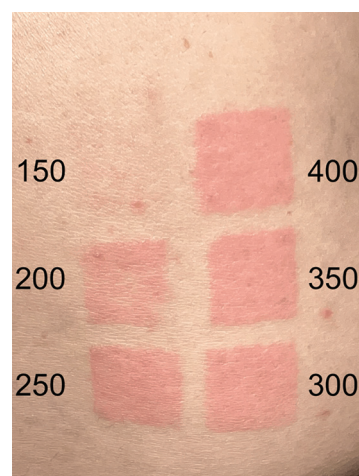


Figure 1: Minimal erythema dose reading. In this case, 200 mJ/cm² was regarded as the minimal erythema dose

In the event of severe adverse reactions, such as bright red erythema accompanied by pruritus or blistering at the phototesting site, participants were advised to apply cool compresses and would be provided with topical corticosteroids for symptomatic relief.

Statistical analysis

The clinicodemographic profile of the participants of the study, the distribution of MED, and occurrences of adverse events to excimer phototherapy were summarized by descriptive statistics. The numerical variable (age) was described as median and interquartile range, due to nonnormality of the distribution. Categorical variables (MED, sex, Fitzpatrick skin phototype, pruritus, pain, burning sensation, and blistering) were described as frequency and percentages.

The association between MED and the following clinicodemographic factors: sex and Fitzpatrick skin phototype was determined by Fisher exact test of homogeneity. Data analysis was performed using Stata version 17 (StataCorp LLC, College Station, Texas, USA). Missing values were neither replaced nor estimated. Normality of the distribution of the numerical variable age was determined by the Shapiro–Wilk test of normality. All tests of hypotheses were evaluated against a level of significance of $\alpha = 0.05$.

RESULTS

A total of 158 participants were enrolled in this study. Nine were lost to follow-up and were not included in the data analysis [Figure 2]. One hundred and forty-nine patients (43 males, 106 females) with a median age of 28 years were able to complete the study and analysis. Fifty patients were of Fitzpatrick skin type III, 85 of skin

type IV, and 14 of skin type V. There were no patients with skin types I, II, or VI. All patients were of Filipino origin [Table 1].

Fifty participants (33.56%) had an MED of 200 mJ/cm², closely followed by 48 (32.31%) who had an MED of 250 mJ/cm², and 32 (21.48%) with an MED of 150 mJ/cm². The remaining 19 participants had an MED within the range of 300–400 mJ/cm² [Figure 3].

Males had significantly lower MED than females ($P = 0.033$). Most male participants (37.21%) had an MED of 150 mJ/cm², whereas most females (36.79%) had an MED of 250 mJ/cm² [Figure 4].

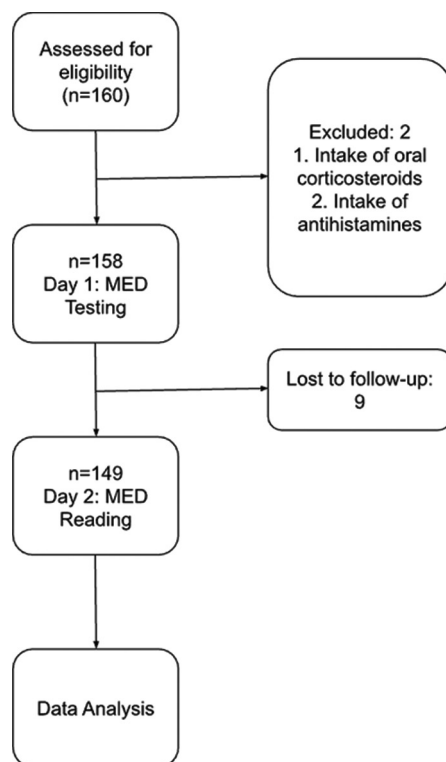


Figure 2: Participant flow diagram

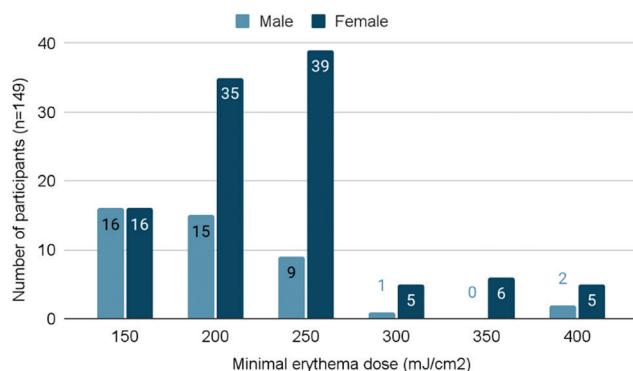


Figure 4: Association between minimal erythema dose and sex

According to Fitzpatrick skin type, most participants with skin type III (36%) had an MED of 200 mJ/cm², skin type IV (34.12%) with 250 mJ/cm², and skin type V (71.42%) with 200–250 mJ/cm². There is no sufficient evidence to conclude that Fitzpatrick skin phototype is significantly associated with MED ($P = 0.565$) [Figure 5].

Thirteen patients reported mild-to-moderate pruritus on the MED test site. Seventeen complained of pain, with one who reported severe pain which spontaneously resolved after a few hours. There were three participants with a mild burning sensation. None of the participants developed blistering as an adverse effect.

DISCUSSION

Due to the geographic and racial variation in MED, among other factors, our study aimed to determine the MED to excimer light phototherapy in Filipinos. To the authors' knowledge, this is the first such study. This may help guide standardization of the initial excimer light dose in Filipino skin, providing the optimal radiation amount while minimizing side effects.

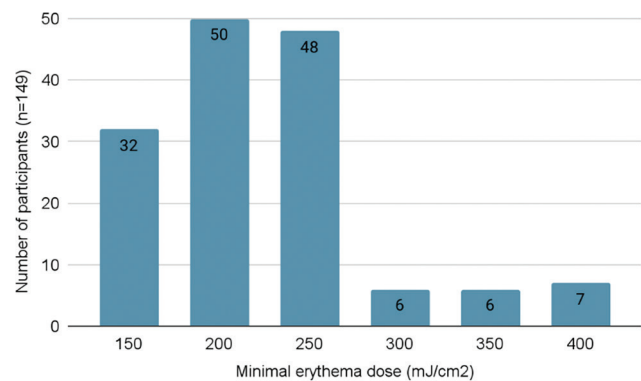


Figure 3: Minimal erythema dose

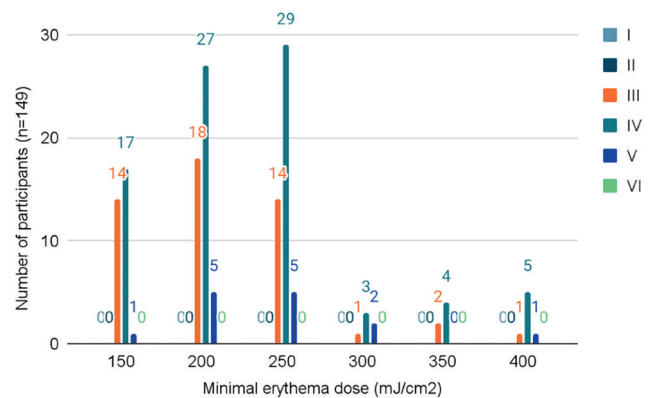


Figure 5: Association between minimal erythema dose and Fitzpatrick skin phototype

Table 1: Demographic profile of study participants (n=149)

Characteristics	Values (%)
Age (years), mean±SD	28±10
Sex, frequency (%)	
Male	43 (28.86)
Female	106 (71.14)
Fitzpatrick skin phototype (%)	
I	0
II	0
III	50 (33.56)
IV	85 (57.05)
V	14 (9.40)
VI	0

Values are expressed as mean±SD or frequency (%). SD: Standard deviation

However, our study population consisted of adult Filipinos seen at a tertiary government hospital, which may not be representative of the general Filipino population.

Studies regarding the relationship between skin phototype and MED are conflicting, with some stating that those with darker skin types typically have a higher MED, while others reported no association.^[6] The results of this study showed that for Filipino adult patients with a Fitzpatrick skin phototype of III to V, the MED ranged from 150 to 400 mJ/cm², with a median MED of 200 mJ/cm². In our analysis, the Fitzpatrick skin phototype did not correlate with the MED.

Most of the existing literature on MED testing has focused on narrowband ultraviolet B (NB-UVB), the most widely used form of phototherapy. A recent study conducted at a tertiary hospital in the Philippines reported a median MED to NB-UVB of 800 mJ/cm² in Filipino patients. For phototherapy initiation, it is standard practice to use 50%–70% of the MED, translating to an initial NB-UVB dose of 400–560 mJ/cm² – a value higher than the current standard phototherapy starting dose in that institution.^[4] Notably, this is the only published local study on MED testing to date, and no prior studies have explored the MED to 308-nm excimer light in the Filipino population.

In a study conducted in India involving patients with vitiligo belonging to Fitzpatrick skin phototypes IV to VI, the MEDs to 308-nm excimer light of normal skin on the back were in the 200–1500 mJ/cm² range, with a median MED of 600 mJ/cm. When they compared the MED between different skin phototypes, they also did not find any association.^[7]

In another study by Asawanonda *et al.*, wherein they determined the MED of psoriasis patients at Massachusetts General Hospital, Boston, USA, using a 308-nm excimer

laser, the MED ranged from 114.05 to 325.96 mJ/cm², with a mean MED of 203.03 mJ/cm². The participants had a Fitzpatrick skin phototype of I to IV.^[8] Although the participants involved in Asawanonda's study have a lighter skin phototype, the MED values were similar to our findings in Filipino skin. This may further support the lack of association between MED and Fitzpatrick skin type. Whether the results are reproducible in all skin phototypes is beyond the scope of this study since we only included Filipino participants.

The association of sex and MED has also been investigated in other research. Tan *et al.* investigated the different factors associated with MED, and they reported that females had a significantly higher MED than males.^[6] This is consistent with a previous study by Damian *et al.*, which associated the lower MED in males to more significant immunosuppression following UV exposure. The dose of UV needed to cause immunosuppression is three times lower in males. Immunosuppression occurs with UV exposure well below the erythema or sunburn threshold; hence, those who were more prone to sunburn were also more susceptible to immunosuppression.^[9] These findings suggest that excimer light dosing protocols should be approached more conservatively in male patients.

In a systematic review by Lopes *et al.* wherein they analyzed six published studies on the efficacy and safety of excimer light compared to other phototherapy devices for vitiligo, adverse effects noted with treatment were mild and well tolerated. Out of a combined total of 411 patients for the six studies included, 23 patients experienced erythema, 22 noted pruritus, burning sensation, or dryness of the skin and 20 had blister formation.^[10] Similarly, in our study, adverse effects encountered were mostly mild, with only one patient reporting severe pain. This was a male patient with vitiligo who had an MED of 150 mJ/cm². He developed severe pain on the area given the highest dose of 400 mJ/cm². The pain spontaneously resolved without the need for active intervention. This indicates that the phototesting doses used in the study are safe and may be used as the standard incremental doses in MED testing using the 308-nm excimer light.

CONCLUSIONS

In Filipino patients with skin phototypes III to V, our study found that the median MED is at 200 mJ/cm². In the treatment of localized photoresponsive skin diseases such as psoriasis, atopic dermatitis or mycosis fungoides (except vitiliginous skin which is regarded as skin phototype I) in

Filipino patients, we can consider an initial starting dose of 200 mJ/cm². As the MED was found to be lower in males, a more conservative initial starting dose should be considered. However, determination of the MED to identify the most appropriate starting dose is still the ideal method because of the variation in MED even in the same population.

Financial support and sponsorship

Received a research grant from the Philippine Dermatological Society

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Chong WS, Pan JY, Ting TE. Phototherapy and Photodiagnostic Methods for the Practitioner. Singapore: World Scientific; 2017.
2. Lim HW, Honigsmann H, Hawk JL, editors. Photodermatology. Boca Raton, FL: CRC Press; 2007.
3. Lee ES, Park K, Heller MM, Kamangar F, Lee SS, Koo JY. Minimal erythema dose testing made easy with excimer laser. *Psoriasis Forum* 2011;17a: 280-2.
4. Astorga MI, Dizon MV, Tinio PA. Determination of minimal erythema dose of Filipino adults to standardize the initial dose of narrowband ultraviolet B phototherapy in a tertiary hospital. *J Philipp Dermatol Soc* 2021;30:40-5.
5. Bhor U, Pande S. Scoring systems in dermatology. *Indian J Dermatol Venereol Leprol* 2006;72:315-21.
6. Tan Y, Wang F, Fan G, Zheng Y, Li B, Li N, *et al.* Identification of factors associated with minimal erythema dose variations in a large-scale population study of 22 146 subjects. *J Eur Acad Dermatol Venereol* 2020;34:1595-600.
7. Sekar CS, Srinivas CR. Minimal erythema dose to targeted phototherapy in vitiligo patients in Indian skin. *Indian J Dermatol Venereol Leprol* 2013;79:268.
8. Asawanonda P, Anderson RR, Chang Y, Taylor CR. 308-nm excimer laser for the treatment of psoriasis: A dose-response study. *Arch Dermatol* 2000;136:619-24.
9. Damian DL, Patterson CR, Stapelberg M, Park J, Barnetson RS, Halliday GM. UV radiation-induced immunosuppression is greater in men and prevented by topical nicotinamide. *J Invest Dermatol* 2008;128:447-54.
10. Lopes C, Trevisani VF, Melnik T. Efficacy and safety of 308-nm monochromatic excimer lamp versus other phototherapy devices for vitiligo: A systematic review with meta-analysis. *Am J Clin Dermatol* 2016;17:23-32.