



## “To Study the Role of Sunscreen in Children”

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### ABSTRACT:

It is well known that sunscreens constitute an essential component of overall photoprotection. Sunscreens, both physical and chemical, have been used widely for the prevention and treatment of a variety of disorders caused by UV radiation, including sunburn, photoaging, skin cancer, and phototoxic responses. These conditions include sunburn, photoaging, and phototoxic reactions. Sunscreens are now offered in a variety of forms, including creams, lotions, gels, sticks, and sprays, among others. Forty clinical dermatological specialists took part in the meetings of the expert group that were held over the internet in the form of a teleconference and webinar to review definitions, diagnosis, and treatment options. The most recent research about the use of sunscreen compounds was presented, together with the clinical expertise of industry professionals. It is very necessary to apply a sufficient quantity of sunscreen with an acceptable sun protection factor. This application must be done in accordance to the individual's skin type as well as their exposure pattern. The prudent use of sunscreens, the avoidance of sun exposure during the middle of the day, and the wearing of protective apparel are all necessary components of a comprehensive sun protection program. It cannot be denied that there is a need to promote public education and understanding on the usage of sun protection products like sunscreen.

### Introduction

Cancer of the skin is the most common kind of cancer to be diagnosed. Since 2014, the incidence has been rising, making it a worldwide health problem for children and adolescents, especially considering the fact that many physically active and athletic pursuits take place outdoors. According to a number of studies, the amount of time spent in the sun is greatest for those who have not yet reached the age of 21.<sup>1</sup> It is believed that between 25 and 50 percent of a person's lifetime ultraviolet (UV) exposure takes place during childhood. It is also believed that between 25 and 50 percent of a person's lifetime UV exposure occurs between birth and age 60. In addition to this, it is believed that children are exposed to three times the amount of ultraviolet radiation that adults are on a yearly basis.<sup>2</sup>

It might be challenging to decide how to best impact people's attitudes and beliefs around skin cancer. This may be attributable to a variety of factors, including differences in social standing, educational systems, and

teaching venues. On the other hand, there are numerous different ways that youngsters may be protected from potentially dangerous UV radiation.<sup>3</sup> When teaching children about sun protection, the elementary school years have the most beneficial outcomes.<sup>3</sup> Changes in behavior throughout infancy may be able to reduce the occurrence of skin cancer.<sup>4</sup> It has been argued that schools are the greatest resource for putting changes into effect and educating youngsters about the dangers of UV exposure.<sup>2</sup> Participants may be informed about the dangers of ultraviolet (UV) radiation, but information alone is not enough to modify participants' behaviour in order to protect themselves from the sun. This is a recurring subject. It may be challenging to modify a patient's behavior via therapy because of factors such as peer pressure, an unrealistic optimism in which the potential for short-term benefit exceeds the potential for long-term damage, and a desire to seem tanned and "healthy".<sup>5</sup>

Many of the existing strategies for preventing melanoma take a "one size fits all" approach, with the



goal of concentrating on people who have the lightest skin color possible. For those who have a greater likelihood of acquiring skin cancer, taking preventative measures against melanoma using standardized methods, such as covering up with long-sleeved clothes and using sunscreen with a high UV protection factor, is essential. It is necessary to take a targeted and methodical approach in order to discern the benefits and drawbacks that various sun protection solutions provide for people with different skin tones. In order to keep blood levels of vitamin D stable while also preventing carcinogenesis, a variety of preventative measures are required. There are not many recommendations or research available that investigate this multi-tiered approach to health. Childhood melanomas are quite uncommon. Although only 2% to 3% of all melanomas are found in children, the danger posed by the disease should not be minimized. Melanoma is a kind of skin cancer that may grow over time, with the majority of cases occurring between the ages of 15 and 19 in people younger than 20. One theory suggests that a genetic predisposition has a more significant impact in the development of melanomas that occur at an earlier age.<sup>6</sup> This is in contrast to UV radiation, which is thought to have a more significant impact in the development of melanomas in later years of adolescence. The study compared cases to controls. It has also been shown that living at a greater latitude during childhood is associated with a higher risk of developing melanoma later in life.

This points to the possibility that UV radiation may have the same effect on teenagers as it does on adults when it comes to the development of melanoma. It was shown that individuals diagnosed with melanoma, who had been exposed to severe bursts of UV radiation at an earlier age were more likely to have genetic damage that resulted in BRAF mutations. NRAS mutations were shown to be more prevalent in individuals who had been subjected to higher levels of UV radiation.<sup>4</sup>

According to the findings of Glenn and colleagues, "sun exposure is the primary modifiable risk factor for melanoma, with childhood being estimated to be one of the most critical exposure periods for conferring risk." In addition, the estimated risk of acquiring melanoma is raised between 8 and 12 times for first-degree relatives of people who have survived melanoma when compared to those who do not have a history of

melanoma in their family. This is due to a combination of many variables, some of which include common patterns of sun exposure, hereditary propensity, and phenotypic.<sup>6-8</sup>

Additional research has led researchers to the conclusion that a small amount of exposure to UV rays during childhood may reduce the risk of developing allergies by elevating serum vitamin D levels.<sup>9</sup> There is a need for further research to be done in order to identify the impact that ultraviolet radiation, in addition to hereditary and environmental variables, plays in the development of skin cancer. This study is to examine a wide variety of approaches to sun protection for babies, children, and teenagers, focusing on those that have been successful as well as those that have been less successful.

## Details about sunscreens

Sunscreens have a long history of use as effective photoprotective agents, and their use has been well studied and recorded. Sunscreens are formulated to protect users from the potentially damaging effects of prolonged exposure to the sun.<sup>10,11</sup> Sunscreens are an essential component in the fight against human skin conditions brought on by ultraviolet radiation from the sun.<sup>11</sup>

## Sunscreens are divided into many categories.

Sunscreens may either be applied topically or absorbed into the body via the bloodstream.<sup>11</sup> Topical agents may be further divided into two categories: those that include inorganic UV filters and those that contain organic UV filters. This distinction is made based on the unique mechanisms of action that are activated when the agents are exposed to sunlight. UVA and UVB blockers are found in organic sunscreens, which are also known as chemical sunscreens.<sup>12</sup> Inorganic blockers shield the skin from the sun's harmful rays by scattering or reflecting them throughout a broad range.<sup>11</sup> Hybrid UV light filters consist of organic and inorganic materials fused together at the molecular or nanoscale level.<sup>11</sup>

## Values for both SPF and PFA

SPF, which stands for "sun protection factor," is often used to define the level of protection provided by a sunscreen.<sup>13</sup> It is calculated by dividing the amount of UV energy needed to cause a minimal erythema dose on protected skin by the amount of UV energy needed to cause a MED on unprotected skin.<sup>13</sup> The phrase



"minimum effective dose" refers to the shortest exposure duration or lowest dose of UV light irradiation necessary to cause a modest, observable erythema on unprotected skin.<sup>13</sup> When it comes to preventing sunburns, a sunscreen's SPF rating is indicative of how well it works.<sup>13</sup> The photoprotection factor of UVA, commonly known as PFA value, is another metric that is used to rate sunscreen products. PFA testing has been broken down into its component parts, which include the quantity of substance to be applied, the dosage of radiation, and the radiation field.

### The essential wavelength

Measurements in the 290-400 nm band reveal the crucial wavelength as the point at which a sunscreen stops absorbing 90 percent of the sun's UV radiation.<sup>14</sup> Sunscreens that block both UVB and UVA rays will have a critical wavelength between 320 and 400 nm, whereas those that block solely UVB rays will have a critical wavelength higher than 320 nm.<sup>15</sup> The FDA requires a mean critical wavelength of less than 370 nanometers for sunscreens to be promoted as providing "broad spectrum" protection against UVA and UVB radiation.<sup>15</sup> Sunscreens with a critical wavelength larger than 370 nm and a protection factor index more than 4.9 are regarded to have a broad spectrum.<sup>16</sup>

### SPF values recommended for use with sunscreens

The sun protection factor scale ranges from 2 to 50, with 2 being the least protective, 15 the middle, 30 the highest, and 50 the most possible. best people agree that the best effective sunscreens are those with an SPF of at least 30 and that include photostable UVA filters. It is suggested to use a sunscreen with a sun protection factor (SPF) of at least 30 when outside throughout the summer. Consumers usually apply sunscreen in an inconsistent manner and in quantities that are far lower than what is suggested, which results in a reduction in the product's real SPF.<sup>17</sup> Even if just a little quantity is applied, sunscreens with a high SPF may still provide enough coverage.<sup>17</sup> People who participate in outdoor activities such as swimming and hiking are subjected to significantly higher levels of ultraviolet radiation exposure than the recommended exposure limits. As a result, these people have a greater likelihood of developing skin cancer.<sup>18</sup> Encouragement to apply sunscreen with a broad-spectrum, water-resistant, and at least SPF 30-50 rating should be given to athletes

who are in environments where UV radiation is present.<sup>19</sup>

Under certain circumstances, a higher SPF might be absolutely necessary. Patients diagnosed with CLE, for example, are required to apply a sufficient quantity of sunscreen with an SPF of at least 50 a half an hour before they are scheduled to be exposed to the sun.<sup>20,21</sup> Use of sunscreen has been shown to enhance outcomes in patients with PIH, and sunscreens with a higher SPF may be more beneficial.<sup>21</sup> A SPF of at least 50 is recommended for use on photosensitive patients when selecting a sunscreen.<sup>22</sup> People of color should use broad-spectrum sunscreens with an SPF of at least 30, particularly those that incorporate inorganic filters. These sunscreens provide the best protection.<sup>16</sup> A research carried out by Lakhdar and colleagues shown that pregnant women benefit from using a broad-spectrum sunscreen with an SPF of 50+ on a consistent basis.<sup>21</sup> Despite comparable settings, just 2.7% of newly diagnosed instances of melasma were detected, compared to 53% in a prior investigation by the same investigators.<sup>21</sup> Furthermore, eight out of twelve original melasma sufferers had a significant improvement in their disease.<sup>21</sup> Regularly applying broad-spectrum sunscreen with an SPF of at least 30, ideally at least 20 minutes before stepping out into the sun, is essential for those who reside at high elevations and are vulnerable to extended exposure to UV radiation.<sup>23,24</sup>

### Amount of sunscreen recommended for first application and subsequent reapplications

At a concentration of 2 mg/cm<sup>2</sup>, a sunscreen must be properly applied to all areas that are going to be exposed to the sun. Before exposing it to the sun, it has to be allowed to dry entirely first. According to the teaspoon rule for applying sunscreen, which was established by Schneider et al, 33 milliliters would be applied to the complete body if 3 milliliters were applied to each arm and to the face and neck, and if 6 milliliters (slightly more than a teaspoon) were applied to each leg, to the chest and belly, and to the back. This would bring the total amount of sunscreen applied to the body to 33 milliliters.<sup>25-28</sup>



## Patients, circumstances, and preferences about sun protection products

When selecting the galenic form of a sunscreen, it is necessary to take into consideration the characteristics of the patient, specifically how the product is to be used and where it will be applied.<sup>29</sup> Sunscreens that come in either cream or stick form are generally recommended for use on infants and children aged 6 months to 2 years.<sup>29</sup> Sunscreens that come in a spray or gel form are recommended for people who have oily skin and acne.<sup>30</sup>

It has been shown that novel sunscreens with microfine particles may effectively treat acne and rosacea without causing any adverse side effects. Sprays are helpful for providing defense for the scalp.<sup>30</sup> There is evidence to show that using a lipstick with a sunscreen helps increase the amount of moisture in the lips.<sup>31</sup> In addition, cosmetics such as foundation and makeup may assist give daily protection with an SPF ranging anywhere from 4 to 30.<sup>30</sup> At the moment, extra sun protection may be obtained from moisturizers thanks to the incorporation of sunscreens with varying SPF ratings.<sup>25</sup> Cinnamates, titanium dioxide, and zinc oxide are now used in lieu of the dangerous compounds that included para-aminobenzoic acid (PABA).<sup>32</sup>

## Sunblocks that are both physical and chemical

Physical sunscreens work by reflecting or scattering light, whereas chemical sunscreens work by absorbing high-energy ultraviolet radiation. Zinc oxide and titanium dioxide are the active ingredients in physical sunscreens.<sup>32</sup>

Patients who are porphyriac, have a drug photoallergy, or have PMLE may reap the benefits of the photoprotection that metal oxides provide.<sup>33</sup> However, as a result of their reflecting features, they could have an excessive shine and a white look. As a consequence of this, their usage is restricted since there is a low degree of aesthetic acceptability for them. It is noteworthy to note that the synergy between organic and inorganic sunscreens has been established, and it has been shown that goods featuring both organic and inorganic sunscreens have a larger efficacy compared to products having either organic or inorganic sunscreens alone. This makes it clear that products including both organic and inorganic sunscreens are

superior than products containing either organic or inorganic sunscreens alone.

## A sunscreen's ability to withstand water is a desirable quality.

A sunscreen is considered water-resistant if it retains the SPF rating shown on the bottle even after being submerged in water twice consecutively for a total of forty minutes. A very water-resistant sunscreen is one that keeps its SPF rating despite being submerged in water four times in a row for 20 minutes each (for a total of 80 minutes).<sup>16</sup> Sunscreens that are water-resistant should be used in situations in which there is heavy perspiration, prolonged immersion in water, increased skin friction as a result of physical contact, or contact with sand.<sup>34</sup>

## Photostability of sun protection products

Sunscreens are developed with the intention of reaching the highest possible level of efficacy, which includes taking precautions to ensure and enhance photostability. Because of the fact that all organic UV filters have the ability to photodegrade, this is something that has to be done.<sup>35</sup> The evidence that is currently available suggests that the SPF of organic and inorganic sunscreens, respectively, drops by 38% and 41% after 4 hours, and by 55% and 58% after 8 hours, in participants who, over the course of eight hours, engaged in strenuous activity, were then exposed to a hot environment, and finally bathed in water. This was the case in participants who were also subjected to a hot environment for the duration of the experiment. This drop in SPF occurred after the participants had been exposed to a hot environment, followed by bathing. Therefore, in order to acquire the purported advantages of using sunscreen, it is essential to apply the correct and advised quantity of the product. Utilization of sunblocks for a variety of patient populations and conditions.

## Newborns and younger children

Sunscreens should be used as part of a comprehensive plan for protecting oneself from the sun, which also involves staying out of the sun during the middle of the day and dressing in protective clothes. It seems that oil-based emulsions that include inorganic filters are the sunblocks that are the safest for use on youngsters.<sup>36</sup> Oxybenzone and octocrylene are two ingredients that



should be avoided in children's sunscreens.<sup>36</sup> In addition, regular use of sunscreens starting in childhood and continuing through adolescence has the potential to significantly lower the chance of acquiring skin cancer throughout the course of a person's whole lifetime.<sup>37</sup> Babies that are less than six months old should not have sunscreen applied to them, since this practice is not recommended.<sup>16</sup>

### **Attitudes and actions about UV exposure among children, adolescents, and young adults**

When Glenn et al. queried the 336 parents who had survived melanoma about the sun protection strategies that their children used, the highest marks were given to using sunscreen and wearing shirts with sleeves that went all the way up to the elbows. The usage of sunscreen was recommended by 78.5 percent of respondents, while shirts with full-length sleeves were recommended by 75.08% of respondents. When people went outside on a sunny day, the proportion of individuals who wore hats fell to 29.91%, and the percentage of people who remained in the shadow dropped to 23.05%. This is because people are more likely to seek out the sun when it is light outside. The number of persons who use sunglasses while the sun is out has decreased to 8.41% of the population. On a typical sunny weekend day, parents reported a broad variation in the total number of hours their children spent outside in the sun playing or otherwise being active. It would be beneficial to do this research again, but with a larger sample size, so that more people may be questioned about their risk perceptions. Due to the fact that it was a survey that was completed through phone, email, and snail mail, this should also be examined with extreme caution.<sup>38</sup>

In addition, bivariate and multivariate analyses were carried out in order to evaluate the psychological and social implications of sun protection. Younger age groups, feminine gender, greater objective risk, less impediments, higher perceived social norms of sun protection, and better perceived efficiency of sun protection items were shown to be related with higher overall usage of sun protection. A greater objective risk was also linked to more widespread use of sun protection. There was no correlation found between ethnicity, the time and stage at which melanoma was diagnosed, awareness of melanoma, family history, or perceived risk, and total sun protection.<sup>38</sup>

According to the findings of the research, obstacles are the most important factor in determining the effectiveness of sun protection techniques. In this age group, female adolescents were more likely to be seen wearing sunglasses. This research found some early constructions that teenagers could employ to protect themselves from sun exposure; however, it did not investigate whether or not these constructs are the result of social constructs or of a perceived objectifiable danger. Additional research is required to accurately determine the most effective strategies that adolescents can use to reduce their exposure to UV light.<sup>38</sup>

Patel et al. carried out a research with the participation of 860 individuals ranging in age from two to eighteen years old. According to the findings, there is a geographical preference for sun exposure as well as sun protection techniques. The amount of time spent in the sun and becoming tanned was greatest in Hawaii and smallest in California. The individuals from Colorado were the ones who most commonly wore hats and sunglasses. Both the amount of time spent in the sun and the likelihood of being sunburned were different for men and girls. While 42% of females believed that they were more likely to get sunburned if they did not wear sunscreen. Just 28% of male respondents said the same thing. In addition, women reported that they shield themselves from UV rays by using umbrellas, seeking shade, and applying sunscreen more often than men did. Men were more likely than women to say that they wore shirts that covered their shoulders and hats most of the time.<sup>39</sup>

The participants were divided up into age groups based on their years of birth. As participants' ages climbed, a considerably lower percentage of them reported using sun protection measures such as sunscreen, hats, or protective gear. On the other hand, as age climbed, so did the amount of time spent tanning in the sun and using sunglasses. A lighter skin tone was shown to have a positive link with the use of sun protection measures such as sunscreen, hats, sunglasses, shirts with sleeves, and apparel that was created using sun protection material.<sup>39</sup> Due to the fact that this research was based on a survey, its correctness cannot be established with certainty. Respondents may have falsely indicated that they make use of a greater





number of preventative measures than is really the case.

In order to collect information on sun protection measures used by schools, Reyes-Marcelino et al. carried out a comprehensive study using a systematic methodology. Many of the studies that were looked at had a significant possibility of being biased. Studies on sun protection were mostly carried out in primary schools, and 89% of the results suggested a favorable improvement. After a period of four weeks, half of the studies found that participants took greater care to protect themselves from the sun. In 73% of the studies that were looked at, there was an increase in the use of sunscreen. Only 38% of the studies found an increase in people's tendency to seek shade. Hat use varies throughout various research. While some people said they wore their hats more frequently, others said they did so less frequently or that there was no difference at all. The kind of hat also had an effect on the findings, with wide-brimmed hats showing a rise and baseball caps showing a decline in their prevalence. The findings of studies on garments designed to shield against the sun were inconsistent and did not lead to any clear conclusions. Two to four weeks following the completion of the questionnaires, the findings of the great majority of research that examined the correlation between self-reported changes in behavior and a subsequent declaration of a wish to change revealed that there were no actual changes in conduct. In a total of 87% of studies that evaluated the efficiency of boosting awareness of sun exposure, participants indicated a significant improvement in their knowledge on how to protect themselves from the sun.<sup>40</sup> The urge to get a tan was reduced by half in 33 different studies that looked at attitudes about tanning.

The biggest proportion of kids who wanted to maintain their urge to tan were those who were enrolled in secondary schools. According to the findings of these research, modifying the behaviors of teenagers involves a number of different factors and might be challenging to accomplish. Due to the possibility of bias in surveys and confounding outcomes, it is important to interpret the findings with extreme caution. They present information suggesting the ability to affect young children begins at the elementary school level and is best done there. There is a need for more research to discover whether or not the

changes that occur early on in life last into puberty, the teenage years, and even after grade school has ended.<sup>40</sup>

Because the brains of teenagers have not yet finished developing, many adolescents look for instant gratification and pay little attention to the future. Absorption of ultraviolet radiation by the skin results in the production of vitamin D, which has a role in the regulation of serotonin levels. Because of the good effects of UV exposure on mental health, teenagers may be more open to increasing their UV exposure in an effort to lower their rates of depression. This may also cause teenagers to pursue tanning behaviors for cosmetic reasons, without giving any thought to the long-term effects of these behaviors on their health. A tan may be described as the intentional darkening of skin pigmentation by increased exposure to ultraviolet light. Tans may be achieved in this way by spending time in the sun or by using tanning beds that emit UV light inside. Teenagers who tan may do so because they believe there are health advantages to doing so. According to the findings of a research conducted in Spain, young girls who were unhappy with their looks were greatly impacted by social media and other forms of pressure from the outside world. Peer pressure may have influenced them directly or indirectly to enhance their tanning practice. Many young people purposefully expose themselves to UV radiation in order to get a darker skin tone. This may be accomplished by tanning in a tanning bed or by spending time in the sun.<sup>41</sup>

The production of endorphins and an increase in tanning-seeking behavior are two of the biomechanical processes that may contribute to an increased reliance on tanning. 40 percent of those who had a history of indoor UV tanning believed that it would be difficult to stop, according to the findings of a research that included 1275 teenagers between the ages of 14 and 17 years old. In addition, 45% of tanners believed that not having a tan made them seem undesirable, 9% made an effort to stop tanning but were unsuccessful, and 21% harbored sentiments of regret after tanning. According to the findings of another research conducted with university students who tanned, thirty percent of them abandoned their obligations, and fourteen percent chose to tan rather than study or work. The increasingly widespread desire among young people to get a tan presents a challenge that is hard to overcome. Altering the social dynamic is important in order to



bring about changes in tanning-related behaviors since these behaviors are very susceptible to social status, signals, and stigma.<sup>41</sup>

Thoonen et al. designed a questionnaire to collect data about demographics, the frequency and severity of sunburns experienced by children, and the sun protection practices of their parents. The questionnaire was filled out by a total of 1,299 different persons. According to the findings, 42.4% of the youngsters had suffered from at least one sunburn throughout the course of the preceding year. Sunburns were more severe for children who had more sun-sensitive skin and for children who were older than 10 years old. The use of sun protection methods such as applying sunscreen, finding shade, and wearing protective clothes was observed to be more common among younger children and children with sensitive skin. When outdoor activities were scheduled ahead of time, people were more likely to protect themselves from the sun by applying sunscreen and finding cover. When outdoor activities were not planned ahead of time, a higher percentage of people reported wearing protective clothing. It's possible that socioeconomic factors had a role in the development of sun protection methods.<sup>42</sup>

Although there has been progress made in education regarding sun protection, a number of studies suggest that the implementation of these strategies may not be adequate. One common mistake that many parents do is not applying sunscreen at least 30 minutes before going outside, using an insufficient quantity of the product, skipping sensitive body regions, and neglecting to reapply as directed on the product's label. These are just some of the potential dangers. This research highlights the pressing need for more education on the appropriate methods of sun protection.

In pediatric populations where there has been a previous instance of malignancy, there is an increased chance of acquiring skin cancer. Protecting this sensitive group from the sun's rays is of the highest importance, yet determining how well they adhere to UV protection measures may be challenging. A research was carried out in which 143 pediatric patients who had malignancy were contrasted with 143 pediatric patients who did not have malignancy in

order to establish if there are any variations in the sun protection measures used.<sup>42</sup>

## Conclusion

The use of photoprotection methods such as sunscreens helps to shield the skin from the myriad of damaging effects that may be caused by exposure to ultraviolet (UV) radiation. This, in turn, helps to forestall the development of potentially life-threatening conditions such as sunburn and cancer. The proper quantity of sunscreen must be applied initially and then reapplied at regular intervals in order to get the greatest possible benefit from photoprotection. In spite of the many advances that have been made in photoprotection, there is still a need for more research on the use of sunscreens, particularly among the Indian population.

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