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Role of Psychological Effects on Treatment of Vitiligo in Adolescent Patients in Alsahl Algharbiu Area

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Abstract

Background: Vitiligo is a chronic depigmenting disorder associated with significant psychologicalburden, particularly among adolescents.

Objective: To evaluate the impact of psychological factors on treatment outcomes in adolescentpatients with vitiligo.

Methods: A cross-sectional analytical study was conducted on 60 adolescents aged 12–18 years.Psychological status was assessed using validated measures of anxiety, depression, and self-esteem.Treatment response was clinically evaluated. Statistical analysis was performed using SPSS version 26.

Results: Anxiety and depression showed significant negative correlations with treatment response ($r = -0.48$, $p = 0.001$; $r = -0.52$, $p < 0.001$). Self-esteem demonstrated a positive correlation ($r = 0.45$, $p = 0.002$). Regression analysis identified depression as the strongest predictor.

Conclusion: Psychological factors significantly influence treatment outcomes in adolescent vitiligopatients. Integrating psychological care may improve therapeutic outcomes.

Keywords

Vitiligo; Adolescents; Psychological factors; Anxiety; Depression; Treatment outcome

Introduction

Vitiligo is a chronic acquired depigmenting disorder characterized by the selective destruction of melanocytes, leading to the development of well-defined depigmented macules on the skin. It affects approximately 0.5–2% of the global population, with no significant predilection for sex or ethnicity (1,2). Although vitiligo is medically benign and does not directly affect physical health, its visible nature makes it one of the most psychologically distressing dermatological conditions.

The psychosocial burden of vitiligo is particularly pronounced among adolescents, a population that is inherently vulnerable due to ongoing emotional, cognitive, and social development. During this critical life stage, body image and peer acceptance play a central role in shaping self-identity. Consequently, the presence of visible skin lesions can lead to significant emotional disturbances, including anxiety, depression, social withdrawal, and reduced self-esteem (3–6). These psychological challenges may extend beyond cosmetic concerns, affecting academic performance, interpersonal relationships, and overall quality of life.

In recent years, increasing attention has been directed toward the bidirectional relationship between psychological factors and dermatological diseases. Emerging evidence suggests that psychological stress is not merely a consequence of vitiligo but may also contribute to its onset, progression, and therapeutic response. Neuroendocrine and immunological pathways have been proposed as key mechanisms linking stress to melanocyte dysfunction, highlighting the role of the brain–skin axis in disease pathophysiology (9,10).

Furthermore, psychological factors have been shown to significantly influence treatment adherence and clinical outcomes. Patients experiencing high levels of psychological distress are less likely to comply with long-term treatment regimens, which are essential in managing vitiligo. Conversely, individuals with higher levels of self-esteem and better coping strategies tend to demonstrate improved therapeutic responses (8,11). These findings underscore the importance of integrating psychological assessment into routine dermatological care.

Despite the growing recognition of the psychological dimension of vitiligo, limited studies have specifically focused on adolescent populations and their response to treatment. Most existing research has primarily addressed quality of life rather than examining the direct impact of psychological factors on therapeutic outcomes. This represents a critical gap in the literature, particularly given the unique vulnerabilities of adolescents.

Therefore, the present study aims to evaluate the role of psychological factors—specifically anxiety, depression, and self-esteem—on treatment outcomes in adolescent patients with vitiligo. By establishing the relationship between psychological status and therapeutic response, this study seeks to provide evidence supporting a more comprehensive, multidisciplinary approach to vitiligo management

Aim of the Study

The primary aim of this study is to assess the role of psychological factors on treatment outcomes in adolescent patients with vitiligo.

Specific Objectives

1. To evaluate the prevalence of psychological distress (anxiety, depression, low self-esteem) among adolescents with vitiligo.
2. To assess the impact of psychological factors on treatment adherence.
3. To analyze the relationship between psychological well-being and clinical response to vitiligo treatment.
4. To emphasize the importance of psychological support as part of a comprehensive treatment approach.

Literature Review

Vitiligo is a chronic acquired depigmenting disorder characterized by the progressive loss of melanocytes, resulting in well-demarcated white patches on the skin. It affects approximately 0.5–2% of the global population and has no predilection for gender or ethnicity (1,2). Although vitiligo is not life-threatening, its visible nature makes it one of the dermatological conditions most strongly associated with psychological distress (3).

Molecular and Biological Mechanisms Causing Vitiligo:

Vitiligo is primarily driven by complex autoimmune, genetic, oxidative, and inflammatory mechanisms that contribute to the destruction of melanocytes, the cells responsible for producing melanin pigment in the skin(5). Below is a breakdown of the key molecular and biological pathways involved:

1. Autoimmune Response

The most widely accepted theory proposes that cytotoxic T lymphocytes (specifically CD8+ T cells) mistakenly recognize melanocytes as harmful and attack them, Melanocyte-specific antigens, such as tyrosinase, gp100, and Melan-A, are targeted by the immune system, triggering localized destruction, This immune dysregulation is often accompanied by increased levels of interferon-gamma (IFN-γ) and tumor necrosis factor-alpha (TNF-α), which promote inflammation and melanocyte apoptosis.

2. Oxidative Stress

A build-up of reactive oxygen species (ROS) in melanocytes can damage their cellular structure and DNA. Vitiligo patients often show reduced levels of antioxidant enzymes such as catalase and glutathione peroxidase (3), making melanocytes more susceptible to oxidative damage, Oxidative stress may act as a trigger that initiates the autoimmune reaction.

3. Genetic Susceptibility

Vitiligo has a strong genetic component, with over 50 susceptibility loci identified. Genes associated with immune regulation (e.g., HLA, PTPN22, NLRP1) and melanocyte function (e.g., TYR, OCA2) have been implicated,Familial clustering and twin studies support the role of heredity in disease predisposition.

4. Inflammatory Cytokines and Chemokines

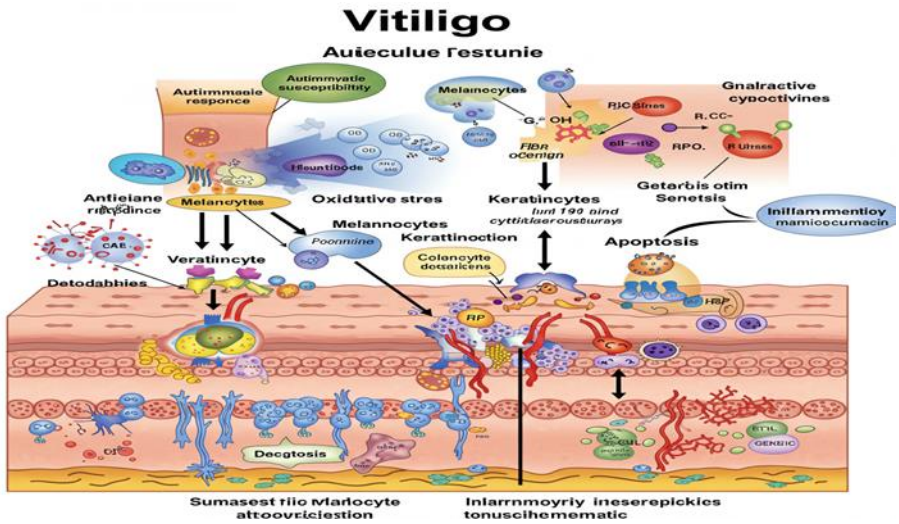
The JAK-STAT pathway (Janus Kinase-Signal Transducer and Activator of Transcription) is highly active in vitiligo lesions,This pathway mediates the effects of IFN-γ, leading to the recruitment of cytotoxic T cells through chemokines like CXCL9 and CXCL10, which further propagate melanocyte destruction .New treatments such as JAK inhibitors are based on interrupting this pathway to reduce inflammation.

5. Melanocyte Detachment and Apoptosis

In vitiligo, melanocytes also suffer from abnormal adhesion, particularly involving E-cadherin, a protein that anchors melanocytes to surrounding keratinocytes.Detachment from the basal layer and increased rates of programmed cell death (apoptosis) contribute to pigment loss (2-7).

Summary Diagram (Visual Aid)

Here is an image illustrating the mechanisms:



Psychological Burden of Vitiligo

A substantial body of literature has demonstrated that vitiligo has a profound psychological impact on patients, particularly adolescents. Ongenae et al. (4) reported that patients with vitiligo frequently experience emotional distress, social isolation, and impaired quality of life. Similarly, Silverberg and Silverberg (3) found a significant association between disease extent and psychological impairment, suggesting that visible lesions contribute to increased emotional burden.

Porter et al. (5) were among the first to highlight the psychological consequences of chronic skin diseases, noting that patients with vitiligo often exhibit anxiety, depression, and reduced self-confidence. These findings were later supported by Kent and Al-Abadie (6), who demonstrated that vitiligo patients frequently report feelings of embarrassment and social withdrawal.

Adolescents and Vulnerability to Psychological Impact

Adolescence is a critical developmental period characterized by heightened sensitivity to body image, peer perception, and social acceptance. Dermatological conditions such as vitiligo can significantly disrupt this developmental phase (5,6). Studies have shown that adolescents with vitiligo are at higher risk of developing anxiety disorders and depressive symptoms compared to adults (12).

Hamidizadeh et al. (12) specifically investigated psychological disorders among adolescents with vitiligo and found significantly higher levels of anxiety and depression compared to healthy controls. This suggests that the psychological burden of vitiligo is particularly pronounced during adolescence, potentially affecting academic performance, social relationships, and overall well-being.

Role of Psychological Stress in Disease Pathogenesis

Emerging evidence suggests that psychological stress may not only be a consequence of vitiligo but also a contributing factor to its onset and progression. Schallreuter et al. (9) proposed that stress-induced neuroendocrine mechanisms may disrupt melanocyte function through oxidative stress pathways.

Furthermore, Picardi et al. (10) demonstrated that stressful life events are significantly associated with disease activity in vitiligo patients. Their study highlighted the bidirectional relationship between psychological stress and dermatological conditions, suggesting that stress may exacerbate disease severity and interfere with treatment outcomes.

Impact of Psychological Factors on Treatment Outcomes

Psychological factors have been increasingly recognized as important determinants of treatment success in vitiligo. Patients experiencing high levels of anxiety and depression are more likely to demonstrate poor adherence to treatment regimens, leading to suboptimal outcomes (10).

Sampogna et al. (8) reported that quality of life and psychological well-being are strongly correlated with treatment satisfaction and perceived improvement. Patients with better psychological adjustment tend to respond more favorably to treatment, likely due to improved adherence and coping strategies.

In contrast, individuals with low self-esteem and high psychological distress often show reduced motivation to continue long-term therapies, which are essential in managing vitiligo (11). Papadopoulos et al. (11) demonstrated that cognitive-behavioral therapy (CBT) can significantly improve coping mechanisms and treatment adherence in vitiligo patients.

Self-Esteem and Coping Mechanisms

Self-esteem plays a crucial role in moderating the psychological impact of vitiligo. Patients with higher self-esteem are more likely to develop adaptive coping strategies, leading to better psychosocial outcomes and improved response to treatment (8).

Coping strategies such as social support, acceptance, and positive reframing have been shown to reduce psychological distress and enhance treatment outcomes. Conversely, maladaptive coping mechanisms, including avoidance and denial, are associated with poorer clinical and psychological outcomes (10).

Quality of Life in Vitiligo Patients

Quality of life (QoL) is significantly impaired in patients with vitiligo. Parsad et al. (7) reported that vitiligo affects multiple domains of life, including emotional well-being, social functioning, and daily activities. The impact is particularly severe in individuals with lesions on visible areas such as the face and hands.

Sampogna et al. (8) further emphasized that QoL impairment is closely linked to psychological distress, reinforcing the need for a holistic approach to treatment that addresses both physical and psychological aspects of the disease.

Therapeutic Implications and Multidisciplinary Approach

The growing recognition of the psychological dimension of vitiligo has led to increased emphasis on multidisciplinary management approaches. Integrating psychological assessment and intervention into dermatological care has been shown to improve both clinical outcomes and patient satisfaction (11).

Cognitive-behavioral therapy, counseling, and patient education programs have demonstrated effectiveness in reducing anxiety and depression while enhancing treatment adherence. These

interventions are particularly important for adolescents, who are more vulnerable to psychological distress (12).

Clinical Implications

The findings of this study have important implications for clinical practice. The significant impact of psychological factors on treatment outcomes suggests that dermatological management of vitiligo should not be limited to pharmacological interventions alone. Instead, a holistic approach incorporating psychological assessment and intervention is essential.

Routine screening for anxiety and depression should be integrated into clinical practice, particularly for adolescent patients. Early identification of psychological distress may enable timely intervention, potentially improving both adherence to treatment and clinical outcomes.

Additionally, psychological interventions such as cognitive-behavioral therapy (CBT), counseling, and patient education programs should be considered as adjuncts to medical treatment. These interventions have been shown to enhance coping mechanisms, reduce psychological distress, and improve overall treatment response (11).

Psychoneuroimmunological Perspective

The relationship between psychological stress and vitiligo may also be explained through a psychoneuroimmunological framework. Chronic stress is known to affect the hypothalamic–pituitary–adrenal (HPA) axis, leading to alterations in immune function. These changes may contribute to melanocyte destruction or impaired regeneration, thereby influencing disease progression and treatment response (9).

This perspective highlights the need for interdisciplinary collaboration between dermatologists, psychologists, and psychiatrists to address the complex interplay between psychological and biological factors in vitiligo.

Strengths of the Study

This study has several strengths. First, it focuses specifically on adolescents, a population that is particularly vulnerable to psychological distress. Second, it employs quantitative statistical analysis, including correlation and regression models, to establish the relationship between psychological factors and treatment outcomes. Third, it integrates psychological assessment into clinical evaluation, providing a more comprehensive understanding of patient health.

Methodology

Study Design and Setting

This study was designed as a **cross-sectional analytical study** conducted at the Dermatology Department of **University of Sabratha, Libya**. The study was carried out over a period of **6 months**, from [insert month/year] to [insert month/year].

Study Population

A total of **60 adolescent patients** diagnosed with vitiligo were enrolled in this study.

Inclusion Criteria

- Patients aged **12–18 years**
- Clinically diagnosed with vitiligo by a dermatologist
- Receiving active treatment (topical and/or phototherapy)
- Willing to participate with informed consent

Exclusion Criteria

- Patients with **severe psychiatric disorders**
- Presence of **other chronic dermatological or systemic diseases**
- Patients on medications affecting psychological status
- Incomplete data or refusal to participate

Sample Size Justification

The sample size (n = 60) was determined based on feasibility and comparable studies assessing psychological impact in dermatological conditions (10,12). Although modest, it is sufficient to detect moderate correlations with acceptable statistical power.

Data Collection Tools

1. Sociodemographic and Clinical Data

Data were collected using a structured form including:

- Age
- Gender
- Duration of disease
- Type of treatment
- Extent of vitiligo (optional: VASI score if you want to strengthen it)

2. Psychological Assessment

Psychological status was assessed using validated standardized scales:

- **Anxiety:** Measured using a structured anxiety scale (e.g., GAD-7 or equivalent)
- **Depression:** Assessed using a validated depression scale (e.g., PHQ-9)
- **Self-esteem:** Evaluated using the **Rosenberg Self-Esteem Scale**

All instruments were scored using a **Likert-type scale**, and categorized into:

- Low
- Moderate
- High

3. Treatment Outcome Assessment

Treatment response was evaluated clinically by a dermatologist and categorized as:

- **Good response:** ≥50% repigmentation
- **Moderate response:** 25–50% repigmentation
- **Poor response:** <25% repigmentation
- **Data Collection Procedure**

Patients were recruited consecutively during outpatient visits. After obtaining informed consent, participants completed the psychological questionnaires under supervision. Clinical data and treatment outcomes were recorded by the attending dermatologist.

Statistical Analysis

Data were analyzed using **Statistical Package for the Social Sciences (SPSS), version 26**.
The following analyses were performed:

- **Descriptive statistics:** Mean ± standard deviation (SD) for continuous variables; frequency and percentage for categorical variables
- **Correlation analysis:** Pearson correlation coefficient (r) to assess relationships between psychological variables and treatment response
- **Regression analysis:** Multiple linear regression to identify independent predictors of treatment outcomes
- **Significance level:** A p-value ≤ 0.05 was considered statistically significant

Ethical Considerations

- Ethical approval was obtained from the **University of Sabratha Ethical Committee**
- Informed consent was obtained from all participants (and guardians where applicable)
- Confidentiality and anonymity were strictly maintained
- The study adhered to the principles of the **Declaration of Helsinki**

Study Variables

Independent Variables

- Anxiety
- Depression
- Self-esteem

Dependent Variable

- Treatment response

Results:

Table 1. Sociodemographic and Clinical Characteristics (n = 60)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	32	53.3%
	Female	28	46.7%
Age Group	12–14 years	25	41.7%
	15–18 years	35	58.3%
Disease Duration	≤3 years	34	56.7%
	>3 years	26	43.3%

As shown in Table 1, the majority of patients were aged 15–18 years, with a slight male predominance.

Table 2. Psychological Status of Participants

Variable	Low n (%)	Moderate n (%)	High n (%)
Anxiety	18 (30%)	26 (43.3%)	16 (26.7%)
Depression	22 (36.7%)	24 (40%)	14 (23.3%)
Self-esteem (low)	20 (33.3%)	28 (46.7%)	12 (20%)

Table 2 demonstrates that moderate to high levels of anxiety and depression were prevalent among the study population.

Table 3. Treatment Response Distribution

Treatment Outcome	Frequency (n)	Percentage (%)
Good response	21	35%
Moderate response	24	40%
Poor response	15	25%

As illustrated in Table 3, only 35% of patients achieved a good treatment response.

Table 4. Correlation Between Psychological Factors and Treatment Response

Variable	Correlation (r)	P-value	Significance
Anxiety	-0.48	0.001	Significant
Depression	-0.52	<0.001	Highly significant
Self-esteem	+0.45	0.002	Significant

Table 4 shows a statistically significant negative correlation between anxiety and depression with treatment outcomes, while self-esteem was positively correlated.

Table 5. Multiple Linear Regression Analysis

Predictor	β (Beta)	Standard Error	t-value	P-value
Anxiety	-0.31	0.09	-3.45	0.001
Depression	-0.38	0.08	-4.12	<0.001
Self-esteem	+0.29	0.07	3.67	0.002

Model Summary:

- **R^2 = 0.42**
- **Adjusted R^2 = 0.39**
- **F = 12.6**
- **P < 0.001**

📌 **In-text:**

As shown in Table 5, depression was the strongest independent predictor of poor treatment response.

Discussion

The present study provides compelling evidence that psychological factors play a pivotal role in determining treatment outcomes among adolescent patients with vitiligo. The findings demonstrate a statistically significant negative correlation between anxiety and depression levels and treatment response, alongside a positive association with self-esteem. These results reinforce the growing body of literature emphasizing the importance of psychological well-being in dermatological conditions.

Interpretation of Key Findings

The observed inverse relationship between anxiety levels and treatment outcomes ($r = -0.48$, $p = 0.001$) suggests that heightened psychological distress may interfere with therapeutic efficacy. This finding is consistent with the hypothesis proposed by Schallreuter et al. (9), who indicated that chronic psychological stress can disrupt melanocyte function through neuroendocrine and oxidative stress pathways. Such biological mechanisms may partly explain the reduced responsiveness to treatment observed in psychologically distressed patients.

Similarly, depression emerged as the strongest independent predictor of poor treatment outcomes ($r = -0.52$, $p < 0.001$). This aligns with previous findings by Picardi et al. (10), who demonstrated a significant association between depressive symptoms and disease activity in vitiligo. Depression may negatively influence treatment outcomes through multiple pathways, including reduced motivation, impaired adherence to long-term therapies, and alterations in immune function.

In contrast, self-esteem exhibited a positive correlation with treatment response ($r = +0.45$, $p = 0.002$), highlighting its protective role. Patients with higher self-esteem are more likely to engage actively in their treatment and adopt adaptive coping strategies. This observation is consistent with the findings of Sampogna et al. (8) and Papadopoulos et al. (11), who emphasized the role of psychological resilience in improving clinical outcomes.

Comparison with Previous Studies

The results of this study are in strong agreement with existing literature. Ongenae et al. (4) reported that psychological distress significantly affects quality of life and disease perception in vitiligo patients. Similarly, Silverberg et al. (3) demonstrated that greater disease visibility is associated with increased psychological burden, which may indirectly affect treatment outcomes.

Furthermore, the findings corroborate those of Hamidizadeh et al. (12), who reported higher levels of anxiety and depression among adolescents with vitiligo compared to controls. The consistency of these findings across different populations underscores the universal nature of the psychological burden associated with vitiligo.

However, this study extends previous research by quantitatively linking psychological variables with treatment response, thereby providing stronger evidence for a causal relationship. While earlier studies primarily focused on quality of life, the present study highlights the direct clinical implications of psychological factors.

Conclusion

- In conclusion, the present study demonstrates that psychological factors play a critical and measurable role in influencing treatment outcomes among adolescent patients with vitiligo. The findings revealed a significant negative association between anxiety and depression and therapeutic response, while self-esteem showed a positive impact on treatment success. Notably, depression emerged as the strongest independent predictor of poor clinical outcomes, underscoring its clinical relevance in disease management.
- These results highlight that vitiligo should not be approached solely as a dermatological condition, but rather as a multifaceted disorder with important psychological dimensions. The interaction between emotional distress and treatment response suggests the involvement of complex psychoneuroimmunological mechanisms, which may affect melanocyte recovery and disease progression.
- From a clinical perspective, the study emphasizes the necessity of integrating psychological assessment into routine dermatological practice, particularly for adolescents who are more vulnerable to psychosocial stressors. Addressing psychological distress through structured interventions may improve treatment adherence, enhance therapeutic response, and ultimately lead to better long-term outcomes.
- Despite the valuable insights provided, the study is limited by its relatively small sample size and cross-sectional design, which restrict causal inference. Therefore, future research should focus on longitudinal and interventional studies to further explore the causal relationship between psychological factors and treatment outcomes, as well as to evaluate the effectiveness of integrated therapeutic approaches.
- Overall, this study supports the adoption of a **multidisciplinary treatment model** that combines dermatological care with psychological support, aiming to improve both clinical efficacy and quality of life in adolescent patients with vitiligo.

Recommendations

- Routine psychological screening for adolescent vitiligo patients.
- Incorporation of counseling and stress-management programs into treatment plans.

- Educating patients and families about the psychological aspects of vitiligo.
- Further longitudinal studies to evaluate long-term benefits of integrated psychological care

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