



## Original Article

## Impact of narrow-band ultraviolet B radiation therapy on the quality of life of patients with vitiligo



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### المخلص

**أهداف البحث:** يعاني مرضى البهاق من الضغط النفسي والعاطفي أثناء خضوعهم لعلاج طويل الأمد. والآثار النفسية والاجتماعية الموهنة لهذا المرض، التي تؤثر على جودة حياة المرضى موثقة جيداً. في هذه الدراسة، قمنا بتقييم تأثير إضافة العلاج بالأشعة فوق البنفسجية ضيقة النطاق على جودة حياة مرضى البهاق في منطقة المدينة المنورة، المملكة العربية السعودية.

**طرق البحث:** تمت مقابلة ٣٨ مريضاً من مركز الأمراض الجلدية الرئيسي في المدينة المنورة (مستشفى أحد) باستخدام نموذج مؤشر جودة الحياة للأمراض الجلدية قبل وبعد عام واحد من دورة العلاج باستخدام الأشعة فوق البنفسجية ضيقة النطاق، التي أضيفت إلى نظامهم العلاجي الأساسي مع استمرار استخدامهم للمستحضرات الدوائية الموضعية.

**النتائج:** كانت استجابة المرضى لعلاج البهاق إيجابية. النتيجة الإجمالية لرضا المرضى فيما يتعلق بالعلاج بالأشعة فوق البنفسجية ضيقة النطاق كانت مرتفعة لتصل إلى ٩.١ من ١٠. وقد انخفضت النتيجة الأولية العامة لمؤشر جودة الحياة للأمراض الجلدية (٥.٦٧ ± ٠.٩٠) بشكل ملحوظ بعد العلاج المتضمن استخدام الأشعة فوق البنفسجية ضيقة النطاق (٣.٠٨ ± ٠.٥٦)، مما يشير إلى وجود تحسن. كما تحسن التزام المرضى بزيارات المتابعة والجلسات العلاجية.

**الاستنتاجات:** علاج البهاق المتضمن استخدام الأشعة فوق البنفسجية ضيقة النطاق فعال في تخفيف الضغط النفسي وتحسين جودة الحياة لدى مرضى البهاق.

**الكلمات المفتاحية:** البهاق؛ الأشعة فوق البنفسجية ضيقة النطاق؛ جودة الحياة؛ رضا المريض؛ المملكة العربية السعودية

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### Abstract

**Objectives:** Patients with vitiligo experience emotional and psychological stress as they undergo long-term therapy. The debilitating psychosocial effects of this disease on patients' quality of life is well-documented. This study evaluates the effect of the introduction of narrow-band ultraviolet-B (NB-UVB) therapy on the quality of life of patients with vitiligo in Almadinah Almunawwarah, KSA.

**Methods:** Thirty-eight patients from the main dermatology center of Ohud Hospital, Almadinah Almunawwarah, were interviewed between June 2017 and March 2019 using the Dermatology Life Quality Index (DLQI) questionnaire. The interviews were conducted before and one year after the course of NB-UVB therapy, which was added as a new treatment modality to the basic therapeutic regimen of topical medications.

**Results:** The patients' response to vitiligo therapy was positive. The overall patient satisfaction score regarding the NB-UVB therapy was as high as 9.1 out of 10. The initial overall DLQI score (5.67 ± 0.90) markedly decreased after the NB-UVB therapy (3.08 ± 0.56), indicating a significant improvement. The patients' adherence to the follow-up visits also improved.

**Conclusion:** NB-UVB therapy is effective in alleviating psychological stress and improving the quality of life of patients with vitiligo.

**Keywords:** Narrow-band ultraviolet B; Patient satisfaction; Psychological stress; Quality of life; Vitiligo

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## Introduction

Vitiligo is a dermatological disease in which the skin becomes depigmented gradually, that afflicts approximately 1% of the global population.<sup>1</sup> The decrease or absence of melanocytes results in patches of depigmented skin. The destruction of melanocytes can be caused by an autoimmune disorder resulting in selective attack by lymphocytes.<sup>2</sup> However, several genetic and non-genetic factors are also suggested to contribute to the pathogenesis of the disease. Melanocytes ultimately disappear from the affected area, confirming that the disease results in the destruction of these cells, rather than deactivation or malfunction,<sup>3</sup> which further confirms the involvement of autoimmune mechanisms. Skin invasion by cytotoxic immunocytes, such as CD8+ T cells, has been described in several reports.<sup>2,4,5</sup> The other major theory is that vitiligo is a result of oxidative stress that produces reactive oxygen species, which contribute to melanocyte damage. This involves possible genetic defects resulting in the accumulation of these reactive species<sup>6</sup> and activation of T-cell response.<sup>7</sup> The involvement of dendritic cells, apoptotic mechanisms, and stress factors are also investigated for their possible roles in vitiligo. However, it is the combination of various mechanisms that can contribute to the disappearance of melanocytes from the affected skin.

This disease causes psychological and emotional problems to patients, therefore, is regarded as a psychosomatic disorder.<sup>8</sup> It affects patients' lives and may cause social isolation and decreased self-confidence in addition to interference with pharmacologic treatment.<sup>9,10</sup> Social and marital relationships can also be affected.<sup>11,12</sup> Moreover, social discrimination and stigma has also been documented to influence the daily life of patients with vitiligo.<sup>13–16</sup>

The current mainstream for management of vitiligo ranges from the use of corticosteroids, immunosuppressants, excimer laser, and phototherapy, to autologous skin transplantation. Long-term corticosteroid therapy is not recommended due to its undesirable side effects. Immunosuppressants, such as tacrolimus, have also been recommended;<sup>17</sup> however, better results have been achieved by the introduction of UV light therapy to the treatment regimen.<sup>18</sup> Prostaglandin analogues alone or in combination with phototherapy have shown positive results by assisting repigmentation.<sup>19,20</sup> Narrow-band UVB (NB-UVB) was first described in 1997.<sup>21</sup> Several studies conducted since have concluded that NB-UVB can be the first-line therapy for vitiligo in adults and second-line in children not responding well to corticosteroids.<sup>22–26</sup>

Several mechanisms have been suggested to explain the effects of UV-based phototherapy. For example, vitamin D may have a role in improving the differentiation of melanocytes by enhancing tyrosinase activity<sup>27</sup> and protecting them from oxidative stress.<sup>28</sup> In addition, recent evidence suggests that NB-UVB induces vitamin D synthesis and upregulates the vitamin D receptors in vitiliginous skin.<sup>29</sup> Another line of evidence suggests that ultraviolet radiation affects the regulation of stress response in the melanocortin system.<sup>30</sup> Moreover, NB-UVB may act through its immunomodulatory effect that alters T helper cell-mediated autoimmune depigmentation of the skin, which may further suggest that cytokine targeting can be a useful tool for controlling the disease.<sup>31</sup>

Most studies on the quality of life of patients with vitiligo receiving NB-UVB radiation have been conducted after the introduction of NB-UVB. Therefore, the objective of this study is to evaluate and statistically compare the quality of life before and after the introduction of NB-UVB to patients with vitiligo in Almadinah Almunawwarah, KSA, both newly diagnosed and those receiving other treatments.

## Materials and Methods

All patients with vitiligo attending the Dermatology Clinic in Ohud Hospital, Almadinah Almunawwarah, KSA, for NB-UVB therapy between June 2017 and March 2019 were approached. Informed consent was obtained from all patients willing to participate in this study. For children, consent was provided by their parents. The inclusion criteria incorporated patients who were regularly attending the twice-weekly treatment sessions with NB-UVB and were followed up for one year, and had no severe disabilities, mental or psychological disorders. Patients with a history of photosensitivity or claustrophobia and critically ill patients were excluded from the study.

Each patient was interviewed, and a standard questionnaire was completed before the start of therapy and one year after completion of NB-UVB therapy. The questionnaire contained the patients' demographic data and was based on the standard, well-established Dermatology Life Quality Index (DLQI), with each question scored on a scale of 0–3 indicating “not at all or not relevant”, “a little”, “a lot”, and “very much”, respectively.<sup>32</sup> There was one exception to this scoring system related to the question on whether the patient's condition prevented him/her from work or study; if the answer was “yes”, the score was 3; otherwise, the score was 0. The sum of the scores represented the total DLQI score, with higher scores indicating a greater negative impact on the patients' quality of life.

## Statistical analysis

The 20th version of SPSS software (IBM Corp., Armonk, NY, USA) was used for statistical analysis. The paired t-test was used to compare the means of the pre- and post-treatment DLQI scores. The significance level was interpreted as highly significant, significant, or nonsignificant at  $P < 0.001$ ,  $P < 0.05$ , or  $P \geq 0.05$ , respectively.

## Results

A total of 42 patients with vitiligo were enrolled in the study. We excluded four patients who did not complete the

**Table 1: Patients' characteristics (n = 42).**

Variables	Values
<b>Sex</b>	
Male	23 (54.8) <sup>1</sup>
Female	19 (45.2) <sup>1</sup>
<b>Age (year)</b>	20.8 ± 1.9 <sup>2</sup>
<b>Education level</b>	
Primary	11 (26.2) <sup>1</sup>
Intermediate	7 (16.7) <sup>1</sup>
Secondary	11 (26.2) <sup>1</sup>
University	13 (31.0) <sup>1</sup>
<b>Duration of vitiligo (year)</b>	5.1 ± 0.4 <sup>2</sup>
<b>Family history</b>	
None	20 (47.6) <sup>1</sup>
First-degree relatives	14 (33.3) <sup>1</sup>
Second-degree relatives	8 (19.0) <sup>1</sup>
<b>Predisposing factors</b>	
Autoimmune diseases	0 (0.0) <sup>1</sup>
Early hair greying	8 (19.0) <sup>1</sup>
Contact/occupational factors	0 (0.0) <sup>1</sup>
Stress-related factors	15 (35.7) <sup>1</sup>
Smoking	0 (0.0) <sup>1</sup>
<b>Concurrent treatment</b>	
None	5 (11.9) <sup>1</sup>
Topical corticosteroids	8 (19.0) <sup>1</sup>
Topical tacrolimus	9 (21.4) <sup>1</sup>
Topical corticosteroids and tacrolimus	17 (40.5) <sup>1</sup>
Traditional herbal treatment	3 (7.1) <sup>1</sup>
<b>Satisfaction with UV therapy on a scale of 0–10</b>	9.1 ± 0.3 <sup>2</sup>

Data is presented as <sup>1</sup>n (%) or <sup>2</sup>mean ± standard error of the mean.

post-treatment questionnaire; thus, a total of 38 patients completed the study. The youngest patient was 8 years old and the oldest was 61 years old. The shortest duration of the disease before starting the UV therapy was 1 year, while the longest was 12 years. Early greying of hair and stress-related factors were the dominant predisposing factors for vitiligo. On an average, the satisfaction level with the introduction of UV therapy was high. Table 1 summarises the patient characteristics.

The sample included patients from all education levels ranging from primary school to university. Approximately half of the patients did not report a family history of the disease. Most patients were concomitantly treated with NB-UVB and tacrolimus (21.4%), corticosteroids (19%), or both (40.5%), while a small proportion preferred traditional herbal products (unidentified). The mean score for patient satisfaction with the UV therapy was 9.1 out of 10, indicating a high level of acceptance of this therapeutic strategy.

Overall, the total DLQI score was significantly reduced after the UV therapy, from a moderate to small effect on the quality of life of the study subjects. The concurrent treatments used by the patients had no impact on the results. No correlations were found between the demographic features and pre- or post-NB-UVB treatment scores. Table 2 shows a comparison of the mean pre- and post-NB-UVB treatment scores.

## Discussion

The mean pre-NB-UVB DLQI score in this study is 5.67, which is comparable to the score reported in previous studies. In a study in the United Kingdom, which included more than 600 patients, the overall score was 4.82,<sup>13</sup> while another study on 119 patients in Belgium showed a DLQI score of 4.95.<sup>33</sup> However, slightly higher scores were seen in other studies, reaching 7.3 and 10.67 in the United

**Table 2: Comparison between pre- and post-UV treatment DLQI scores.**

Question <sup>a</sup>	Before UV <sup>b</sup>	After UV <sup>b</sup>	P value <sup>c</sup>
1. Over the last week, how itchy, sore, painful, or stinging has your skin been?	0.67 ± 0.13	0.17 ± 0.06	< 0.001
2. Over the last week, how embarrassed or self-conscious have you been because of your skin?	1.00 ± 0.19	0.86 ± 0.16	> 0.05
3. Over the last week, how much has your skin interfered with you going shopping or looking after your home or garden?	0.67 ± 0.13	0.56 ± 0.12	< 0.05
4. Over the last week, how much has your skin influenced the clothes you wear?	0.83 ± 0.15	0.36 ± 0.11	< 0.001
5. Over the last week, how much has your skin affected any social or leisure activities?	0.61 ± 0.14	0.22 ± 0.07	< 0.001
6. Over the last week, how much has your skin made it difficult for you to do any sport?	0.28 ± 0.09	0.08 ± 0.05	< 0.05
7. Over the last week, has your skin prevented you from working or studying? If "No", over the last week how much has your skin been a problem at work or studying?	0.36 ± 0.13	0.25 ± 0.07	> 0.05
8. Over the last week, how much has your skin created problems with your partner or any of your close friends or relatives?	0.33 ± 0.13	0.17 ± 0.08	< 0.05
9. Over the last week, how much has your skin caused any sexual difficulties?	0.22 ± 0.11	0.14 ± 0.07	> 0.05
10. Over the last week, how much of a problem has the treatment for your skin been, for example, by making your home messy, or by taking up time?	0.72 ± 0.15	0.28 ± 0.09	< 0.001
Total score (out of 30)	5.67 ± 0.90	3.08 ± 0.56	< 0.001

DLQI, Dermatology Life Quality Index.

<sup>a</sup> The score for each question, except Question 7, is as follows: very much = 3, a lot = 2, a little = 1, and not at all or not relevant = 0. For Question 7, the score is 3 for 'yes' and 0 for 'no'.

<sup>b</sup> Mean ± standard error of the mean.

<sup>c</sup> < 0.001 is considered highly significant; < 0.05 is considered significant; and > 0.05 is considered nonsignificant.

Kingdom and India, respectively.<sup>32,34</sup> In a study on 109 patients in the city of Qassim, the DLQI was 14.72, and it was recommended that the patients should be managed with the help of a psychiatrist. This high score was correlated with the wrong perception of the public regarding this disease, which places social and psychological stress upon the patients.<sup>35</sup> It is believed that during the last 10 years, social awareness regarding many diseases has significantly improved, and these beliefs are expected to diminish over time.

In addition, the social and psychological effects of vitiligo can affect the family members of the patients. A questionnaire study in KSA interviewing the families of 141 patients with vitiligo revealed that the emotional and social lives of such families were negatively affected.<sup>36</sup> This led to the conclusion that not only the patients, but also their families may require organized educational supportive help. A study in Iran, where the family DLQI was 6.1, confirmed this negative psychosocial effect on the families of 150 patients with vitiligo. In another study, it was reported that the least affected factors were related to educational and occupational aspects.<sup>37</sup>

In contrast to other studies, the current study measured the score of quality of life twice: before and after the introduction of NB-UVB. The mean DLQI score in this study decreased from 5.67 to 3.08 post-NB-UVB therapy, with the difference being highly significant ( $P < 0.001$ ), which indicated an improved quality of life as perceived by the patients. Although a recent study from India has used a similar before-after approach, the study period was shorter (6 months compared to one year in the current study).<sup>38</sup> In addition, the differences in the effect of demography on the DLQI score between the two studies may be attributed to genetic variation. Moreover, we have added an overall satisfaction score (out of 10) at the end of the questionnaire as an internal check of reliability. The reported average satisfaction score of 9.1 has confirmed that the therapeutic strategy was widely accepted by patients. It is worth mentioning that the patients' commitment to the clinic appointments (2–3 times a week for a year) also improved, confirming their satisfaction with the treatment.

However, in the current study, a better response to treatment has been noted among patients receiving a combination of NB-UVB therapy with immunosuppressants or corticosteroids, which is in accordance with previously published results. It has been reported that topical tacrolimus, an immunosuppressant, in addition to NB-UVB therapy, is successful in refractory cases of vitiligo.<sup>39</sup> The effectiveness and safety of the combination has recently been reconfirmed.<sup>40</sup> The use of corticosteroids also improves the therapeutic outcome of NB-UVB treatment. In a randomised controlled study, patients with vitiligo maintained on UVB treatment three times weekly were additionally treated with clobetasol propionate ointment (0.05%) for a year, showing better clinical outcomes.<sup>41</sup>

The small sample size in this study might be considered a limitation. The study includes all patients with vitiligo who agreed to be enrolled for a 1-year period since the commencement of the study. The reluctance or disagreement among other patients could be attributed to the psychological effects of the disease. Further large scale, multicentre studies are recommended.

## Conclusions

The addition of NB-UVB therapy to conventional topical corticosteroids or immunosuppressant drugs may significantly improve the response to the treatment for vitiligo. It also improves the patients' quality of life and their adherence to follow-up visits to the dermatology clinic because of their increased satisfaction with this therapeutic combination.

## Recommendations

It is recommended that NB-UVB therapy is introduced in current practice and made easily accessible to patients.

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## Conflict of interest

The authors have no conflict of interest to declare.

## Ethical approval

This prospective, cross-sectional study was performed following the tenants of the Declaration of Helsinki and was approved by the College of Dentistry Research Ethics Committee, Taibah University (TUCD-REC), Almadinah Almunawwarah, KSA (no. TUCDREC/20170228/EIBadawy, March 21, 2017).

## Authors' contributions

HMJK performed the data analysis and helped in writing the manuscript; AGA designed the study and helped in data collection; AAA helped in data collection and patient interviews; YMA helped in data collection and writing the manuscript; and HME helped with the study design and patient interviews. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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