

## **Nb-Uvb Phototherapy treatments for Short-Term Adverse Events Using Datamining Technique**

**Shaik Maheboob**

*Research Scholar, Dept. of Computer Science & Engineering,  
Sri Satya Sai University of Technology & Medical Sciences,  
Sehore, Bhopal-Indore Road, MadhyaPradesh, India*

**Dr. Harsh Pratap Singh**

*Research Guide, Dept. of Computer Science & Engineering,  
Sri Satya Sai University of Technology & Medical Sciences,  
Sehore, Bhopal-Indore Road, MadhyaPradesh, India*

**Dr. K.Nagi Reddy**

*Research Co-Guide IT department at Lords  
Institute of Engineering and Technology*

### **ABSTRACT**

Data mining as an integral part of the knowledge discovery in database (KDD) has acquired significant attention in the course of recent years. All around, data mining is the way toward finding interesting structures in a significantly voluminous amount of data. Attributable to its methods and algorithms supporting variable types of data, the data mining approach has been applied in numerous scientific territories, including the healthcare industry. Phototherapy denotes the utilization of ultraviolet (UV) light in the management of a few dermatoses. Most phototherapy regimens utilize ultraviolet radiation of different wave lengths. Currently, irradiations with broadband UVB, narrowband UVB, 308 nm excimer laser, UVA 1, UVA with psoralen (PUVA), and extracorporeal photochemotherapy are being utilized. The interplay of the different photo biologic pathways is a long way from being completely understood. Issues that may benefit from such methodology are various, with psoriasis, atopic dermatitis, cutaneous T-cell lymphomas, morphea, and vitiligo as fundamental indications. The immune modulatory effects of UVB radiation principally affect the epidermis and superficial dermis, while UVA radiation affects mid and profound dermal components, particularly veins. UVB radiation is consumed by endogenous chromophores, like atomic DNA, which initiates a course of events. Absorption of UV light by nucleotides causes the formation of DNA photoproducts and suppresses DNA synthesis.

**KEYWORDS:** Phototherapy, Prediction, Data Mining, Supervised, Unsupervised; Knowledge discovery

## INTRODUCTION

Phototherapy is a protected and effective treatment method that utilizes ultraviolet radiation (UVR). Phototherapy immune suppressive affects cutaneous T cells and cytokines, and it is utilized in the treatment of different dermatological conditions, including psoriasis, cutaneous T cell lymphoma, and vitiligo. Notwithstanding, conventional phototherapy methods have certain limitations in restricted infections because of their acute and on-going antagonistic effects. To that end, miniature phototherapy or targeted phototherapy technologies have been created. Targeted phototherapy has a few advantages over conventional methods, for example, not uncovering healthy skin regions to UVR and shorter treatment durations; as a result, the bother experienced by the patient reduces, and the patient satisfaction and adherence to treatment increments. A few studies have investigated the adequacy of miniature phototherapy, particularly for vitiligo and psoriasis. In any case, the safety and adequacy of targeted. The present study intended to retrospectively evaluate the safety and adequacy of NB-UVB miniature phototherapy in different dermatological problems.



**Figure 1.1 NB-UVB Phototherapy Treatments**

Phototherapy denotes the utilization of ultraviolet (UV) radiation in the management of a few dermatoses. Most phototherapy regimens utilize ultraviolet radiation of different wavelengths. The fluorescent lights with explicitly coated tubes permit filtering of different wavelengths. Initial dosimetry tests are utilized to determine the negligible erythema portion, and afterward subsequent steadily expanding dosages are applied. Appropriate dosimetry is

needed to dodge acute results, for example, burn from the sun reaction. Problems that may benefit from such methodology are various, with psoriasis, atopic dermatitis, cutaneous T-cell lymphomas, morphea, and vitiligo as principle indications. Currently, phototherapy with broadband UVB (290–320 nm), narrowband UVB (311–313 nm), 308 nm excimer laser, UVA 1 (340–400 nm), UVA in addition to psoralen (PUVA), and extracorporeal photochemotherapy (photopheresis) are being utilized. UV radiation shows a spectrum of effects on human skin. The interplay of the different photo biologic pathways is a long way from being completely understood.

### **Ultraviolet B therapy**

UVB is the simplest type of phototherapy, as it alludes to the utilization of artificial UVB radiation without additional exogenous photosensitizers. The immune modulatory effects of UVB radiation basically affect the epidermis and superficial dermis. The radiation is consumed by the major endogenous chromophores with immunological importance, like atomic DNA, trans-uranic corrosive, and cell films. Absorption of UVB by nucleotides prompts the formation of DNA photoproducts, fundamentally pyrimidine dimers. Cyclobutane dimers constitute a majority of the total UV radiation-instigated DNA harm. UVB openness lessens DNA synthesis and is therefore used to smother the accelerated DNA synthesis, for example, in epidermal cells of patients with psoriasis. In addition to DNA effect, UVB openness up regulates articulation of tumor silencer quality resulting in either cell cycle arrest (permitting time for DNA fix) or apoptosis of keratinocytes in the event of hopeless DNA harm. The up regulation of this tumor silencer quality might be liable for inhibition of keratinocyte turnover in psoriatic plaques. UVB light causes photo isomerization of urocanic corrosive (UCA), the second most important chromophore in the epidermis. UVB makes isomerization of UVC from trans UCA cis-UCA. The presence of cis-UCA has immunosuppressive effects by means of cutaneous cytokine production slanting from Th-1 to a Th-2 reaction. In addition to DNA, UV radiation can affect extra atomic sub-atomic targets located in the cytoplasm and cell film. These targets incorporate cell surface receptors, kinases, phosphatases, and transcription factors. Devary et al. have discovered that UV reaction doesn't need an atomic sign and is probably going to be initiated at the plasma layer. Activation of atomic factor-kappa B at the cell film following UVB openness prompts T-lymphocytes apoptosis, which requires anew protein synthesis, and expanded layer permeability which may likewise assume a part in immunosuppression. The proposed components for UVB effect on cutaneous T-cell lymphomas incorporate impairment of

epidermal Langerhans cell function and alterations in cytokine production and grip atom articulation by keratinocytes. Narrowband UVB instigates neighborhood and systemic immunosuppressive effects which may particularly contribute particularly to valuable effect of this light source.

### **Phototherapy Unit**

NB-UVB phototherapy lodges contain fluorescent TL-01 (100 W) tubes as the wellspring of irradiation. The cost of a chamber and lights show extensive variations between countries and distributors. NB-UVB lodges accessible economically either incorporate TL-01 alone or in combination with UVA tubes. Combination chambers take longer to administer a treatment portion. Thus, although they give flexibility, they may represent an unsatisfactory trade-off for a bustling phototherapy unit. Recently, shorter tubes of NB-UVB have additionally opened up in little zone treatment equipment's (hand and foot unit, NB-UVB brush) for the therapy of confined body zones. NB-UVB timetables can be tailored by patient skin type and nearby experience. There are two regimens that are most regularly utilized; the first includes determination of the person's base erythema portion (MED) by methods for a separate bank of TL-01 tubes. Often 70% of the MED esteem is utilized for the first treatment; thereafter therapy is given three times or more in seven days with 40, 20 or 10% increments relying upon nearby experience and skin type tolerance. Another methodology, as regularly practiced in India, includes a standard starting portion (280 mJ/cm<sup>2</sup>), with stepwise increment (typically 20%) contingent on the patient's erythema reaction. In the photodermatoses, the methodology is more cautious with just 10% incremental routine on sun-uncovered sites. If there should be an occurrence of gentle erythema, the irradiation portion is held constant for subsequent treatments or until resolution of symptoms. The objective of therapy is to accomplish persistent asymptomatic erythema. If there should be an occurrence of excruciating erythema "with or without edema/blistering, further treatment is" withheld till the symptoms die down. After resolution of excess symptoms, the portion administered is half of the last portion and subsequent increments ought to be by 10%.

- **Vitiligo** - In India, vitiligo is associated with stamped social stigma, thus requesting its effective management. NB-UVB is another addition to the armamentarium of therapies for vitiligo. Clinical involvement in NB-UVB in vitiligo is limited, with a couple of distributed reports. Notwithstanding, initial results have been empowering

and there is a developing interest in its utilization in vitiligo around the world. While prior reported studies have evaluated its job mostly in Western population, our involvement with Indian patients is further proof of its adequacy in the treatment of vitiligo.

- **Psoriasis** - The NB-UVB light was created as 'another' UVB phototherapy source with an outflow spectrum within the therapeutic waveband for psoriasis phototherapy. NB-UVB phototherapy has a higher ratio of therapeutic to erythemogenic activity, resulting in expanded viability, decreased frequency of consuming and longer reduction. Results from two therapeutic action spectroscopy studies indicated that wavelengths of the reach 295-320 nm are effective in clearing psoriasis, while shorter wavelengths are more erythemogenic, and wavelengths longer than 320 are less therapeutic. Subsequent clinical studies have tended to report significantly greater improvement of psoriasis with NB-UVB including diminished occurrence of consuming scenes, expanded viability and longer abatement when contrasted and wide band sources. At the point when NB-UVB phototherapy and PUVA were analysed, there was little by and large distinction in viability. Although treatment with NB-UVB is reported to be exceptionally effective in clearing psoriasis patients, whether this therapy represents a modest development or a genuine breakthrough isn't clear. On the off chance that NB-UVB is to supplant PUVA therapy in the treatment of more serious psoriasis, it must not just accomplish an equivalent freedom rate in psoriasis, but it must likewise maintain reduction at a practically identical recurrence of treatment. At present, little studies do give some expectation in this respect.
- **Atopic Dermatitis** - Fortunately atopic dermatitis (AD) is less serious in the Indian population and can be mostly overseen by topical therapies.<sup>27</sup> Recently NB-UVB has been reported to be effective for the treatment of AD and is one of the first line therapies in moderate-to-extreme AD in western countries. To optimize the patient's very own comfort, cooling is incorporated into the irradiation cabin.<sup>30</sup> Available data indicate that NB-UVB is by all accounts a promising modality for the treatment of moderate-to-extreme atopic dermatitis and is well accepted by patients. It offers an effective alternative to steroids for constant extreme.

### Long Term Use and Adverse Effects

Likewise with other types of UV openness, in addition to the expected immediate burn from

the sun effects, ongoing NB-UVB openness is probably going to build photo maturing and the danger of carcinogenesis. Presently there is insufficient human data accessible to give recommendations in regards to the protected greatest NB-UVB portion. In any case, as indicated by a portion reaction model it has been calculated that the drawn out hazard for carcinogenesis with its utilization might be not exactly that of PUVA therapy. Clinical involvement in NB-UVB is limited and currently there is no established safe limit for its most extreme safe duration of utilization in vitiligo. Njoo et al suggest that responsive patients can be given this treatment for a limit of 24 months. After the first course of one year, they suggest a resting time of three months to limit the yearly cumulative portion of UVB. In youngsters, the most extreme duration permitted is 12 months. Subsequently, whenever required, just limited territories ought to be uncovered. On the off chance that no reaction is seen after six months, further therapy ought to be debilitate. Further, the danger of cutaneous malignancies in vitiligo can be decreased by skin saving standards, for example covering the parts that have repigmented satisfactorily and protecting the genitals.

## LITERATURE REVIEW

**Sedef Rahin et al (2015)**, there is no definite solution for vitiligo; be that as it may, treatment reactions with photo biological modalities are quite acceptable. Of all these, restricted band UVB phototherapy was proposed rather recently. Calcipotriol has been appeared to have stimulating activity on melanogenesis other than immune modulatory and anti-inflammatory effects. This study was performed to determine whether adding topical calcipotriol to limit band UVB phototherapy improves the adequacy of treatment. Methods: In this prospective, single-blinded (investigator), right-left correlation clinical study, 20 patients with summed up vitiligo were enlisted. Symmetrical injuries with comparable sizes, bilaterally distributed on arms, legs, hands, feet or trunk were selected as reference sores. In addition to narrowband UVB, totally 96 treatment meetings, gotten two or three times week after week, the patients were approached to apply 0.005% topical calcipotriol on the selected side of the reference sores twice every day. Then, they were monitored at the finish of each 24-meeting interval.

**Hamed Baziyaad et al (2019)**, Data mining as an integral part of the knowledge discovery in database (KDD) has acquired significant attention in the course of recent years. Overall, data mining is the way toward finding interesting structures in an extensively voluminous amount of data. Attributable to its methods and algorithms supporting variable types of data, the data mining approach has been applied in numerous scientific regions, including the healthcare

industry. As to matter, in this paper, we elaborate on the latest papers, including data mining techniques and algorithms in the healthcare field of exploration. We present a data mining audit dependent on the newest explores. Afterward, we categorize data mining papers in healthcare dependent on directed and unaided learning standards just as ordering them in terms of their applications in the healthcare area. In each healthcare application, we propose some synopsis points of the papers. At last, we dive into the nonattendance and thus, the necessity of existing some novel methods in healthcare spaces in this explores.

## **EXPERIMENTAL METHODS**

Narrowband UVB (NB-UVB) phototherapy and psoralen-UVA (PUVA) photochemotherapy are generally utilized phototherapeutic modalities for a scope of skin illnesses. The principle indication for NB-UVB and PUVA therapies is psoriasis, and other key analyses incorporate atopic dermatitis, vitiligo, cutaneous T-cell lymphoma (CTCL), and the photodermatoses. The choice on decision of phototherapy is important and NB-UVB is generally the essential decision. NB-UVB phototherapy is a protected and effective therapy which is normally viewed as when topical agents have fizzled. PUVA needs earlier psoralen sensitization but stays an exceptionally effective mainstay therapy, often utilized when NB-UVB fizzles, there is fast backslide following NB-UVB or in explicit indications, for example, pustular or erythrodermic psoriasis. A retrospective chart review study was planned in order to evaluate the safety and efficacy of targeted UVB therapy in various cutaneous diseases.

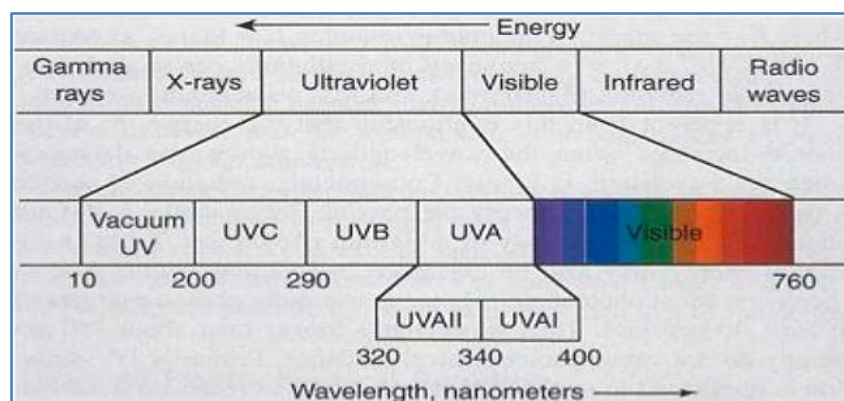
### **Patient selection**

All patients alluded to our phototherapy unit for targeted UVB therapy between 2014 and 2016 were remembered for the study. All patients were lethargic to past topical and additionally systemic treatment attempts except for 18 patients (10.5%) who didn't get any treatment previously. The clinical charts and clinical photographs of all patients were checked on to investigate patient socioeconomics, illness and treatment characteristics, phototherapy parameters, treatment outcomes, and antagonistic effects.

### **Treatment protocol and its implementation**

In our phototherapy unit, targeted UVB therapy was performed with a Daavlin-Levia gadget (Bryan, Ohio, USA) emitting NB-UVB radiation with a wavelength of 311–315 nm; the gadget is equipped for treating a region of 3 cm<sup>2</sup> with an output of 90 mW/cm<sup>2</sup>. The insignificant erythema portion (MED) was calculated for the back skin taking all things

together patients before treatment. The treatment was applied two or three times per week, and the initial portion was determined as 30% of the MED for patients with vitiligo and half of the MED for patients with other conditions. The portion increments were conducted at each meeting by evaluating the erythema reaction, as a rule by 50 mJ/cm<sup>2</sup> for patients with vitiligo and 20% of the last portion for patients with other conditions.



**Figure Phototherapy experimental model**

The antagonistic effects associated with phototherapy, like erythema, pigmentation, itching, and bullae formation, were evaluated before each meeting. Clinical photographs of the patients were taken preceding treatment and afterward at regular intervals with a similar camera, in a similar room, and with similar light conditions. The treatment was continued until complete freedom or most extreme adequacy was accomplished and discontinued when patients had demolishing sores or results. A similar dermatologist (KES) evaluated the reaction to treatment by looking at the photographs and utilizing the doctor's worldwide assessment. In patients with alopecia areata (AA), the reaction to treatment was surveyed by the rate of terminal and vellus hair regrowth. In patients with vitiligo, the reaction to treatment was evaluated by the rate of repigmentation; in patients with psoriasis, the presence and improvement rate of erythema, desquamation, and infiltration; in patients with LSC, the severity of lichenification; and in patients with palm plantar psoriasis/dermatitis, the presence and improvement rate of infiltration, erythema, desquamation, and crevices were thought about between pre-and post-treatment photos. In patients with more than one injury treated, last reaction to treatment was determined through the worldwide assessment of every single treated sore. As needs be, the treatment reaction was characterized as follows: no reaction (0%–25%), gentle reaction (25%–half), moderate reaction (51%–75%), significant reaction (76%–90%), and complete reaction (>90%). Statistical investigation was performed utilizing SPSS 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistical methods were utilized in



the investigation of the data. The mean, standard deviation, and reach were calculated in the examination of mathematical factors. Categorical factors were evaluated by recurrence investigation. Although the event of results and phototherapy parameters were investigated taking all things together patients who had at least one treatment meeting, the reaction to treatment was just evaluated in patients who had attended at least one subsequent visit during the treatment course. The last observation conveyed forward was utilized for the examination of treatment outcomes in those patients who didn't attend a development. The reaction rates were additionally evaluated separately in patients whose treatment was settled by a doctor.

## RESULTS

A total of 173 patients were alluded to our phototherapy unit during the study time frame, who's segment and sickness characteristics are summed up in Table 1. Sixteen (9.2%) of the 173 patients were rejected from the study as a result of nonattendance in the subsequent interaction. The excess 157 (91.8%) patients got more than one meeting of therapy and attended at least one subsequent visit.

**1) Vitiligo** - From 50 patients with vitiligo, the targeted phototherapy were utilized as a monotherapy in 25 patients, though the leftover 25 patients got at least one concomitant topical therapy (tacrolimus, corticosteroids, or antioxidants).

**2) Alopecia areata** - Of the 34 patients with AA remembered for the study, the targeted phototherapy was utilized as a monotherapy altogether patient, except for 1 patient who got concomitant topical tacrolimus treatment.

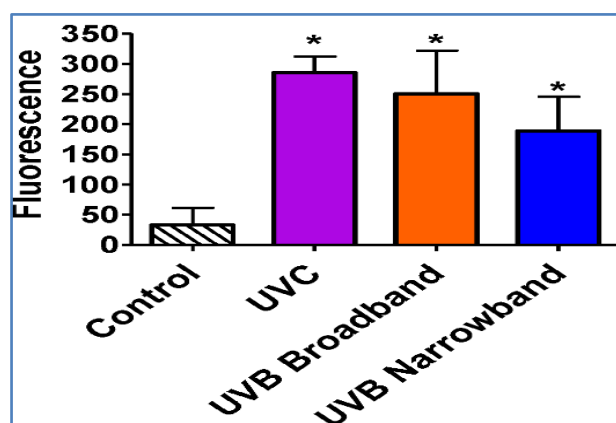
**3) Lichen simplex chronic** - Among the 26 patients with LSC, the targeted phototherapy was utilized as a monotherapy taking all things together patients, except for 8 patients who were likewise treated with topical tacrolimus, corticosteroids, and antihistamines.

**4) Palmoplantar psoriasis/eczema (PPP)** - A total of 39 patients with palm plantar psoriasis/skin inflammation was remembered for the examination. The targeted phototherapy was utilized as a monotherapy in 19 patients, though it was joined with topical agents in 17 patients.

**5) Psoriasis vulgaris** - Of the 24 patients with plaque-type psoriasis vulgaris, the targeted phototherapy was utilized as a monotherapy in 8 patients, while it was joined with topical agents in 15 patients and acitretin in 1 patient.

## DISCUSSION

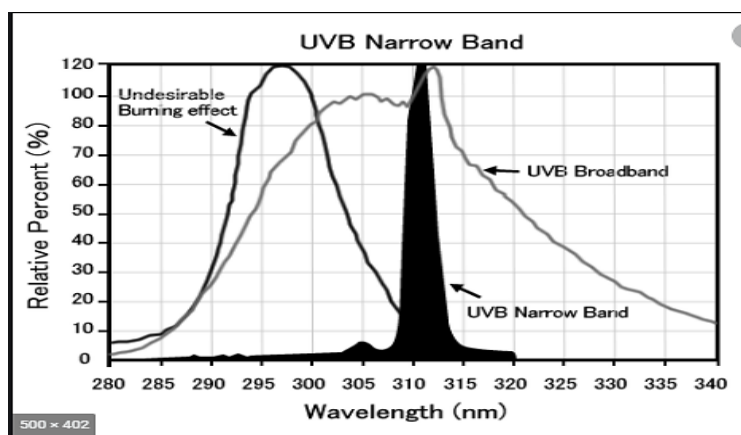
In this retrospective study, the safety and adequacy of targeted NB-UVB therapy was evaluated in patients with vitiligo, AA, LSC, palmoplantar psoriasis/skin inflammation, or psoriasis vulgaris who were treated at our phototherapy unit between 2014 and 2016. Just a limited number of past studies have tended to the safety and adequacy of targeted UVB treatment for the aforementioned dermatological problems. Phototherapy is normally utilized in the treatment of vitiligo, particularly in head and neck injuries recalcitrant to topical therapies. In the literature, the reaction rates with conventional phototherapy modalities have been reported to be 78%–100% with PUVA and 41%–100% with NB-UVB. Monochromatic excimer laser (MEL), a targeted phototherapy modality, has been reported to instigate  $\geq 75\%$  repigmentation in 16% – 52% of patients. Among the 46 patients with vitiligo, in whom the treatment reaction was surveyed, a moderate or better reaction was seen in (23.9%) of them. Of the patients in whom the treatment course was concluded by a doctor, a moderate or better reaction was obtained in (23.3%). Although PUVA therapy is a grounded first line treatment for vitiligo, recent studies have shown that NB-UVB therapy is more effective, less perilous and better than PUVA therapy. NB-UVB therapy is currently a pretty much established and suggested phototherapy for summed up vitiligo, pregnant ladies and kids in light of the great safety profile. Determination of insignificant erythema portions (MED) is essential for rational treatment with UV light. Serish and Srinivas reported that the mean MED for NB-UVB was 300 mJ/cm<sup>2</sup> for the Indian skin.



**Figure Narrowband UVB Phototherapy**

In the present study, although MED was not calculated, the NB-UVB therapy was started with an initial portion of 250 mJ/cm<sup>2</sup>. The optimal NB-UVB irradiation routine presently can't seem to be characterized. Henceforth, enormous scope studies are warranted to establish the

standard protocol of NB-UVB therapy. In this particular study, lesser number of openings ( $51.91 \pm 19.18$ ) was needed to accomplish 25–75% repigmentation. Likewise, the cumulative portion was additionally lesser ( $46.8 \pm 25.2 \text{ J/cm}^2$ ) to accomplish a similar repigmentation, though Njoo et al reported similar repigmentation with more number of openings ( $76.3 \pm 16.7$ ). Similar observations were reported in other western studies. Our study and other Indian studies showed that brown complexion requires lesser number of openings and cumulative portion to accomplish 25–75% repigmentation when contrasted and white skin. It has additionally been seen in our study that with great adherence to therapy and consistence, faster and great reaction can be accomplished. It has been demonstrated statistically that great reaction is directly associated with more number of openings, cumulative portion and great consistence. We have likewise seen throughout therapy that initially, in certain patients, fresher sores used to grow but while continuing the therapy, more up to date injuries stop to show up and the infection was stabilized. This could be because of the immune modulatory effect of NB-UVB, although the exact components are still not known. In our study likewise certain anatomical sites like face, neck, trunk and back reacted faster, with better repigmentation to NB-UVB therapy, and helpless reaction was seen over the acral regions. The repigmentation accomplished on the whole the cases was cosmetically accepted and matched with the encompassing typical skin, dissimilar to in PUVA therapy. In this manner, NB-UVB therapy is better than oral PUVA therapy. In our study board, NB-UVB equipment was utilized in youngsters and in patients with confined vitiligo. This particular NB-UVB equipment was discovered to be helpful and convenient, particularly in the pediatric age gathering and comparative results were obtained. It has been seen that youngsters reacted faster with great repigmentation ( $> 75\%$ ), with lesser number of openings and cumulative portion of NB-UVB. Comparable observations were reported in other studies too.



**Figure UVB Phototherapy treatment**

In a study that investigated the viability of NB-UVB in vitiligo, Menchini et al. treated 734 patients with vitiligo and reported  $>75\%$  improvement in 70% of patients. In a study by Majid and Imran, an excellent reaction was obtained in approximately 63% of patients who were treated a few times week after week. Similarly, Lotti et al. reported an improvement of  $\geq 75\%$  in 72% of 100 patients. In another study, a repigmentation rate of half 100% was seen in 31 of 40 patients. In contrast to the high reaction rates reported in these studies, Klahan and Asawanonda reported an improvement of  $\geq 50\%$  in just 15% of 15 patients, which was like the results of the present study. The low reaction rates saw in our study can be clarified by the accompanying:

- i) the response rates in different areas of the body could not be evaluated separately due to the retrospective nature of the study, and thus this approach might have underestimated the treatment outcomes;
- ii) ii) a high number of patients were lost to follow-up;
- iii) iii) a high number of patients attended treatment irregularly.

Consistent with past studies, no unfavourable events happened in 22 (44%) patients with vitiligo, though the most well-known unfriendly event was gentle erythema, which was seen in 16 (32%) patients. These discoveries demonstrate that targeted NB-UVB therapy is a protected treatment in terms of acute antagonistic effects.

## CONCLUSION

This paper introduced the prediction of short term antagonistic events in NB-UVB phototherapy treatments utilizing data mining techniques. To sum up, NB-UVB phototherapy and PUVA photochemotherapy are both priceless treatments to have accessible in any dermatology department and ought to be prioritized, not just for psoriasis, but in a variety of other inflammatory and proliferative skin sicknesses, including atopic dermatitis. Treatment can be securely and effectively administered and is all around tolerated with not many unfriendly effects. Excellent sickness reduction might be accomplished, whilst saving the utilization of other potentially toxic medications at a relatively beginning phase in a patient's excursion. Straight on comparative monotherapy studies with biologic therapies don't exist and are required. Because of the relative cost-adequacy of the phototherapies and the understanding of their drawn out safety profiles contrasted and the cost and less lengthy development for the biologics, these ought to be utilized before consideration of biologic treatments. Similarly as with any therapy, standardization of optimized treatment regimens,

cautious observation of treatments conveyed and therapeutic outcomes, unfavourable effects and long haul follow-up studies, including determining any skin disease hazard, are essential. The development of the National Managed Clinical Network for Phototherapy significantly affects standardization, safety, and carefulness in conveyance of our phototherapy practices in Scotland and has end up being a priceless tool, empowering the spot of NB-UVB, and PUVA therapies to continue to be grounded in the treatment of skin illness.

## REFERENCES

- [1] Hönigsmann H, Schwarz T. Ultraviolet therapy. In: Bologna JL, Jorizzo JL, Schaffer JV (editors). *Dermatology*. 3rd ed. Amsterdam, the Netherlands: Elsevier; 2012.
- [2] Mehraban S, Feily A. 308nm excimer laser in dermatology. *J Lasers Med Sci* 2014.
- [3] Alshiyab D, Edwards C, Chin MF, Anstey AV. Targeted ultraviolet B phototherapy: definition, clinical indications and limitations. *Clin Exp Dermatol* 2015
- [4] Mysore V, Shashikumar B. Targeted phototherapy. *Indian J Dermatol Venereol Leprol* 2016.
- [5] Majid I. Efficacy of targeted narrowband ultraviolet B therapy in vitiligo. *Indian J Dermatol* 2014.
- [6] Bayramgürler D, Demirsoy EO, Aktürk AŞ, Kıran R. Narrowband ultraviolet B phototherapy for alopecia areata. *Photodermatol Photoimmunol Photomed* 2011
- [7] T. Narmadha, J. Gowrishankar, M. Ramkumar, and K. Vengatesan, "Cloud Data Center Based Dynamic Optimizing Replica Migration", *J. Comput. Theor. Nanosci.* 16, 576–579 (2019)
- [8] Kemény L, Csoma Z, Bagdi E, Banham AH, Krenacs L, Koreck A. Targeted phototherapy of plaque-type psoriasis using ultraviolet B-light-emitting diodes. *Br J Dermatol* 2010; 163: 167-173
- [9] D. K. Sharma and H.S. Hota, "Data Mining techniques for prediction of different categories of dermatology diseases". *Journal of Management Information and Decision Sciences*, vol. 16, no. 2, 2013,
- [10] Ahmad, Parvez, S. Qamar, and S.Q.A. Rizvi, "Techniques of data mining in healthcare: a review." *International Journal of Computer Applications*, vol. 120, no.15, 2015.
- [11] K. Danjuma and A.O. Osofisan, "Evaluation of Predictive Data Mining Algorithms in Erythemato-Squamous Disease Diagnosis". *arXiv preprint arXiv:1501.00607*, 2015