Stress, anxiety, and depression in patients with vitiligo

Marwa Abd El Malk Nasser1, Samar Mohamed Raggi El Tahlawi2, Zahra Abbas Abdelfatah1 and Mohamed Ramadan Soltan3*

Abstract

Background: Vitiligo has a significant effect on patients’ quality of life; they feel stigmatized and disturbed by their condition. A lot of vitiligo patients, according to reports, suffer from psychological disturbances. The aim of the study is to find the relation between vitiligo and stress, anxiety, and depression and to measure how vitiligo affects the quality of life index. This study included 50 vitiligo patients and 50 matched healthy control groups. All patients were assessed by the Depression Anxiety Stress Scale (DASS) to determine the severity of anxiety, depression, and stress symptoms and the Dermatology Life Quality Index (DLQI) scale to evaluate their quality of life while the control group underwent only the Depression Anxiety Stress Scale.

Results: The prevalence of stress was 76% (n=38), anxiety was 78% (n=39), and depression was 80% (n=40); the difference was statistically significant between patient group and control group regarding stress, anxiety, and depression. Gender had a significant relationship with stress, anxiety, and depression (p < 0.05) (female affected more than male). Also, there was a statistically significant relation between the degree of vitiligo and anxiety (p < 0.05). Vitiligo has a moderate to very severe effect on the quality of life index. There was a statistically significant positive correlation between stress and feeling of embarrassment from vitiligo and clothes choice.

Conclusion: Vitiligo is a psychocutaneous disease that does not only affect the patient’s physical status, but also his mental and psychological status.

Keywords: Vitiligo, Depression, Anxiety, Stress

Background

Vitiligo is an acquired, multi-factorial and usually progressive disorder of melanin production. Vitiligo equally affects males and females as well as all different races. Vitiligo has various onset-age, distribution pattern and progression course. Vitiligo is the most prevalent cutaneous pigmentary disorder. Its prevalence reaches 0.5–2%, worldwide. The mean age of onset is about 20 years, and 95% of cases are under the age of 40 [1–3].

On account of severity of differentiation between depigmented and normal skin, darker skin people usually face more stigmatization, discrimination, and perhaps major psychosocial issues [4]. About 75% of vitiligo patients have a psychiatric condition, according to reports. Depression, anxiety, and stress are shared psychological disorders in vitiligo patients [5].

There might be huge constraints to the patients’ quality of life (QoL) when vitiligo affects the obvious parts of the body or the genitals [6]. It should be noted that vitiligo is usually asymptomatic, so its effect on quality of life is much more related to psychological problems, such as lack of self-confidence [7, 8], unpleasant body images [9], unsuccessful social relationships [4], and lower quality of marital relations [10, 11], than the exclusive physical issues.

Multiple mechanisms have been proposed for melanocyte destruction in vitiligo. These include genetic, autoimmune responses, oxidative stress, generation of...
inflammatory mediators, and melanocyte detachment mechanisms. Both innate and adaptive arms of the immune system appear to be involved. None of these proposed theories are in themselves sufficient to explain the different vitiligo phenotypes, and the overall contribution of each of these processes is still under debate, although there is now consensus on the autoimmune nature of vitiligo. Several mechanisms might be involved in the progressive loss of melanocytes, and they consist either of immune attack or cell degeneration and detachment. The “convergence theory” or “integrated theory” suggests that multiple mechanisms may work jointly in vitiligo to contribute to the destruction of melanocytes, ultimately leading to the same clinical result [12–16].

This study aims to find the relation between vitiligo and stress, anxiety, and depression to measure how vitiligo affects the quality of life index.

Methods
Our study is a case-control involving fifty patients of both sexes with the diagnosis of vitiligo and fifty healthy volunteers as a control group (from families of Fayoum University hospitals’ medical and paramedical staff) matched in age, gender, and academic level. Patients were selected from Dermatology Department, Fayoum University Hospital, within the period from October 2019 to March 2020. Vitiligo patients were between 12 to 60 years old. Both genders were included. They included 14 males (28.0%) and 36 females (72.0%). Patients under the age of 12 and those with other dermatological disorders that can cause stress, anxiety, or depression were excluded from the study.

This study was accepted by the faculty of medicine, Fayoum University Research Ethical Committee. The study’s goals were explained to the participants after they gave their consent. They were assured confidentiality and the right to refuse to take part in the research.

Following that, all of the patients were evaluated as follows:

1. History taking

Name, age, sex, marital status, family history, work, age of onset, any stress before (death of family member), any physical trauma, sort of vitiligo, form of treatment, duration of treatment, other diseases related and other cutaneous manifestation, and degree of vitiligo according to the Vitiligo Area Scoring Index (VASI) score which were done by dermatologist.

2. Vitiligo Area Scoring Index (VASI)

Hamzavi et al. [17] have introduced a quantitative parametric score, named VASI for Vitiligo Area Scoring Index, which is conceptually derived from the PASI score widely used in psoriasis assessment [18]. The total body VASI is calculated using a formula that includes contributions from all body regions (possible range, 0–100).

$$\text{VASI} = \Sigma(\text{all body sites}) \times (\text{depigmentation})$$

One hand unit, which encompasses the palm plus the volar surface of all the digits, is approximately 1% of the total body surface area and is used as a guide to estimate the baseline percentage of vitiligo involvement in each body region. The body is divided into five separate and mutually exclusive regions: hands, upper extremities (excluding hands), trunk, lower extremities (excluding feet), and feet. The axillary region is included with the upper extremities while the buttocks and inguinal areas are included with the lower extremities. The extent of residual depigmentation is expressed by the following percentages: 0, 10%, 25%, 50%, 75%, 90%, or 100%. At 100% depigmentation, no pigment is present; at 90%, specks of pigment are present; at 75%, the depigmented area exceeds the pigmented area; at 50%, the depigmented and pigmented areas are equal; at 25%, the pigmented area exceeds the depigmented area; at 10%, only specks of depigmentation are present.

3. Depression anxiety stress SCALE (DASS) [19]

The Depression Anxiety and Stress Scale is a 21-question shortened version with 7 questions for each psychological morbidity. The questionnaire asked about a recent experience with the products, and each one is graded from 0 (did not matter to me at all) to 3 (applied to me very much). The main goal of the DASS is to figure out how severe anxiety, depression, and stress symptoms are. The total score is determined by adding the scores for all of the products. The Arabic version [20] was used.

4. Dermatology Life Quality Index (DLQI)

The DLQI is a dermatology-specific, patient-reported quality of life test which is commonly used to assess vitiligo patients’ quality of life. It has ten questions that assess everyday tasks, recreation, symptoms, and emotions, as well as work and school and personal relationships [21]. Since the patient answers each question on a scale of 0 to 3, the DLQI is determined by adding the scores for each question, yielding a score that ranges from 0 to 30. The higher the ranking, the worse the quality of life has been. A score of more than ten indicates that the skin disorder has a significant impact on one’s quality of life.
life. No impact (0–1), slight effect (2–5), moderate effect (6–10), extremely large effect (11–20), and intensely large effect (21–30) on patients’ lives are the categories [22]. The Arabic version for the Dermatology Life Quality Index was used [23].

**Statistical analysis**

Results were collected, tabulated and statistically analyzed by an IBM compatible personal computer with SPSS statistical package version 23 [24]. Student’s t-test is a test of significance used for comparison of quantitative variables between two groups of normally distributed data. ANOVA test was used for comparison of quantitative variables between more than two groups of normally distributed data. Bivariate Pearson correlation test was also used to test the association between variables. P value < 0.05 was considered significant.

**Results**

Demographic and clinical data of study groups are included in Table 1. The mean age of patients was 34.69±5.87 (62% (n=31) were <40 years and 38% (n=19) were ≥40 years). Seventy-two percent (n=36) were females and 28% (n=14) were males. Fifty-eight percent (n=29) were married and 42% (n=21) were single.

The prevalence of stress was 76% (n=38), anxiety was 78% (n=39), and depression was 80% (n=40) (Figs. 1, 2, and 3 and Table 2). The quality of life index in vitiligo sufferers is included in Table 3.

There was a statistical difference between patient and control groups regarding stress, anxiety, and depression (p < 0.001) (Fig. 4).

There was no statistically significant correlation between age of patients in years, marital status, type of work, type of vitiligo, site of lesions, type of therapy whether systemic therapy or UVB therapy, and either stress, anxiety, or depression (p > 0.05), while there was a significant positive correlation between gender and anxiety (p < 0.05) (female affected more than male). Also, there was a statistically significant positive correlation between moderate to a severe degree of vitiligo and both anxiety and depression, and there was a statistically significant positive correlation between family history of vitiligo and depression (Table 4).

There was a statistically significant positive correlation between stress and embarrassment of vitiligo and clothes choice. However, there was no statistically significant correlation between the patient’s psychological status and other parameters of quality of life (Table 5).

**Discussion**

In the present study, 38 (76%) patients experienced moderate to severe stress, 39 (78%) patients experienced moderate to severe anxiety, and 40 (80%) patients experienced moderate to severe depression. These findings are consistent with Henning et al. [25] whom reported that vitiligo patients experience a lot of stress. The incidence and development of vitiligo can be influenced by the stress in which the patients are subjected to. Also, these findings are consistent with Nikam et al. [26] who reported that vitiligo is strongly associated with psychiatric disorders. Depression and anxiety remain the foremost common. Also, according to Vernwal [27], a stress-vitiligo cycle occurs when vitiligo causes psychological discomfort and adversely affects social relations.

Within this study, vitiligo patients are slightly more likely than control group to have stress, anxiety, and depression. These findings corroborate those of Lai et al. [28] who found that patients suffering vitiligo are slightly more likely than those without vitiligo to have an affective disorder or experience depressive symptoms. Also, Öztekin and Öztekin [29] found a significantly higher depression level and worse sleep quality in the vitiligo patients than the control group. Also, Hamidizadeh et al. [5] found that the quantity of tension and hopelessness in patients with vitiligo was significantly higher than healthy controls.

Regarding the possible causes of vitiligo, the death of a family member was identified as a potential cause of vitiligo in 22% of patients; according to the current study, 6% had family member illness, and 16% had fear as other possible causes of their vitiligo. These results are in agreement with Cupertino et al. [30] who reported that stressful life events generate vitiligo. As they conducted a large study that assessed 1541 vitiligo patients to assess the stressors’ effect on these patients Among the attendees and before the onset of vitiligo within 2 years, 56.6% had a minimum of one stressor, including the death of a loved (16.6%) and financial/work issues (10.8), the loss of a long-term relationship (10.2%), and family problems (7.8%) are among the most traumatic life events (51.0%).

In the present study, females experienced significant stress, anxiety, and depression as compared to males. Savant et al. [31] looked at gender inequalities in depression and found a greater prevalence of 28 (63.64%) in females compared to 24 (42.86%) in males, which was statistically significant. Also, this could be to keep with according to Abdelmaguid et al. [32], vitiligo has a negative impact on patients’ psychological well-being in regards of anxiety and depression, especially in female patients. These findings are consistent with Hamidizadeh et al.’s [5] findings showing that women with vitiligo were more nervous and hopeless than healthy controls, although there was no substantial difference in the degree of tension and hopelessness between the two groups.

With this study, there was no relation between the area involved by vitiligo and psychological disturbances.
In agreement with Kota et al. [33], they found that there was no significant correlation between skin area affected by vitiligo and depression. Regarding the effect of vitiligo on quality of life, the majority of cases 46% showed tremendous effect on their quality of life. Also, these results are within the road with Silpa-Archa et al. [34] who

| Variable                      | Patient | N  | %  | Control | N  | %  |
|-------------------------------|---------|----|----|---------|----|----|
| Age                           | Mean± SD| 34.69±5.87 |    | 30.27±7.65 |
| Age in years                  | <40 years | 31 | 62.0 | 40 | 80.0 |
|                               | ≥40 years | 19 | 38.0 | 10 | 20.0 |
| Age of onset                  | Mean± SD| 29.32±7.84 |    |
| Gender                        | Male     | 14 | 28.0 | 16 | 32.0 |
|                               | Female   | 36 | 72.0 | 34 | 68.0 |
| Marital status                | Single   | 21 | 42.0 | 10 | 20.0 |
|                               | Married  | 29 | 58.0 | 40 | 80.0 |
| Family history of vitiligo    | Positive | 37 | 74.0 |    |
|                               | Negative | 13 | 26.0 |    |
| Work of patients              | Student  | 16 | 32.0 |    |
|                               | Worker   | 9  | 18.0 |    |
|                               | Housewife| 25 | 50.0 |    |
| Degree of vitiligo            | Mild     | 20 | 40.0 |    |
|                               | Moderate | 24 | 48.0 |    |
|                               | Severe   | 6  | 12.0 |    |
| Possible cause of vitiligo    | No obvious cause | 14 | 28.0 |    |
|                               | Death of family member | 11 | 22.0 |    |
|                               | Family member illness | 3  | 6.0  |    |
|                               | Fear     | 8  | 16.0 |    |
|                               | Post traumatic | 1 | 2.0  |    |
|                               | Leprosy  | 3  | 6.0  |    |
|                               | Pregnancy| 2  | 4.0  |    |
|                               | After delivery | 1 | 2.0  |    |
|                               | Infertility | 1 | 2.0  |    |
|                               | Work problems | 6 | 12.0 |    |
| Type of vitiligo              | Acral    | 3  | 6.0  |    |
|                               | Focal    | 12 | 24.0 |    |
|                               | Segmental| 12 | 24.0 |    |
|                               | Generalized | 22 | 44.0 |    |
|                               | Universal| 1  | 2.0  |    |
| Sun-exposed lesions           | Unexposed| 8  | 16.0 |    |
|                               | Exposed  | 34 | 68.0 |    |
|                               | Both     | 8  | 16.0 |    |
| Ultraviolet B (UVB) therapy  | Negative | 21 | 42.0 |    |
|                               | Positive | 29 | 58.0 |    |
| Topical therapy               | Negative | 22 | 44.0 |    |
|                               | Positive | 28 | 56.0 |    |
| Systemic therapy              | Negative | 26 | 52.0 |    |
|                               | Positive | 24 | 48.0 |    |
**Stress**

- Normal to mild stress: 76%
- Distressed: 24%

**Anxiety**

- Normal to mild anxiety: 78%
- Moderate to severe anxiety: 22%

Fig. 1 Percentage of stress

Fig. 2 Percentage of anxiety
found that in the Thai population, vitiligo caused medium QoL impairment, and there was a moderate incidence of depression. Also, these results are in line with Cupertino et al. [30] who reported that vitiligo sufferers have a moderate DLQI score (range from 4.4 to 17.1), which is similar to psoriasis and atopic dermatitis.

Regarding sexual difficulties and problems with the partner, the present study showed that about 10% had many sexual difficulties. Also, within the current study, about 21% had many problems with their partners. These findings are consistent with those of Cupertino et al. [30] who discovered that roughly 25% of vitiligo patients reported that their condition has damaged their interpersonal relationships. Overall, 10–15% believe that vitiligo has hampered their ability to socialize with people of the opposite gender, as well as their ability to

| Variable | N  | %  | N   | %  |
|----------|----|----|-----|----|
| Stress   |    |    |     |    |
| Normal   | 2  | 4.0| Normal to mild stress | 12 | 24.0 |
| Mild     | 10 | 20.0| Distress            | 38 | 76.0 |
| Moderate | 18 | 36.0|   |     |
| Severe   | 14 | 28.0|   |     |
| Extreme severe | 6 | 12.0|   |     |
| Anxiety  |    |    |     |    |
| Normal   | 2  | 4.0| Normal to mild anxiety | 11 | 22.0 |
| Mild     | 9  | 18.0| Moderate to severe anxiety | 39 | 78.0 |
| Moderate | 16 | 32.0|   |     |
| Severe   | 10 | 20.0|   |     |
| Extreme severe | 13 | 26.0|   |     |
| Depression |    |    |     |    |
| Normal   | 4  | 8.0| Normal to mild depression | 10 | 20.0 |
| Mild     | 6  | 12.0| Moderate to severe depression | 40 | 80.0 |
| Moderate | 14 | 28.0|   |     |
| Severe   | 12 | 24.0|   |     |
| Extremely severe | 14 | 28.0|   |     |
locate, amount, and frequency of possible or actual sexual interactions. Furthermore, about half of those who were impacted said it was because of their personal humiliation, 13% said it was because of their partner’s humiliation, and 37% said it was because of both.

In the present study, 20% have no embarrassment of vitiligo, 8% have little embarrassment, 24% have a lot of embarrassment, and 48% have very much embarrassment. These results are in line with the results of Sarkar et al. [35] who reported that the most common psychiatric morbidity in vitiligo patients was depression (62.29%) followed by embarrassment (55.73%). Regarding clothes choice and social activities, the present study showed that 18% were not plagued by vitiligo in clothes choice, 8% vitiligo moderately affected, 18% vitiligo had many effects, and 56% has very much effect. Also, 18% of vitiligo did not affect their social activities, 12% of vitiligo has a little effect, 32% of vitiligo has a lot of effects, and 38% of vitiligo has abundantly affected.

These findings are consistent with Kota et al. [33]; they also found that vitiligo can even pose difficulty in primary daily activities like wearing clothes, having food of their choice, and going to social events. Within this study, there were two patients (4%) who developed vitiligo during pregnancy. This can be in line with Mason et al. [36] who reported that a precipitating factor was identified in nine of their vitiligo patients (22%), including pregnancy, sunburn, and skin trauma. In the present study, there is one patient (2%) who developed vitiligo after delivery, and this is against Delatorre et al. [37] who reported that almost all patients experienced stable vitiligo during pregnancy, still as within the 6-month period after delivery.

During this study, there have been 3 patients (6%) who developed vitiligo after leprosy. This is consistent with the findings of Boisseau-Garsaud et al. [38] who found eleven individuals with vitiligo between 101 patients with lepromatous (multibacillary) leprosy. The link between vitiligo and leprosy was not coincidental. The physiopathology leading to this high rate of vitiligo in leprosy is unclear.

There was no significant correlation between stress, anxiety, and depression and quality of life in patients with vitiligo. This was in line with Hedayat et al. [39] who concluded that psychiatric conditions such as depression and anxiety have no impact on the quality of life in people with vitiligo, while in contrast with Mechri et al. [40] who stated that the quality of life ratings had a positive association with depression and anxiety scores.

**Limitations**

The limitation of this study is that the study was conducted in a single large university hospital which might not represent all individuals with vitiligo or might not be generalizable to other countries. Although DASS is the standard measurement for screening of depression, anxiety, and stress, its limitation is that it is a self-rated questionnaire. Additional clinical information, e.g., patient’s function, effects of medication, illness, and...
psychiatric evaluation, are recommended for definite diagnosis and comprehensive evaluation. Furthermore, we did not evaluate patients younger than 12 years old.

**Conclusion**

Vitiligo patients have a high prevalence of psychiatric comorbidity: stress, anxiety, and depression. The onset of vitiligo is preceded by a stressful situation in most patients. Vitiligo contains a moderate to huge effect on the quality of lifetime of patients in particular (clothes choice and feelings of embarrassment). Female patients with vitiligo are more liable to psychiatric problems than male patients. There is no statistically significant correlation between stress, anxiety, depression, and the quality of life index in vitiligo patients.

### Table 4 Correlation between patient’s stress, anxiety, depression, and both demographic and clinical data of patients

|                          | Stress R | P    | Anxiety R | P    | Depression R | P    |
|--------------------------|----------|------|-----------|------|--------------|------|
| Age                      | -0.080   | 0.583| 0.006     | 0.969| 0.091        | 0.528|
| Age of onset             | -0.256   | 0.073| -0.040    | 0.785| 0.106        | 0.464|
| Gender                   | 0.171    | 0.235| 0.314*    | 0.026| 0.245        | 0.086|
| Marital statue           | -0.041   | 0.979| 0.037     | 0.798| -0.020       | 0.889|
| Family history of vitiligo| 0.120    | 0.408| 0.205     | 0.154| 0.296*       | 0.037|
| Work                     | -0.166   | 0.248| 0.017     | 0.907| 0.066        | 0.649|
| Degree of vitiligo       | 0.116    | 0.424| 0.403*    | 0.002| 0.316*       | 0.025|
| Cause of vitiligo        | 0.018    | 0.903| 0.017     | 0.908| 0.016        | 0.913|
| Type of vitiligo         | 0.256    | 0.741| 0.018     | 0.903| 0.106        | 0.464|
| Sun exposure             | 0.015    | 0.918| -0.146    | 0.312| -0.053       | 0.714|
| UVB therapy              | 0.091    | 0.529| 0.135     | 0.350| -0.020       | 0.889|
| Topical therapy          | -0.026   | 0.856| 0.016     | 0.915| -0.141       | 0.329|
| Systemic therapy         | -0.022   | 0.877| -0.070    | 0.631| 0.180        | 0.211|

*significant P-value <0.05

### Table 5 Correlation between patient’s stress, anxiety, depression, and quality of life index

|                          | Stress R | P    | Anxiety R | P    | Depression R | r    |
|--------------------------|----------|------|-----------|------|--------------|------|
| Social activities sharing| -0.072   | 0.618| 0.112     | 0.440| 0.039        | 0.790|
| Embarrassment of vitiligo| 0.285*   | 0.045| 0.221     | 0.123| 0.084        | 0.562|
| Clothes choice           | 0.330*   | 0.019| 0.134     | 0.354| 0.197        | 0.170|
| Quality of life          | 0.014    | 0.974| 0.174     | 0.227| 0.149        | 0.302|
| Work and study difficulties| 0.005   | 0.974| 0.174     | 0.227| 0.149        | 0.302|
| Problems with your partner| 0.011   | 0.939| 0.232     | 0.104| 0.060        | 0.681|
| Sexual difficulties      | 0.161    | 0.265| 0.195     | 0.176| -0.010       | 0.947|
| Difficulties in vitiligo treatment| 0.099 | 0.493| -0.005    | 0.971| 0.129        | 0.371|

*significant P-value <0.05
Abbreviations
DASS: Depression Anxiety Stress Scale; DLQI: Dermatology Life Quality Index; HRQL: Health-Related Quality of Life

Acknowledgements
The writers express their gratitude to the participants for their involvement and support.

Authors’ contributions
MA, SM, ZA, and MR evaluated and interpreted patient data in terms of clinical data and psychometric methods, and all writers contributed to the manuscript’s writing. The final manuscript has been read and accepted by all of the contributors.

Funding
This study did not receive any fund.

Availability of data and materials
Not applicable.

Declarations

Ethics approval and consent to participate
The Ethics Committee of Fayoum University gave their blessing to this study. The participants of the study gave their written consent. There is no way to know how many permits there are. The committee’s reference number is not applicable and/or not available.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
1Department of Dermatology, Faculty of Medicine, Fayoum University, Fayoum, Egypt. 2Department of Dermatology, Faculty of Medicine, Cairo University, Cairo, Egypt. 3Department of Psychiatry, Faculty of Medicine, Fayoum University, PO Box: 63514, Fayoum, Egypt.

Received: 31 May 2021 Accepted: 26 June 2021

Published online: 30 September 2021

References
1. Bolognia J, Jorizzo J, Schaffer J. Dermatology text book. 3. 2012. pp. 1023–4. [Google Scholar]
2. Malhotra N, Dutt M (2013) The pathogenesis of vitiligo. J Cutan Med Surg 17(3):153–172. https://doi.org/10.2310/7750.2012.12005 [PubMed] [CrossRef] [Google Scholar]
3. Patel AB, Kukba R, Kukba A (2013) Clinicopathological correlation of acquired hypopigmentary disorders. Indian J Dermatol Venerol Leprol 79(3):376–382. https://doi.org/10.4103/0377-6332.110749 [PubMed] [CrossRef] [Google Scholar]
4. Mattoo SK, Handa S, Kaur I, Gupta N, Malhotra R (2002) Psychiatric morbidity in vitiligo: prevalence and correlates in India. J Eur Acad Dermatol Venereol 16(6):573–578. https://doi.org/10.1111/j.1468-3083.2002.00590.x
5. Hamidzadeh N, Ranjarb S, Ghanizadeh A, Varziti MM, Jafari P, Handjani F (2020) Evaluating prevalence of depression, anxiety and hopelessness in patients with vitiligo on an Iranian population. Health Qual Life Outcomes 18(1):20
6. Schmid-ott G, Kiback RM, Sheftoni R (2007) Stigmatization experience, coping and sense of coherence in vitiligo. J Eur Acad Dermatol Venereol 21(4):456–461. https://doi.org/10.1111/j.1468-3083.2006.01897.x
7. Porter JR, Beuf AH, Lerner A, Nordlund J (1986) Psychosocial effect of vitiligo: a comparison of vitiligo patients with “normal” control subjects, with psoriasis patients, and with patients with other pigmentary disorders. J Am Acad Dermatol. 15(2):220–224. [PubMed]. https://doi.org/10.1016/1090-9622(86)70160-6
8. Talsania N, Lamb B, Bewley A (2010) Vitiligo is more than skin deep: a survey of members of the Vitiligo Society. Clin Exp Dermatol. 35(7):736–739. [PubMed]. https://doi.org/10.1111/j.1365-2230.2009.03765.x
9. Kent G, Al-Abadie M (1996) Factors affecting responses on Depression Anxiety Stress Scale item among vitiligo sufferers. Clin Exp Dermatol. 21(5):330–333. [PubMed]. https://doi.org/10.1111/j.1365-2230.1996.tb0016x
10. Wang KY, Wang KH, Zhang ZP (2011) Health-related quality of life and marital quality of vitiligo patients in China. J Eur Acad Dermatol Venereol. 25(4):429–435. [PubMed]. https://doi.org/10.1111/j.1468-3083.2010.03980.x
11. Dolatshahi M, Ghazi P, Feizy V, Hemami M (2008) Life quality assessment among patients with vitiligo: comparison of married and single patients in Iran. Indian J Dermatol Venereol Leprol 74(6):700. [PubMed] [Google Scholar]
12. Picard M, Dell’Anna ML, Ezedine K, Hamzavi I, Harris JE, Parsad D et al (2015) Vitiligo. Nat Rev Dis Primers. 1(1):15011. https://doi.org/10.1038/nrdp.2015.11
13. Ezedine K, Elhetheriadiou V, Whittom M, van Geel N (2015) Vitiligo. Lancet. 386(9987):74–84. https://doi.org/10.1016/S0140-6736(14)60763-7
14. Le Poole IC, Das PK, van den Wijngaard RM, Bos JD, Westerhof W (1993) Review of the etiopathomechanism of vitiligo: a convergence theory. Exp Dermatol. 2(4):145–153. https://doi.org/10.1111/j.1365-2230.1996.tb00023.x
15. Sandoval-Cruz M, García-Carrasco M, Sánchez-Porras R, Mendoza-Pinto C, Jiménez-Herrández M, Munugula-Realpozo P, Ruiz-Anguitas A (2011) Immunopathogenesis of vitiligo. Autoimmun Rev. 10(12):762–765. https://doi.org/10.1016/j.autrev.2011.02.004
16. Richmond JM, Frisoli ML, Harris JE (2013) Innate immune mechanisms in vitiligo: danger from within. Curr Op Immunol. 25(5):676–682. https://doi.org/10.1016/j.coi.2013.10.010
17. Hamzavi I, Jain H, McLean D, Shapiro J, Zeng H, Liu H (2004) Parametric modeling of narrowband UV-B phototherapy for vitiligo using a novel quantitative tool: the Vitiligo Area Scoring Index. Arch Dermatol. 140(6):677–683. https://doi.org/10.1001/archderm.140.6.677
18. Fredriksson T, Pettersson U (1978) Severe psoriasis–oral therapy with a new retinoid. Dermatology. 157(4):238–244. https://doi.org/10.1159/000208393
19. Lovibond SH, Lovibond PF (1995) Manual for the Depression Anxiety & Stress Scales, 2nd edn. Psychology Foundation, Sydney
20. Moussa, M.T., Lovibond, P.F. & Laube, R. 2001. Psychometric properties of an Arabic version of the Depression Anxiety Stress Scales (DASS21). Report for New South Wales Transcultural Mental Health Centre, Campbelltown Hospital, Sydney
21. Finlay AY, Khan GK (1993) The Dermatology Life Quality Index: a simple practical measure for routine clinical use. British Association of Dermatologists Annual Meeting, Oxford, July 1993. Br J Dermatol. 129(4):27
22. Basra MK, Fenech R, Gatt RM, Salek MS, Finlay AY (2008) The Dermatology Life Quality Index 1994–2007: a comprehensive review of validation data and clinical results. Br J Dermatol. https://doi.org/10.1111/j.1365-2133.2008.08852.x
23. Khoudi I, Lambachah FZ, Ismaili N, Senouci K, Hassam B, Abouzagl R (2013) Measuring quality of life in patients with psoriasis using the Arabic version for Morocco of the Dermatology Life Quality Index. Int J Dermatol 52(7):795–802. https://doi.org/10.1111/1365-4632.2011.05450.x
24. Snedecor GW, Cochran WG (1980) Statistical methods, 7th edn. Iowa State University Press, Ames
25. Hennring SW, Jaishankar D, Barse LW, Dellaceica ER, Lancki N, Webb K, Janusek L, Mathews HL, Price RN Jr, Le Poole IC (2020) The relationship between stress and vitiligo: evaluating perceived stress and emotional medical record data. Plos One 15(1):e0227909
26. Nikam B, Kale MS, Hussain AA, Jamale V, Shah R (2020) Increased risk of psychiatric disorders in patients with vitiligo. J Crit Rev 7(4):2623–2627
27. Vernwal D (2017) A study of anxiety and depression in Vitiligo patients: new challenges to treat. Eur Psychiatry 41(S1):S321. https://doi.org/10.1016/j.eurpsy.2017.02.242
28. Lai YC, Yew WY, Kennedy C, Schwartz RA (2017) Vitiligo and depression: a systematic review and meta-analysis of observational studies. Br J Dermatol 177(3):708–718. https://doi.org/10.1111/bjd.15199
29. Öztekin A, Öztekin C (2020) Sleep quality and depression in vitiligo patients. Eurasian J Fam Med 9(1):35–41. https://doi.org/10.33880/efjm.2020090105
30. Panteghini F, Niemeyer-Corbellini JP, Ramos-e-Silva M (2017) Psychosomatic aspects of vitiligo. Clin Dermatol 35(3):292–297. https://doi.org/10.1016/j.clindermatol.2017.01.001
31. Savant NS, Vanjari NA, Khopkar U (2019) Gender differences in depression, coping, stigma, and quality of life in patients of vitiligo. Dermatol Res Pract 2019:1–10. https://doi.org/10.1155/2019/6879412
32. Abdelmaguid EM, Khalifa H, Salah MW, Sayed DS (2020) Assessment of depression and anxiety in relation to quality of life in patients with vitiligo. Egypt J Dermatol Venereol 40(2):99
33. Kota RS, Vora RV, Varma JR, Kota SK, Patel TM, Ganjiwale J (2019) Study on assessment of quality of life and depression in patients of vitiligo. Indian Dermatol Online J 10(2):153
34. Silpa-Archa N, Pruksaeakanan C, Angkoolpakdeeukul N, Chaiaiaburut C, Kulthanan K, Ratta-Apha W, Wongpraparut C (2020) Relationship between depression and quality of life among vitiligo patients: a self-assessment questionnaire-based study. Clin Cosmetic Investig Dermatol 13:511–520. https://doi.org/10.2147/CCID.S265349
35. Sarkar S, Sarkar T, Sarkar A, Das S (2018) Vitiligo and psychiatric morbidity: a profile from a vitiligo clinic of a rural-based tertiary care center of eastern India. Indian J Dermatol 63(4):281
36. Mason CP, Gawkrodger DJ (2005) Vitiligo presentation in adults. Clin Exp Dermatol 30(4):344–345. https://doi.org/10.1111/j.1365-2230.2005.01779.x
37. Delatorre G, Oliveira C, Chaves T, Linsingen R, Castro C (2013) A study of the prognosis of vitiligo during pregnancy. Surg Cosmet Dermatol 5(1):37–39
38. Boisseau-Garsaud AM, Vezon G, Helenon R, Garsaud P, Saint-Cyr I, Quist D (2000) High prevalence of vitiligo in lepromatous leprosy. Int J Dermatol 39(11):837–839. https://doi.org/10.1046/j.1365-4362.2000.00093.x
39. Hedayat K, Karbalai M, Ghasemi M, Goodarzi A, Fakour Y, Akbari Z, Ghayoumi A, Ghandi N (2016) Quality of life in patients with vitiligo: a cross-sectional study based on Vitiligo Quality of Life index (VitiQoL). Health Qual Life Outcomes 14:1–9
40. Mechti, A., Amri, M., Douarika, A.A., BH, A.H., Zouari, B. and Zili, J., 2006. Psychiatric morbidity and quality of life in vitiligo: a case controlled study. La Tunisie Médicale, 84(10), pp.632-635.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.