Scientific Research Publishing

Journal of Biosciences and Medicines, 2025, 13(8), 451-466
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

To What Extent Could a Patient's Skin Type Correlate with the Skin's Response to Topical Vitamin A: Tretinoin and Adapalene?

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How to cite this paper: Murad, S. and Thompson, P. (2025) To What Extent Could a Patient's Skin Type Correlate with the Skin's Response to Topical Vitamin A: Tretinoin and Adapalene? *Journal of Biosciences and Medicines*, **13**, 451-466.
https://doi.org/10.4236/jbm.2025.138035

Received: July 16, 2025
Accepted: August 23, 2025
Published: August 26, 2025

Abstract

Skin type results in varied responses towards topical vitamin A medications-specifically Tretinoin and Adapalene. An understanding on why patients don't exhibit the same or similar results and symptoms while on the same topical vitamin A medication could result from their phenotypic genetic traits in combination to their skin's response to UV radiation. These two factors are taken into account within this study in order to categorize patients to accurately compare their reactions. This study focuses on analyzing patients through skin types I - VI through the categorization of the Fitzpatrick scale. This categorization allows for the hypothesis to be supported or refuted on whether, "If melanocytes are abundant in the skin, then they will have lessened severity in symptoms." The quantitative and qualitative methodology was a correlational study that utilized a questionnaire, a skin type categorization with variables taken from the Fitzpatrick scale, and statistical analysis—mean, range, standard deviation, and standard error, in order to highlight if there were any statistical differences or similarities across all skin types. The data indicate how there was a statistically significant difference between the skin types across this study. This is seen through popular symptoms including sensitivity, peeling, purging period, and duration. However, some skin types exhibited a minute variation in reaction to the topical medication. Ultimately, this study reveals how skin types exhibit varied responses towards topical vitamin A medications, contributing a deeper understanding of how medications can result in a diverse severity between patients.

Keywords

Tretinoin, Adapalene, Fitz Patrick, Skin Type, Purging, Retinoid, Vitamin A

1. Introduction

Since the early 2000s, there has been a rise in utilizing topical vitamin A in the form of retinoids. Retinoids are topically applied cream medications which are composed of vitamin A. The retinoid medications Tretinoin and Adapalene are prescribed by dermatologists for a multitude of reasons including managing skin texture, acne, dark spots, wrinkles, and skin scarring. These medications have been prescribed internationally due to their various and effective treatments; however, some patients do not experience identical outcomes. Some patients obtain lengthier and more severe purging periods, pigmentation changes, increases in sensitivity, and worsening symptoms when compared to other patients on the same medication and dosage. Purging is a period in which the patient's skin progressively worsens in order to remove the deep bacteria and oil buildup from the hypodermis to the epidermis prior to the skin showing positive results. Issues like these are commonly experienced, sometimes leaving patients who have used the topical for two to three months with more sensitive and irritated skin than prior to the treatment. The reason behind this could evolve from the patient's skin pigmentation. Melanocytes play an immense role in protecting the epidermis from UV radiation exposure and foreign factors, which include chemicals and mechanical trauma [1]. Melanocytes are cells in the body which produce melanin, a color producing protein present in the skin, hair, and nails. It is presented how this color producing protein promotes the protection of the epidermal layer, outermost skin barrier, deflecting any factors that could harm the skin's barrier.

For medical professionals seeking a division in their patient's similarities and differences experienced during their prescription, the Fitz Patrick scale is a key factor in determining a patient's skin type as it analyzes factors including the patient's skin sensitivity to UV radiation, genetic traits, and the amount of visual melanin present within the skin to determine a skin type from I to VI. The possibility of a certain skin type can become a determinant when examining how a medication could affect a patient due to their composition of melanocytes. With an analysis synthesizing the possible effects a patient could undergo, it could potentially eliminate possible risks prior to treatment. Through the study, the data collected will either refute or support the hypothesis, "If melanocytes are abundant in the skin, then they will have lessened severity in symptoms," to highlight if skin type contributes to skin response.

Furthermore, the analysis could enlighten dermatologists to utilize the skin type to more effectively treat their patient's dermatologic journey using topical vitamin A in the popular forms of Tretinoin and Adapalene.

2. Literature Review

2.1. Patient's Skin Type in Correlation with Sensitivity to Ultraviolet Radiation

Melanocytes play a prominent role in skin protection. This traces back to skin type being a primary factor that could shift symptoms and likelihood of develop-

ing worsening skin conditions. For example, the prospect of individuals who possess paler skin or few melanocytes can result in a heightened risk for developing skin cancer due to excessive UV exposure. As claimed by the *British Medical Journal*, "Rates of BCC [Basal Cell Carcinoma] 10 - 20 time higher in skin types that burn easily [skin types I and II]" [2]. There is an emphasize on the increased potential factors that could damage the skins barrier causing mutations in the cell's gene expression. This heightened risk is attributed to the lower concentration of melanocytes, which play a crucial role in protecting against UV radiation. Skin types I and II are relatively fair to pale skinned as they have low melanocyte concentration. With less melanin present, skin types I and II are at higher risk of exposure to lethal conditions due to the skin types' sensitivity.

Studies relating back to UV exposure expand on how some individuals receive a tan post exposure, and how some individuals do not exhibit the same response. Directly incorporated into a publication in the Wayne State University Press, "...those with very pale skin will develop an immediate sunburn but not tan, and those with darker skin rarely have an erythemal response but will develop increased pigmentation several days after UVR exposure..." [3]. Melanocytes aid in deflecting UV rays, which prevent them from directly seeping into the skin, and, thus, minimizes the sensitivity experienced by fairer-skinned individuals. Contrarily, individuals with darker skin, skin types III - VI, showcase the opposite reactions. They demonstrate how in response to UV rays, the melanocytes send a signal to a receptor protein to synthesize melanocytes in order to deflect radiation. It is then noticeable days after the event as this is when the cells travel from the basal layer to the epidermis.

Contrastingly, people of color including Hispanics and Indians were studied based on their skin type and response to UV radiation. Generally, these individuals have skin type IV, as they do not blister and/or sunburn as a result of their darker genetic traits and medium melanocyte concentration. As presented in the *Journal of Immigrant and Minority Health*, "Melanoma is less common in individuals with darker skin, primarily because epidermal melanin filters up to twice as much UV light than the epidermis of Caucasian skin" [4]. The source synthesizes how the focus groups conducted with ethnic minorities that present darker skin—skin types IV to VI—experienced protective development of skin cancer [4]. Data towards lighter-skinned individuals aids in supporting the analysis of how individuals with a darker complexion tend to have lower rates for developing both melanoma and skin cancer due to the reaction in more melanin equates to more protective less sensitive skin. This could result from how a higher concentration of melanocytes presented in darker skin types deflect the UV rays which lower the rates of skin cancer in comparison to lighter-skinned individuals.

2.2. Patient's Skin Type in Correlation with Pigmentation Changes

Individuals who obtain a higher concentration of melanin—darker skin types III - VI—tend to be at higher risk for potential pigmentation problems: post-inflam-

matory hyperpigmentation, melasma, and uneven skin darkening or lightening [5]. An example of this is keloid scars. Keloids are scars which end up forming from excess melanocytes and collagen produced from the body. The skin types that tend to obtain more melanocytes have a tendency to be at greater risk of developing these benign overgrowths on the surface of their skin. As claimed by the National Library of Medicine, "It is also reported that those with SOC are approximately 5 - 16 times more likely to develop keloid scar tissue compared to Caucasian skin" [6]. Chiang and researchers statistically supported how people of color—individuals with darker or more melanocyte concentrated skin—have an increased risk of severe effects while using the topical medication. Rather than an overgrowth of melanocytes and collagen, the skin will have uneven colored patches that are noticeably darker than the rest. Tretinoin is composed of predominantly vitamin A, and when topically applied to the skin, the medication diffuses into the pores of the skin and signals the production of new cells known as cell turnover.

Skin lightening is another effect that can result from the use of retinoids as they speed up cell turnover and accelerate epidermal cell turnover which promotes the shedding of melanin-containing keratinocytes [7]. When it relates to skin lightening, the tendency of this occurring is predominately in the darker skin types or the skin types which include a considerable composition of melanocytes. With a high dosage of Tretinoin, the results of skin lightening to aid in the evenness of hyperpigmentation was effective as the medication pushed forth cell turnover, evenly distributed new cells to the skin, and diminished clashing skin tones to create an even colored epidermis.

2.3. Patient's Skin Type in Correlation with Dryness/Irritation

Another facet highlighted among various studies focusing on retinoids was the tendency for patients to experience dryness and irritation of the skin. The National Library of Medicine highlights how topical adapalene commonly reacts with the skin in a way that causes up to 60% of patients experiencing a burning or stinging sensation during the early treatment phase [8]. Patients experienced the burning sensation roughly during the first month of their prescription. This sensation was experienced throughout various groups throughout the day and post application. These dryness and irritation side effects were not the only reactions commonly experienced amongst patients utilizing Tretinoin and Adapalene as additional common side effects of Adapalene may include irritation, peeling, and redness [8].

Adapalene caused irritation, including erythema [redness of the skin] and skin dryness. In a study conducted with patients who utilize Adapalene gel with the dosage of 0.1%, symptoms similar and including dryness and irritation were present in Asian and Black skin following the application of adapalene gel 0.1% [6]. Based on the collected data, researchers observed that Black patients exhibited a greater tolerance for dryness and irritation as a side effect when compared to White patients within the study. This could be due to increased concentration of

melanocytes deflecting the medication or protecting the skin's barrier at a heightened level.

By understanding the differentiation between certain skin types and their genetic traits specifically their melanin concentration, the information can shed light on the possible outcomes patients can experience prior to their prescription. It is indirectly noticed how patients who have more melanin equate to a more protective skin barrier. The other differentiation of skin types is in the categories of dry, sensitive, combination, and oily skin. These categories barely aid in synthesizing an effective synthesis on how Tretinoin and Adapalene can affect a group of peers. According to the National Library of Medicine, "Additionally, symptoms of erythema, dryness, scaling, stinging/burning and pruritus were lowest in the combination group" [6]. It is seen how dryness and the burning sensation is present; however, a skin type in the groups of dry, combination, normal, and sensitive can shift or evolve over time due to external factors including environmental change, change of diet and lifestyle, and the usage of new medications. This strengthens the necessity in obtaining knowledge of which skin type is affected in which ways through topical vitamin A medications.

Pursuing this, the research that will be explored will be based around the following question: To what extent could a patient's skin type correlate with skin's response to topical vitamin A: Tretinoin and Adapalene?

3. Methodology

To comprehend the relationship between a skin's response to topical vitamin A and an individual's skin type categorized using the Fitz-Patrick Scale, a data analysis synthesizing a patient's symptoms/experience was necessary alongside a deep examination on their genetics and sun exposure. These attributes were taken into account to discover if skin type and response to vitamin A have any correlations scientifically. An in-person determination was necessary for an accurate analysis on the individual's categorization of their skin type, allowing for a correlation between the two variables that were being researched. This goal is aligned with the intended purpose of the research as it seeks to understand an individual's skin type, categorized by genetic factors and skin's response to UV radiation, and its response to vitamin A topicals: Tretinoin and Adapalene.

A quantitative, qualitative, and correlational study—utilizing a detailed survey and a dermatologist approved analysis on the patient's skin type—was conducted as opposed to a descriptive study as it would limit the research correlation made between skin type and response to vitamin A topicals.

A correlational studying was the most effective research method as it aimed to find the common variables between skin type and medication allowing for a detailed analysis on how the two variables affect each other.

The research process began with asking patients in dermatology clinics if they were interested in supporting science to better shape a patients' treatment utilizing vitamin A topicals. The patients who agreed stayed after their appointment

for a five-minute analysis. There were two requirements for the participants: age between 15 - 65 years and utilizing either Adapalene or Tretinoin for over 3 months.

First, the patients who agreed to participate within the study were obligated to thoroughly read a consent form. If the patient was a minor, it was enforced the acknowledgement and permission of the minor's parent to utilize their data within the study.

A table was developed that accurately determines an individual's skin type through their genetic traits and response to UV radiation. It must be noted how the developed chart was approved by a dermatologist prior to the start of the data collection to ensure accurate data for this research study. The table composes of essential traits and objectives that the Fitz-Patrick scale follows to categorize patients under one of six skin types accurately. The chart asked for qualitative measurements, including eye color, hair color, presence of freckles, and the certain type [if any] of sunburn they receive post exposure to UV radiation.

Once finalized, participants were grouped and determined by patient's skin type based on their responses using the bottom section of the chart which sectioned the responses for each question asked from the genetic category and UV radiation category.

With determined skin type in mind, the second procedure was a one-on-one analysis of the patient's experience on the medication. The survey questions were transcribed on to a sheet of paper and a Google Form to document the patient's response and experience they had while on the medication. This step utilized a detailed free response questionnaire, based on the medication, dosage, symptoms, and the longevity on the medication. Furthermore, the one-on-one analysis was used to gather the information as it allowed for the most clarity between the patient while explaining and asking the given questions. Their answers to each of the questions asked were then written on the box section adjacent to the question being asked. This step continued on for all questions included within the survey questionnaire analysis. Most questions asked for qualitative measures of the patient's reaction and symptoms to their dosage on the medication from scales of "Never; Rarely; Sometimes; Often; Always" and then free response answers to showcase their own unique reaction. The rationale for treating the 5-point ordinal scale ("never" to "always") as interval data for statistical analysis was done in order to calculate means and standard deviation in a quantitative sense. The conversion was able to take qualitative responses from the patients and record the commonality in a numerical style to compare with the other skin types. The format obtains qualities similar to the Likert Scale which utilizes five choices: strongly disagree, disagree, undecided, agree, and strongly agree, which then get converted into a numerical value from 1 through 5 [9].

However, two questions were quantitative, including the medication dosage and how long it took for the medication to take full effect with the consumer and the dermatologist agreeing on whether the medication exhibited benefits

based on the intention for going on the topical medication or had no impact at all.

All results provided by participants were then transcribed onto an Excel spreadsheet. Within this spreadsheet, all data was divided into each of Fitz-Patrick's six skin types to further analyze all gathered information as a whole seeking for any similarities and differences within the data. Statistical analysis later followed using Excel functions for each of the six skin types to see the commonality for certain trending symptoms: irritation, peeling, dryness, and result duration. The time frame for evaluation between all six Fitz-Patrick skin types was 3 months to evaluate a minimum of 60 participants with skin types 1 through 6. Additionally, all participants must have utilized their medication for at least 3 months to show consistency and accuracy for their results provided. This further led to the final analysis on whether skin type correlates with the skin's response to vitamin A topicals through refuting or supporting the hypothesis, "If melanocytes are abundant in the skin, then they will have lessened severity in symptoms."

4. Results

Participation Results

A total of 66 patients who have utilized Tretinoin or Adapalene participated in the scientific analysis. Age distributions can be seen in Figure 1 as well as their reason for undergoing the use of their medication in Figure 2. 61% of individuals in the analysis were minors [child], and 39% of individuals were over the age of 18 [adult]. It must be noted that the majority of the participants [86.3%] utilized the medication to lessen existing acne and texture when opposed to the minority [12.1%] using the medication to treat fine lines and wrinkles. Notably, there were zero participants from skin type VI examined as the Black community is the least predominant in the area being researched.

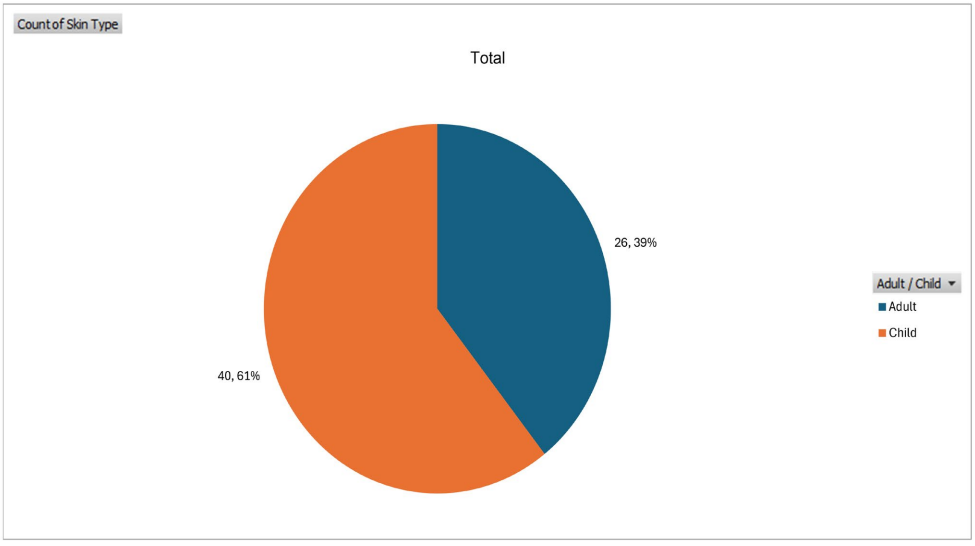

Figure 1. Age distribution among survey and analysis patients [67].

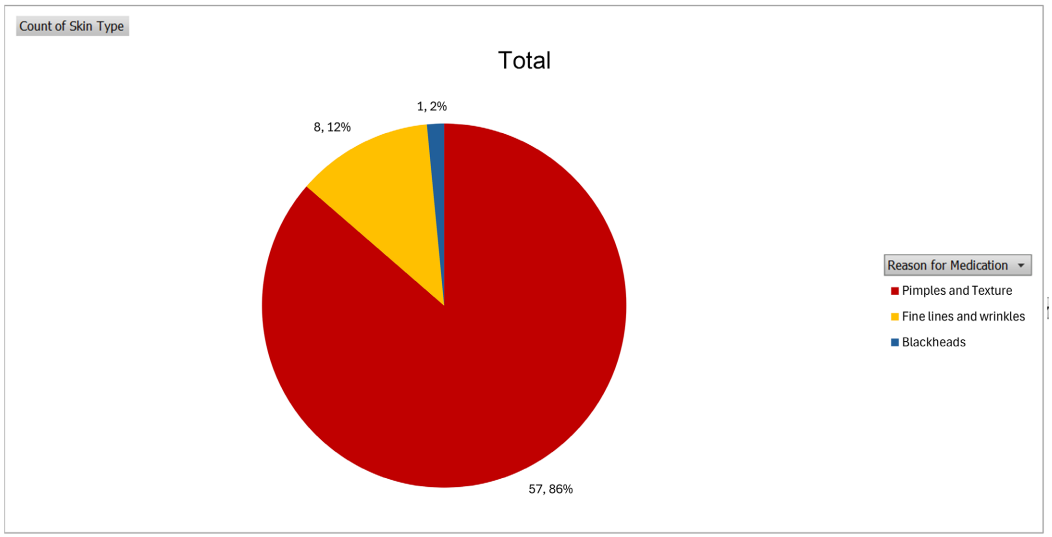

Figure 2. Medication use reasoning distribution.

Figure 3 shows the overwhelming majority of the patients experiencing dryness while on the medication. When asked to select their topmost negative symptoms while on the medication, it is observed how regardless of skin type dryness had a major impact on the patient's skin with a total of 53 comments on dryness showing how 80% of the patients reported how this was a prominent symptom (**Figure 3**).

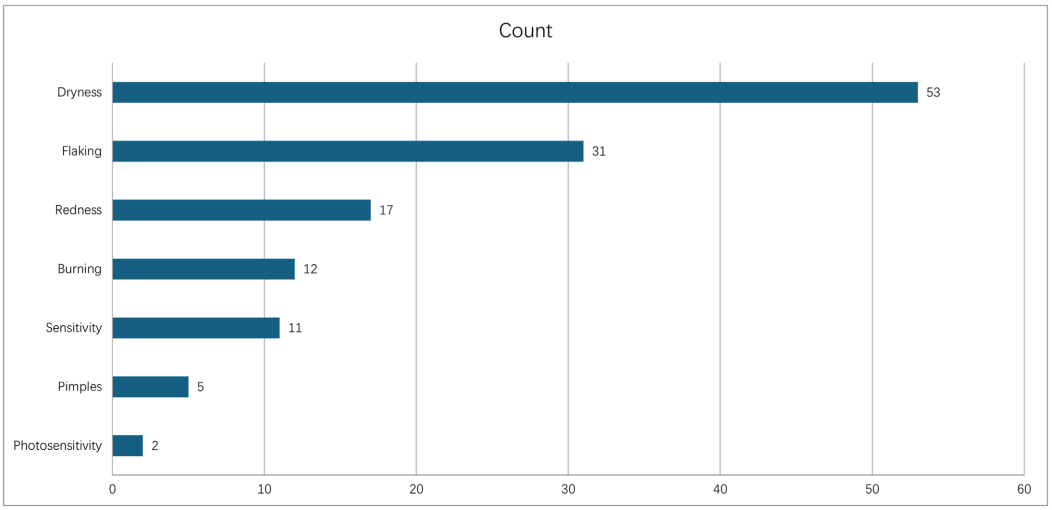

Figure 3. Most prominent symptoms throughout all recorded skin types [I - V].

On the survey portion of the analysis, there was a question regarding if the patient's skin experienced dryness or dehydration, and they were mandated to respond on a scale of "never", "rarely", "sometimes", "often", and "always." When it came to the analysis of their symptoms and skin's response on Excel, every response had a number to allow for a better quantitative analysis of who experienced the same degree of the symptom. The response "never" equated to 1, "rarely" equated to 2, "sometimes" equated to 3, "often" equated to 4, and "always"

equated to 5. With this scale in mind, the highest mean out of all skin types was for skin type I: a mean of 4 which is the skin being "often" dry and dehydrated (Table 1). The second leading skin type to be affected by dryness was skin type IV with a mean of 3.895. As the mean is close to the number 4, it shows how the expected response of their patient's skin was "sometimes" to "often" dry. With a range of 1 to 5, the patient's experience of dryness varied greatly. The standard deviation value [1.197] showcased the dispersal of data values the mean vaguely represents. This further allows for the addition of standard error [0.2746] to show how there is a minimal dispersal of values within the patient's response; finalizing how skin type IV commonly had patients experiencing dryness "often" and "sometimes."

Table 1. Skin types [I - VI] response to vitamin A topicals—dryness.

Skin Type Response to Vitamin A Topicals	Dryness Mean	Dryness SD	Dryness Range
Skin Type I	4	0	[4 - 4]
Skin Type II	3.555	0.616	[3 - 5]
Skin Type III	3.5	1.019	[2 - 5]
Skin Type IV	3.895	1.197	[1 - 5]
Skin Type V	3.462	1.45	[1 - 5]
Skin Type VI	N/A	N/A	N/A

*N/A indicates no data values due to lack of participants from skin type VI. Created by Researcher in Microsoft Excel, 2025.

Furthermore, flaking/peeling was a commonly experienced symptom throughout the groups examined for the study shown in Figure 3. Out of all the skin types analyzed, type IV had the most significant peeling and flaking experience as they had a mean of 3.579 (Table 2). The mean was nearing the "often" mark; however, with a range of 1 to 5 and a mean of 3.6, it showcased the "sometimes" category (Table 2). It must be noted as well how all skin types were within the range of 3.3 - 3.6 other than skin type V showing the lowest peeling mean (Table 2).

Table 2. Skin types [I - VI] response to vitamin A topicals—peeling and flaking.

Skin Type Response to Vitamin A Topicals	Peeling Mean	Peeling SD	Peeling Range
Skin Type I	3.5	0.707	[3 - 4]
Skin Type II	3.277	0.826	[2 - 4]
Skin Type III	3.429	1.089	[2 - 5]
Skin Type IV	3.579	1.121	[1 - 5]
Skin Type V	2.539	1.391	[1 - 5]
Skin Type VI	N/A	N/A	N/A

N/A indicates no data values due to lack of participants from skin type VI. Created by Researcher in Microsoft Excel, 2025.

Each patient reported their skin's response to the medication through the commonly experienced symptom, sensitivity. This symptom was questioned throughout the cohorts of skin types, and it is noticeably significant in the skin types with the least melanocytes. Skin type I had a mean of 5 showing how the participants "always" have sensitivity from their medication (Table 3). In addition, skin types II through IV experienced mild sensitivity showing how they nearly "sometimes" experience sensitivity. The minority of the section was skin type VI—the skin type with the most melanocytes included within the study—showing how they "rarely" experience any form of sensitivity while on the medication.

Table 3. Skin types [I - VI] response to vitamin A topicals—sensitivity.

Skin Type Response to Vitamin A Topicals	Sensitivity Mean	Sensitivity SD	Sensitivity Range
Skin Type I	5	0	[5 - 5]
Skin Type II	2.884	1.079	[1 - 4]
Skin Type III	2.939	0.917	[2 - 5]
Skin Type IV	2.895	0.315	[2 - 3]
Skin Type V	2.385	1.502	[1 - 5]
Skin Type VI	N/A	N/A	N/A

N/A indicates no data values due to lack of participants from skin type VI. Created by Researcher in Microsoft Excel, 2025.

Additionally, the patients in each group were asked if they experienced any increase in pimples to understand if the medicine counteracted and had a worsened effect on the patient's skin. It is most noticeably proven how in skin type I, the patients had a range of 4 and a mean of 4 showing how all participants "often" experienced an increase in pimples throughout their skin as a response to the vitamin A topical (Table 4). It is also seen how in skin type V—the second most predominate response—how they had the broadest range [1 - 5] showing the wide variation of a patients response to an increase in pimples throughout their skin, but it also obtained a mean of 2.6 showing how they "rarely" had any increase in pimples and/or texture in their skin (Table 4). Lastly, skin types II through IV had the most consistent range alongside its standard deviation showing how their variability was minute strengthening their "rare" response of having an increase in pimples and texture throughout their skin.

Table 4. Skin types [I - VI] response to vitamin A topicals—increased pimples.

Skin Type Response to Vitamin A Topicals	Increased Pimples Mean	Increased Pimples SD	Increased Pimples Range
Skin Type I	4	0	[4 - 4]
Skin Type II	1.5	0.786	[1 - 3]
Skin Type III	1.5	0.65	[1 - 3]
Skin Type IV	1.895	0.315	[1 - 2]
Skin Type V	2.615	1.325	[1 - 5]
Skin Type VI	N/A	N/A	N/A

N/A indicates no data values due to lack of participants from skin type VI. Created by Researcher in Microsoft Excel, 2025.

The final symptom questioned between the researcher and the participant was if they experienced an increase in wrinkles. With all skin types nearing 1 or being exactly at 1, it is statistically accurate to state that the majority of the participants experienced no increase in wrinkles. There was a slight majority of participants who stated how they experienced a rare increase in wrinkles. However, since the mean for each skin type are nearing the lower end of the number 1 and the standard error nearing the number 0, it helps support the claim how majority of the patients who utilized retinoids "never" experienced an increase in wrinkles and fine lines (Table 5).

Table 5. Skin types [I - VI] response to vitamin A topicals—increased wrinkles.

Skin Type Response to Vitamin A Topicals	Increased Wrinkles Mean	Increased Wrinkles SD	Increased Wrinkles Range
Skin Type I	1	0	[1 - 1]
Skin Type II	1	0	[1 - 1]
Skin Type III	1.071	0.267	[1 - 2]
Skin Type IV	1.105	0.315	[1 - 2]
Skin Type V	1.231	0.439	[1 - 2]
Skin Type VI	N/A	N/A	N/A

N/A indicates no data values due to lack of participants from skin type VI. Created by Researcher in Microsoft Excel, 2025.

Moreover, a quality that is very critical in examining each skin type's response to the topical medication is by comparing the duration of the patient's purging period. As seen in Figure 4, the skin type with the briefest purging period was skin type IV. Skin type V additionally had a significant number of participants who claimed that their purging period was under the 3-week mark showcasing how the vast majority of skin type V patients had a brief purging period. With skin types I through III having most individuals obtaining an extensive over 3 week purging period, it allowed for the statistical statement to be made and proven how skin types with higher melanocytes have a shorter and brief purging period when compared to the melanocyte deficient skin types obtaining a longer more extensive purging period.

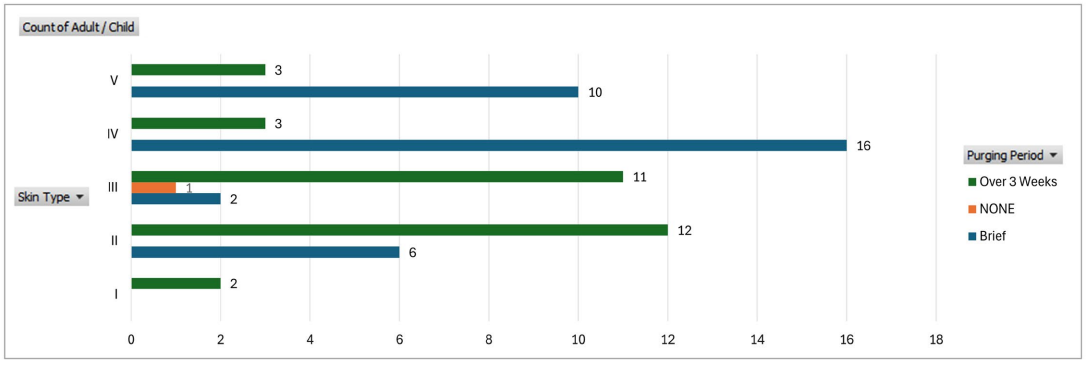

Figure 4. Purging period duration between all skin types analyzed [I - V].

Lastly, the most significant comparison made between all skin types is the results duration. It is shown within Figure 5 how once again skin types IV had the most participants who had the quickest effectivity when it came to the medication making its positive impact most efficiently. With 11 participants stating how they gained their results in around a month, it showcased a vast majority of patients receiving their desired outcome the quickest. However, in skin type IV, there were 3 patients who received their results in 2 months. Due to 79% of patients within this skin type efficiently gaining their desired outcome in 1 month, the data statistically presents that the majority of the patients who have more melanocytes tend to have a quicker process undergoing a topical vitamin A. Additionally, the second most effective and efficient skin type that responded to the vitamin A topicals the quickest was skin type V having 9 participants gain their results in 1 month. Skin types IV and V proves once again how skin types with more melanocytes have a higher effectivity with the vitamin A topical medication quickening their progress on the medication. It is lastly necessary to notice the vast majority of participants in skin type II [10 participants] who noticed how it took their skin at least 2 months to receive their desired results through the medication.

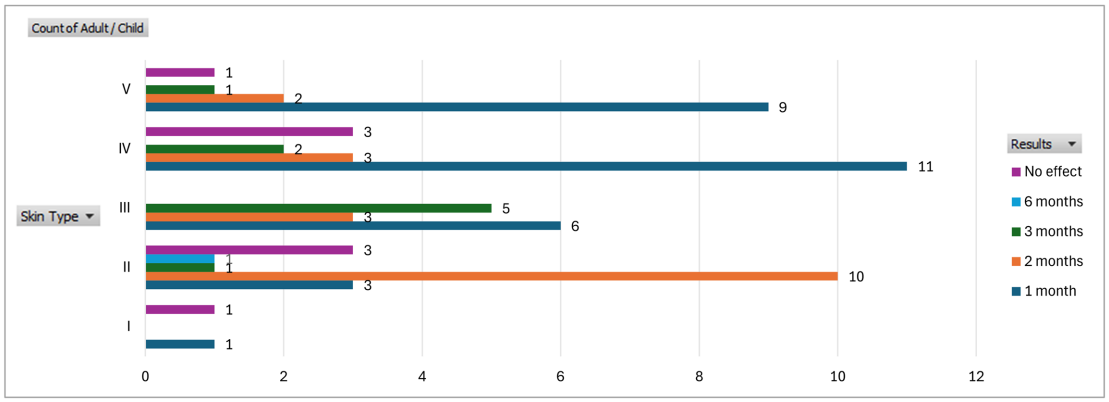

Figure 5. Medicine result duration between all skin types analyzed [I - V].

5. Discussion

As seen through the data results, there is a statistical difference between skin types I through V in correlation to the patient's skin's response to topical vitamin A. While the data does showcase differential reactions to the medications examined upon, the uneven sample size for specifically skin type I must be examined with caution as there was a sample size of 2 patients as the data may reflect sampling variability rather than biological differences.

The datasets relating to the symptom dryness, there is no statistical difference between the five skin types researched upon. All skin types obtained a mean that ranged from 3.426 to 4. This showcased how all skin types exhibit some form of dryness on a relative scale of "sometimes" to "often". Another category that exhibited no statistical difference was the increase in wrinkles. As this is not normally an issue between patients, the results showcased how there is "never" an

increase in wrinkles no matter the skin type as seen through the mean range [1 - 1.2].

On the contrary, there was a statistically significant difference between the skin types I-V relating to peeling, sensitivity, and an increase in pimples. These three symptoms showcased the most variation as seen through the mean and ranges. The standard deviation additionally allowed for a deeper analysis of each skin type to form the conclusion of the varying response through each skin type. To begin with peeling, the research showcased how skin type V had the lowest response and correlation to peeling with a mean of 2.5 ["rarely"]. On the other hand, skin types I-IV had a near 1.0 mark for their range of means. The data sets from the skin types I-IV ranged from 3.277 - 3.579 showing how they "sometimes" to "often" experience peeling through their skin due to the medication. For sensitivity, it is seen how there is a statistical difference between three skin types. Skin type I showcased an "always" sensitive response, when opposed to skin type 5 showing a near "rarely" response of sensitivity. Skin types II-IV ranged from a mean of 2.884 - 2.939 showing a near "sometimes" response of sensitivity and burning sensation within their skin. Similar effects were presented on to the same skin types. Skin type I presented the highest response to an increase of pimples within their skin with a mean of 4 showing "often" times their skin has a reversal effect and presents more pimples than less. Skin types II - IV had the lowest response to the medication's symptom of having an increase in pimples as shown through the mean range of 1.5 - 1.895. This proves how the majority of the patients within this skin type category had "never" to near "rare" increases in pimples. The final skin type not described upon—skin type V—showed a shocking response to the medication. Thought to produce less pimples, the data shows how the medication allowed for many of the patients to have a near "sometimes" response to the symptom of having an increase in pimples. With a range of 1 through 5 and a standard error value of 0.3688, it showed how many patients experienced an increase in pimples while on the vitamin A topical.

In addition, there was a statistical difference seen within the purging period duration between all five skin types. Simplistically, skin types I - III had a lengthy purging period with a duration of over 3 weeks. Conversely, skin types IV and V had brief purging periods with many having brief to no purging periods at all. The purging period duration once again supports the claim made how individuals with skin types with a higher amount of melanocytes tend to have a quickened and less harsh response to vitamin A topicals.

The final and most significant analysis presented within the data is found within the result durations between the five skin types analyzed. It is seen how skin types II and III had an average of 2 months to see effective results. Skin type I could not be properly examined due to the wide gap between no effect and a duration of 1 month. Skin types IV and V have an average of 1 month for their results of the medication. This led for the statement to be made on how skin types with more melanocytes may yield quicker results in the medications Tretinoin and Adapa-

lene.

In the final analysis, there is a significant correlation when considering a patient's skin type to the response of topical vitamin A: Tretinoin and Adapalene. The data presented showed varied degrees to commonly experienced symptoms, result durations, and purging durations, proving how skin types experience different responses to topical vitamin A.

6. Conclusions

The study proved to be beneficial for certain skin types as exhibited through the data set analysis. There was in fact comparable results between all skin types as seen through various symptom frequencies and the skin's response to the medications. Due to the statistical significance between various symptoms experienced, the research question exhibits an inconsistency in responses in vitamin A showing how all patients experience the medication in a different degree. This further supported the hypothesis made on if melanocytes are abundant in the skin, then they will have lessened severity in symptoms. The data is promising as it allows for medical professionals and patients to ensure if this topical vitamin A is suitable for their dermatological treatment.

The results are a testament for future studies with the analysis of the data and sharing of limitations to further build upon this research question. It is necessary for patients to understand the varying responses a medication can have based on skin type, showing the various possibilities that can occur based on their genotypic and phenotypic traits.

Limitations

Certain limitations arose through the research process alongside the data analysis. The durations for both the results and the purging periods were broadened to maximize the grouping of patients for the analysis. Patients who said around 3 weeks were grouped into the 1-month category for results as majority of the patients reported back in a [1 - 3] month response. Purging period duration additionally got altered as many patients did not have similar categories. A response that was 5 weeks would get categorized into 1 month as that was the closest mark to compare with other responses. Concisely, the broad time frames for both results and purging duration diminished the accuracy for the final analysis as patients' responses experienced an alteration to better categorize their responses.

Another concern was the uneven patient pool for each skin type. For instance, for skin type 1, only 2 patients were examined while skin type 4 had a pool of 19 individuals. This raised an issue within the ranges and means as this allowed for an inaccurate standard for comparison between each skin type.

No participants were included from skin type VI as the Black community is a minority in the area examined. The locations of the two dermatologist clinics reported minimal patients who are skin type VI limiting the data analysis for that specific group. This issue limited the comparison of skin types that lack and are

abundant of melanocytes weakening the broadened analysis of all skin types and their response to topical vitamin A.

Implications

Future studies should focus on skin types IV and I and how they differ in the sense of sensitivities as they have an abundance to minimal melanocytes. This shift in the research process can further allow for a better examination between all skin types through more participants and see a limitation that arose. Moreover, future replications of this study should utilize a greater attendance of type I and VI participants to promote a more accurate analysis of data within the correlational study.

The way to achieve accurate and more significant data is through the usage of a greater attendance ratio throughout all skin types. This could be seen through a minimum of 60 participants per skin type prior to statistically analyzing the data. With an overall attendance of 67 participants, future studies can go well over 200 participants to ensure accuracy within the data analysis to determine the correlation between skin type and response to topical vitamin A.

The results revealed how there is a difference in response of topical vitamin A based on the patient's skin type. The significance in the study allows medical professionals to utilize the varying symptoms and cater the overall response to their specific patient. The results can promote a better treatment process for patient's skin to strengthen the justification for the prescription. This additionally allows medical professionals to synthesize if Tretinoin or Adapalene are adequate for the patient's skin issue and if not it would promote a redirect towards a different medication that could yield similar results.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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