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## Quality of life, depression, and anxiety in Turkish children with vitiligo and their parents

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### ABSTRACT

**BACKGROUND:** Vitiligo is a chronic skin condition among psychocutaneous diseases that significantly affect psychiatric well-being of patients, social interactions, and overall quality of life. Only a limited number of studies about psychiatric well-being and quality of life in children with vitiligo and their parents are available.

**AIMS:** With this study, we aimed to assess anxiety, depression, and quality of life in children diagnosed with vitiligo and their parents.

**METHODS AND MATERIAL:** Forty-one vitiligo patients aged 9–16 years 30 healthy controls along with their parents were asked to fill out self-report forms that assessed quality of life (Pediatric Quality of Life Inventory – Child Form; PedsQL-C and Pediatric Quality of Life Inventory – Parent Form; PedsQL-P), anxiety (State–Trait Anxiety Inventory – STAI-C for children and Beck Anxiety Inventory – BAI for parents), and depression (Children's Depression Inventory – CDI and Beck Depression Inventory – BDI for parents).

**RESULTS:** Between groups, significant differences were found in PedsQL-C subscales measuring school functioning, psychosocial health, and overall quality of life. Regarding PedsQL-P scores, there was a significant difference in physical functioning, social functioning, and overall quality of life. No statistical significance was found between groups regarding CDI and STAI-C scores. There was a significant difference in BDI, with higher scores in parents of children with vitiligo.

**CONCLUSIONS:** We believe measuring life quality with standardized instruments and techniques would be important in the assessment of the patient to evaluate the efficacy of treatment, specifically in chronic disorders. Further studies addressing these issues, especially in children, adolescents, and their parents are warranted.

### ARTICLE HISTORY

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### KEYWORDS

Vitiligo; children; adolescent; anxiety; depression; quality of life

### Key-messages

Hopefully contributing to the existing literature, this small-size study found that parents of children with vitiligo have a worse perception of their children's overall quality of life, causing specifically a difference in the perception of physical functioning, which needs to be further addressed and studied with larger samples.

### Introduction

Vitiligo is an expansive and widespread skin disorder characterized by limited hypomelanosis in skin and hair, where total melanocyte loss is observed on a microscopic level [1]. As classified among psychocutaneous diseases, vitiligo significantly affects psyche of the patient and his/her interpersonal relationships, not to mention the quality of life [2,3]. It is commonly known that brain and skin develop from similar embryological origins and skin responses to stimuli have both physiological and psychological

consequences [4]. Worldwide prevalence of vitiligo has been reported as 0.06–2.28% [5], and 50% of the cases are reported to be younger than 20 years old [6,7]. In a study conducted in Turkey, it was reported that 0.15–0.32% of patients that apply to dermatology outpatient units were diagnosed with vitiligo [8]. Vitiligo – as a psychosomatic phenomenon that emerges due to physical and psychological factors where clinical manifestations might include progressive, relapsing, and remitting forms – is largely believed to create a severe burden on the lives of both patients and their families.

It is a well-known fact that stress either induces emergence of various dermatological diseases or causes an increase in severity of skin symptoms [9,10]. Physiological factors that cause emotional stress might be triggers in the formation or exacerbation of various dermatological diseases [10–12]. In more than one-third of individuals with a dermatological problem, efficient treatment of skin lesions has been linked to effective management of related psychological stressors [13]. Skin disorders might

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pose negative social outcome as body image is very important, specifically within certain ages [14,15]. Vitiligo might bear an adverse clinical presentation both in short- and long-term over the life of the patients [7,16]. Vitiligo affects the individual's life rather negatively and might turn out to be destructive and cause stigmatization [17–21]. For most of the cases, vitiligo is a progressive disorder that cannot be foreseen regarding its clinical characteristics [22]. In cases with vitiligo, it has been defined that quality of life might be connected to various factors and onset at younger ages is related to worse overall levels of life quality [23,24]. A limited number of studies exist in the literature that aims to evaluate emotional burden caused by vitiligo and the effect of the illness on psychosocial development, specifically in children and adolescents [25]. As there is one study that reported worse quality of life among children with vitiligo, compared to those with atopic dermatitis [26], Bilgic et al. [27] have also reported that for pre-pubertal children, severity of vitiligo correlated with severity of depression, while in adolescents, lower levels of life quality have been reported especially if the lesions were located in body parts that were visible to others. In cases with lesions located in visible body regions, it has been reported that stigma related to the disorder might pose an increased risk for developing a psychiatric illness or a disorder, along with lower levels of quality of life, assessed [7,14,28].

It has been long identified that children were especially vulnerable to inorganization within the household and this condition might cause psychosomatization at early ages [7,28,29]. As for caregivers, most commonly emerging psychiatric diagnoses following paediatric dermatosis have been defined as anxiety and depression [30–35]. In quality of life studies conducted with relatives of individuals with chronic skin conditions, anxiety and depression have frequently been underlined [28,36–38]. This might be related to the fact that the caregiver not possessing good-enough adjustment mechanisms in confronting his/her child's illness, through a disruption in the ideal image of their children within the parents' minds, following an adversity emerging regarding the physical appearance of the child [39]. According to studies that evaluate patients' quality of life and levels of anxiety and depression, a significant relationship exists between the decline in the patient's quality of life and both depression and anxiety levels of the parents. Emotional vulnerability is typical among these cases; exposure to adverse experiences is related to anxiety and depression in caregivers and this might, in turn, decrease the overall life quality of the caregivers [15].

While it has been reported a negative influence on both physical and psychosocial well-being arose in other chronic skin disorders such as psoriasis and

atopic dermatitis, vitiligo patients have been identified as having a much more detrimental effect on their psychosocial well-being [17–21]. Sampogna et al. [6] have reported significant correlation between quality of life levels and depressive symptoms and alexithymia. Unlike many other medical conditions, skin disorders are easily noticed by other people. Even though vitiligo does not directly cause a physical distress, it might cause discomfort as it disrupts the physical appearance and affects the psyche in a very negative way [6,40]. Studies in this field indicate that patients with vitiligo might experience low self-esteem [23] and depression [6,41]. Brown et al. [42] have defined depression, adjustment disorder, dysthymia, and other psychiatric disorders in 25% of vitiligo cases that had applied to outpatient units, while Sangma et al. [43] have described a comorbidity rate with psychiatric disorders such as depression, in approximately 59% of cases afflicted with the skin condition. One of the potential mechanisms that might explain the depigmentation observed as part of the disorder's clinical presentation, is believed to have links to neuroendocrine dysregulation, a causal factor responsible for developing depression. It has widely been suggested that increased levels of norepinephrine and acetylcholine play a significant role [44] and the onset of pigment loss in 62–65% of the cases would be triggered by psychological stress [45]. As a response to psychic stress, through the activation of hypothalamic–pituitary–adrenal axis, catecholamine discharge occurs and by binding to alpha-receptors on dermal arterioles and activation, vasoconstriction, hypoxia, and production of excessive free oxygen radicals are triggered, resulting in destruction of melanocytes [46,47].

Prevalence of depression among vitiligo patients has been reported ranging between 10% and 60%, depending on the sample size of the study and characteristics of the research population [43,48]. Approximately 1/3 of vitiligo patients were said to have reported depressive symptoms or impaired general health issues, while close to one-fourth of the given population met diagnostic criteria for clinical depression [49]. There are studies in literature suggesting that depressive symptoms might predict overall life quality [6,50]. Studies regarding psychosocial effects are limited [3]. Decline in social support has been defined as a significant and major area of problem for patients [51]. Successful identification and effective management of psychological compounds of the disease carry much importance in increasing quality of life and obtaining a better treatment response [2].

Although studies that assess quality of life, anxiety, and depression in children diagnosed with vitiligo exist in other countries, research conducted in Turkey is still scarce and insufficient. This study aimed to assess anxiety, depression, and quality of life in children diagnosed with vitiligo and their parents.

## Subjects and methods

Patients aged 9-18 years old who had applied to the Dermatology Unit of the research hospital were chosen for this study, and trials were conducted between the dates 01.02.2016 and 01.08.2016, which would be covering a timeframe of six months. Of these, children who have been followed up with the diagnosis of vitiligo for at least three months and their parents were included consecutively in the study sample. Patients who are being followed up due to vitiligo had been regularly attending their visits and each patient had different treatment periods. The medical status of the patients was determined and recorded by the physical examination of the attending dermatology specialist. Then, cases were referred to the child psychiatry department of the same hospital. Patients and their parents (mainly their mothers and in some, their primary caregivers) were asked to fill out scales that measured anxiety, depression, and quality of life. Psychiatric assessments of cases and controls were carried out through routine psychiatric interviewing. Children with a history of any chronic physical disorder or systemic drug use were excluded from the study. Same exclusion criteria were also used for the control group. Prior history of having received psychiatric treatment or psychotropic drug use was not among exclusion criteria, neither for the case group nor for controls.

Taking into a recent and relevant study's methodology [27] as well as a calculated effect size of 0.8097 with alpha values = 0.05 and power value = 0.95, measured via G-power programme, the total number of individuals who would be recruited in the study was calculated as 82, who are divided into 2 groups – 41 were included in the case group and 41 in the control group. 41 children and adolescents as well as their parents who had applied to the unit within planned three-month data collection span of the study and gave consent to be included in the study were recruited, while it was possible to collect the data of 30 age- and gender-matched children and adolescents included in the control group. Comparisons between groups were made, as targeted sample size was obtained for conducting parametric tests. Children and adolescents in the control group consisted of children with no history of a chronic disease, that had applied to the Paediatric Department of the hospital for routine check-up, where the study was conducted.

Ethical approval was obtained from the Ethical Board of the hospital and informed consent was obtained from all cases and their parents upon giving detailed information orally and through written forms about the study.

Our single-centre study of cross-sectional case-control design, data measured by Pediatric Quality of Life Inventory (PedsQL), Child Depression Inven-

tory (CDI), and State-Trait Anxiety Inventory for Children (STAI-C) applied to the case group were compared to those obtained from the application of same measurements to individuals constituting the control group, matched by age and gender. Parents (mostly mothers) were evaluated with Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI), and were also asked to fill out PedsQL – parent version. Therefore, it would possibly be appropriate to identify our research as having employed a single methodology (containing self-report scales and one other data form) with multi-trait features (CDI, STAI-C and PedsQL – Child Form; BDI, BAI, and PedsQL – Parent Form).

The Vitiligo Area Severity Index (VASI) scoring system was used to determine the severity of the disorder. Percentage value indicating the affliction of the disorder was evaluated based on employing the hand unit measurement technique. A single hand unit would approximately be equal to 1% of the total body surface area. The degree of pigmentation for each body area is measured by using percentage values. VASI has been identified as the most valid indices in the evaluation of determining the extent and severity of the disorder and safe to be used under any circumstance [52]. Through employing this scoring system, afflicted and non-afflicted zones of all other specific parts of the body (such as hands, feet, breasts, and genital area) could be measured. Information regarding having experienced any stressor event prior to the onset of illness was retrieved from both cases and their parents, through interrogation during the psychiatric interview.

## Assessment tools

### Child Depression Inventory

CDI is a 27-item self-report form developed by Kovacs [53] that could be applied to children between 6 and 17 years old. Turkish validity and reliability study was carried out by Öy [54] and the pathological cut-off score was maintained as 19 points [54].

### Beck Depression Inventory

BDI is a 21-item self-report form that aims to measure physical, emotional, cognitive, and motivational symptoms seen in depression. Upon scoring on a scale ranging from 0 to 3 for each question, the total score is summed up and scores over 17 are defined as possibly indicating clinical depression. The scale was initially developed by Beck et al. in 1961 [55] and went on being used with the updated version developed by same researchers in 1979. Turkish adaptation and psychometric study were conducted by Hisli [56].

### State–Trait Anxiety Inventory for Children

Developed by Spielberger, this scale has two subscales, each containing 20 questions with multiple choice answers; for state (A-State) and trait anxiety (A-Trait), separately. Each item is scored as 1, 2, or 3 according to symptom severity, in turn, making the minimum score 20 and maximum 60 points one could get from the scale. State anxiety refers to the anxiety felt by an individual at a certain time and circumstance; therefore might alter depending on external factors. On the other hand, trait anxiety defines how the individual feels in general and also reflecting the proneness of that individual to anxiety. Validity and reliability study of the scale was carried out by Özusta in our country, indicating fine clinical utility in children aged between 9 and 16 years [57,58].

### Beck Anxiety Inventory

BAI was initially developed by Beck et al. in 1961 and adapted into Turkish by Ulusoy et al. BAI is a self-report form to determine the frequency of anxiety the individual experiences. The scale is Likert-type consisting of 21 items and each item is scored between 0 and 3. Scores range between 0 and 63, with higher scores reflecting much severe anxiety for that specific individual [59,60].

### Pediatric Quality of Life Inventory

PedsQL is a scale that assesses life quality developed by Varni et al. in 1999, upon thorough assessments that lasted for nearly 15 years [61]. The scale mainly interrogates core functioning domains of overall well-being identified by World Health Organization (WHO), including physical health, emotional, social, and academic functioning. The scale reflects a general opinion for quality of life, that could be used in children and adolescents aged between 2 and 18 years old. The scale also has four different versions that contain age-adjusted questions assessing same domains described before, designed for children aged between 2– and 4 years, 5 and 7 years, 8 and 12 years, and 13 and 18 years old. Made up of four subsections that assess physical, emotional, social, and academic functions, separate scoring for each domain (emotional functioning score (EFS), physical functioning score (PFS), social functioning score (SoFS), and school functioning score (ScFS)) as well as psychosocial health summary

**Table 1.** Age distribution among groups.

Group	Age		Statistical analysis <sup>a</sup> <i>t</i>	<i>p</i>
	Mean	SD		
Vitiligo	10.71	2.21	−0.942	.350
Control	11.20	2.12		

<sup>a</sup>Student's *t* test.

score (PHSS) and total scale score (TSS) could be used during assessment. This scale interrogates the situation of the child/adolescent within the past month and was developed into a Likert-type questionnaire with 5 points to be used in children and adolescents aged between 8 and 18 years. Items are scored ranging from 0 to 100. Scores from each item are summed up to be divided into the number of items, yielding to the total score. Higher total PedsQL scores indicate a better perception of health-related quality of life [62]. PedsQL has both self-report forms for children and adolescents aged between 5 and 18 years old (PedsQL-C) and parent-proxy forms (PedsQL-P) [61]. Turkish validity and reliability studies of self-report and parent forms for children aged 8–12 and 13–18 years old were carried out by Memik et al. [63,64].

### Statistical analysis

In this study, Statistical Package for Social Sciences Programme for Windows 20.0 version (SPSS, 20.0) was used as the software programme for statistics. For group comparisons, chi-square test was used for categorical variables while Student *t* test was preferred for continuous variables. The statistical significance level was determined at  $p < .05$ . By using Kolmogorov–Smirnov test, it was shown that parameters were in accordance with normal distribution.

### Results

No statistically significant difference was found between children and adolescents within the vitiligo group and healthy control group regarding gender and age (Tables 1 and 2).

The average time that had elapsed upon being diagnosed with vitiligo was  $22.7 \pm 35.7$  (3–144) months and mean level of vitiligo severity was  $3.3 \pm 2.9$  (1–16). Patients with vitiligo were ranged within a wide spectrum, according to the severity of the disease, and those with high levels of severity were scarce.

Between groups, significant differences were found in mean scores of PedsQL-C form subscales that measured ScFS, PHSS, and TSS ( $p = .022$ ,  $.049$ , and  $.034$ , respectively) (Table 3).

Regarding PedsQL-P mean scores, there was a significant difference between groups in PFS, SoFS, and TSS, suggesting parents of children with vitiligo tended

**Table 2.** Gender distribution among groups.

	Girls		Boys		Total		Statistical analysis <sup>a</sup>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	$\chi^2$	<i>p</i>
	Vitiligo	22	53.7	19	46.3	41	100	0.255
Control	12	40.0	18	60.0	30	100		
Total	34	47.9	37	52.1	71	100		

<sup>a</sup>Chi-square test.

**Table 3.** Comparison of groups by mean PedsQL-C and PedsQL-P scores.

PedsQL-C scores	Vitiligo		Control		Statistical analysis*	
	Mean	SD	Mean	SD	t	p
PFS	77.7	16.9	83.9	13.7	0.405	.110
EFS	70.6	21.2	74.0	17.1	-0.705	.483
SoFS	87.8	18.0	92.0	11.3	-1.110	.271
ScFS	73.0	17.9	81.8	12.9	-2.257	<b>.022</b>
PHSS	73.3	21.7	82.7	11.7	-2.004	<b>.049</b>
TSS	77.0	13.2	83.8	12.6	-2.159	<b>.034</b>

  

PedsQL-P scores	Vitiligo		Control		Statistical analysis <sup>a</sup>	
	Mean	SD	Mean	SD	t	p
PFS	71.5	21.8	81.0	16.8	-2.056	<b>.044</b>
EFS	68.6	17.9	72.0	19.0	-0.759	.451
SoFS	76.7	19.8	90.0	15.6	-3.017	<b>.004</b>
ScFS	75.2	19.0	79.1	17.2	-0.886	.379
PHSS	73.3	21.7	82.2	11.7	-2.004	.097
TSS	72.3	13.3	82.0	14.8	-2.885	<b>.005</b>

Notes: PFS, physical functioning score; EFS, emotional functioning score; SoFS, social functioning score; ScFS, school functioning score; PHSS, psychosocial health summary score; and TSS, total scale score.

<sup>a</sup>Student's t test.

to evaluate their children rather differently than the parents of the control group children, regarding above-mentioned domains. Statistically significant PedsQL-P mean scores were  $p = .044$ ,  $.004$ , and  $.005$ , respectively (Table 3).

No statistical significance was found between two groups regarding CDI and STAI-C scores (Table 4).

Parents of children with vitiligo scored higher compared to those of the control group, in scales rating depressive symptoms ( $p = .013$  via BDI), although no difference was found regarding anxiety symptoms (measured by BAI) (Table 4).

Of 41 children and adolescents diagnosed with vitiligo, 7 (17.1%) had a prior history of application to a psychiatry unit for treatment, while 34 (82.9%) did not.

While 20 (48.8%) of 41 cases were able to identify a stressful life event prior to onset of vitiligo, 21 (51.2%) did not.

When variables affecting the severity of vitiligo were evaluated via logistic regression analysis model, it was seen that among variables identified as being statistically significant upon primary analyses, PedsQL-C and PedsQL-P subscale scores, mean BDI scores suggestive of parental depressive symptoms, or sociodemographic characteristics of participants did not predict the severity of vitiligo.

**Table 4.** Comparison of depression and anxiety measures between vitiligo and control groups.

Mean score of scales	Vitiligo (n:41)	Control (n:30)	t	p <sup>a</sup>
CDI	6.8 ± 4.6	6.4 ± 5.5	0.321	.749
A-State	44.9 ± 6.1	46.5 ± 3.9	-1.235	.221
A-Trait	46.5 ± 5.1	44.6 ± 3.6	1.696	.079
BDI	14.6 ± 12.4	8.7 ± 6.7	2.342	<b>.013</b>
BAI	12.8 ± 14.1	9 ± 7.8	-1.326	.189

Notes: CDI, Children's Depression Inventory; A-State, State Anxiety Inventory for Children; A-Trait, Trait Anxiety Inventory for Children; BDI, Beck Depression Inventory; and BAI, Beck Anxiety Inventory.

<sup>a</sup>Student's t test.

## Discussion

In this study (where children aged between 9 and 18 years and their parents were evaluated in a psychiatric setting), we aimed to assess anxiety, depression, and quality of life in children and adolescents diagnosed with vitiligo, in comparison with their healthy counterparts, as well as their parents by using valid and reliable instruments for measurement.

We have observed that children with vitiligo had a significant difference in school, psychosocial, and total scale domains of PedsQL, when compared to those of the control group. Parents of children with vitiligo had identified them rather differently than the parents of the control group did, with respect to their perceptions of their child's physical health, social functioning, and in total measures. Disruption in quality of life is reported to be related to vitiligo severity and the distribution of lesions [65]. In their study, Çakın-Memik et al. [64] stress out the importance of sustaining knowledge regarding the perceptions about health-related quality of life of children with chronic disorders to determine to what extent the condition has an effect as variables such as individual differences among people regarding physical and psychic health, independence level, social interactions, family relationships, social factors, belief systems, and future expectations altogether shape the term quality of life [66]. Vitiligo during childhood has negative impacts on quality of life, through reported difficulties in self-assurance, peer relationships, and problems in school functioning [65]. Parsad et al. [2] have reported higher odds of avoiding social activities and a decline in school attendance in children diagnosed with vitiligo, compared to the control group. Another study originating from the Netherlands has reported the detrimental effect of the disorder on social development continued through adulthood, as well [7]. According to the results of another recently made study, that is worthy of elaborate interpretation, where the effects of skin disorders emerging at childhood on life quality was assessed, it was found that cases with vitiligo had lower self-esteem, were much more socially stigmatized, had much more experiences of shame, avoiding proximity, anxiety, depression, adjustment disorder, fear, suicidal ideation, and other psychiatric conditions [42]. According to the results of a research made online with participants aged between 15 and 17 years, it was found that vitiligo types with lesions located on the face, arms, and legs caused much more stress, and related to teasing and bullying [25]. PedsQL-C scores in our study, differences present in ScFS, PHSS, and TSS among children and adolescents diagnosed with vitiligo might indicate that our cases also had some difficulties within these domains, possibly reflecting a preference of staying away from school due to their skin condition. Considering mean age of

our study group and how physical appearance plays an important role in forming an identity and perception of one's self during those years, having a visible skin condition might negatively impact quality of life and school functioning as a subdomain where he/she is in a close and ongoing relationship with her peers, not to mention the emergence of possible psychiatric diagnoses arising secondary to the skin condition, in turn, affecting overall life quality even more adversely.

As parents of children and adolescents diagnosed with vitiligo scored lower on PFS as well as SoFS and TSS subdomains of PedsQL-P form, this might indicate a similar interpretation to what has been discussed in studies by Achenbach [67] and Eiser [68] that parents might have a tendency to perceive their children's quality of life worse than how their children self-evaluate on physical domains. We might pose the same argument as children with vitiligo did not report worse quality on their own physical domain. An overall decrease in quality of life secondary to vitiligo causing social retraction and isolation might cause parents to have a perception of their children as if they are weaker on a physical well-being level, as well. Concerns about social domain were a common ground as reflected through similar assessments of both children and parents, indicating a decrease in quality of life scores from that aspect. This might be caused by the negative impact of the disorder on self-concept and identity related to physical appearance, but might also indicate the presence of a psychiatric disorder present before vitiligo emerged clinically.

In their study where three types of dermatoses were compared, Manzoni et al. [69] have found that having a diagnosis of any of the three declined health-related quality of life, though suggesting that individuals with atopic dermatitis and psoriasis had significantly lower levels of life quality, compared to those diagnosed with vitiligo. As part of the discussion, the authors interpreted this difference by the possibility of individuals with vitiligo, having no visible alteration in appearance, or having less number of afflicted body parts, compared to other two dermatoses [69]. Overall impairment of children's quality of life, and specifically self-awareness and bullying and teasing of peers were related to the severity of the disorder; not to mention differences in where lesions would be distributed were linked to different levels of impairment in the sense of health-related quality of life. It has been stated before that adolescents between ages 15 and 17 years would be more likely to have more experience in self-awareness, compared to those in pediatric age group, which might have had an effect on the above-mentioned situation [25]. We have observed that severity of the disorder did not have any effect on quality of life in our sample. This finding might be related to VASI mean scores of the patients being calculated as

$3.3 \pm 2.9$  (1–16) and individuals with severe types of the disorder being fewer in the whole group. While depressive symptoms of parents who had children with vitiligo were much more higher than that of control group parents, similar connection was not observed for anxiety symptoms. With respect to children's level of anxiety and depression symptoms, no difference was found between two groups. Chan et al. [50] have reported a rate of 16.2% for depressive symptoms, while Sampogna et al. [6] have reported the rate as 31.0%, and that the symptoms were related to quality of life. It was concluded that life quality subscale scores and level of parental depressive symptomatology did not predict the severity of vitiligo.

Sukan and Maner [70] reported that assessing psychosocial status of the caregivers and family functioning would be important in the course of skin disorders, planning appropriate treatment, and for future studies that would be conducted within the field of psychodermatology. Low self-esteem and self-reports of social isolation due to feelings of shame have been reported by many patients with vitiligo [41]. Moral et al. have reported a rate of depression as 34%, according to BDI and anxiety as 60%, according to BAI, in their sample [71]. In his 2013 study, Manzoni has also reported higher levels of anxiety and depression, compared to that observed in general population, in parents of children from all interior-dermatosis groups (atopic dermatitis, psoriasis, and vitiligo – 26% depression and 42% anxiety) [72]. In our study, we have found no difference regarding depression and anxiety scale scores between children and adolescents in vitiligo group and healthy control group, while higher mean depression score was measured in parents of children with vitiligo compared to those from healthy control group. In a study by Prcic et al. [73] where 33 adolescents with vitiligo and 60 healthy controls were compared, no significant difference for depression and anxiety scores was observed between groups. Many observational research exist that favour the idea that an epidemiological link would be present between vitiligo and psychiatric disorders such as depression [74,75], as well as many other studies failing to find any connection [76,77]. In many studies, depressive symptoms have been assessed with the help of psychometric instruments, and a few studies had been carried out with a psychiatric assessment based on a semi-structured interview, through a review of diagnostic criteria from Diagnostic and Statistical Manual for Mental Disorders (DSM). A great number of different rating scales to assess depression exist in different countries. We might speculate that one possible reason for not establishing a difference in depression and anxiety mean scores of children with vitiligo and healthy controls could arise from the probable protective effect of prior positive history for psychiatric help in 17.1% of patients.

There was no significant difference among two groups regarding anxiety levels of parents. However, higher mean depression scores obtained in parents of children with vitiligo might indicate that the presence of this chronic disorder could affect both parents' and their children's quality of life negatively through causing an adverse impact on their social, emotional, and academic functions, in turn, creating greater vulnerability for depression, on the part of parents. In a study by Bilgiç et al. [75], it was established that severity of vitiligo was related to psychiatric well-being of the mothers. Low levels of anxiety detected in children might be related to low levels of parental anxiety. As a condition that would possibly disrupt the fantasy of the idealized child, the child might be affected too, in case of insufficient adaptive mechanisms and the probability of parents reflecting their psychological distress on their children [35,38,78]. Our findings of parental anxiety levels not being higher than those in the control group might have created a positive effect such as moderate levels of anxiety in children and medium levels of vitiligo severity. When type of stress as a triggering factor before the onset of vitiligo was questioned, it was reported that 65% of patients had described a stressful event prior to the condition and 45.6% of this group described having family problems [3]. A well-defined stressor prior to the onset of the condition was found in 48.8% of the cases in our study, while this might be due to the limited time span of our study and the relatively small number of cases included. We might argue that in a wider time range and with larger sample size, one might reach higher rates similar to what has been reported so far in the literature. The extent of the effect vitiligo has on quality of life might alter with age groups. In their study, Bilgic et al. [27] have stated that severity of vitiligo correlated with severity of depression in prepubertal children, however connected to decreased levels of life quality in adolescents. The need to get over lots of stressful process of passage, starting from very early ages might have a negative impact on quality of life [8]. When our case group was redefined and grouped as prepubertal and adolescent groups, no significant difference between groups was observed, with respect to scores of scales measuring the child's and his parent's level of depression, anxiety, and quality of life. Relatively fewer number of adolescents in vitiligo group was thought to have contributed to this consequence. In cases that are older, the more level of exposure to the illness, higher would be the possibility of encountering much more negative consequences linked to levels of life quality. In contrast to significant results obtained in adults, failure to collect similar information might be related to the relatively shorter period of exposure to the disorder, compared to others that are older.

Single variance analyses have suggested a significant difference existed between quality of life (child and

parent) and parental depression scale. However, when multivariate analyses were performed, there was no significant relationship between severity of the disorder and sociodemographic characteristics of participants and again, there was no significant relationship between quality of life and levels of parental depression. Logistic regression analyses might be affected by lots of factors. Parents and children having different perceptions over quality of life and small sample size might have contributed to failing to obtain a meaningful result when logistic regression analysis was applied. Our study was a single-centred study with relatively small sample size; therefore, findings of the study could not be generalized to all Turkish children, that might as well be considered among the limitations of the study. Heterogeneous background of parents, different periods of time elapsed upon being diagnosed, for each case and possibility of recall and/or reporting bias regarding stressors and psychiatric history of the children might be other limitations of the study. The fact that no structured clinical interview was carried out with cases and relying on symptoms identified through self-evaluation of patients and parents might be considered as another limitation. Another one might be that level of life quality was measured only once. Since vitiligo is a chronic skin condition, changes occurring within quality of life through the process might be important to assess and address. Failure to interrogate the patients and their parents for the presence of other autoimmune conditions and evaluating quality of life by the location of lesions were thought as other limitations of the study. As this study was of cross-sectional nature, further need of future longitudinal studies with longer time span and bigger sample size are warranted, in order to generalize the study findings to the whole population.

Despite its many potential limitations, we believe the strength and significance of this study arose since it is an important contribution to limited number of relevant studies in the field, through aiming to explore levels of life quality, symptoms of depression, and anxiety in childhood – onset vitiligo. With its prevalence reported to be 1% of general population, where majority of diagnosed individuals were reported to be under 20 years old [6,7], research conducted with the participation of children and adolescents would be of great importance.

As for the treatment process, focusing beyond clinical severity, and elucidating all possible factors – including psychological effects – that might help throughout the process would be really important. Increasing awareness and recognition of the importance of life quality in vitiligo and the contribution it has provided to determine such factors that affect health-related quality of life might be counted as the strengths of this study. Even though studies aiming



to cover the possible psychiatric effects of vitiligo throughout childhood and adolescence exist in other countries, still, limited number of research is present in our country. Being a prospective study that had employed valid and reliable instruments (PedsQL, BDI, BAI, CDI, STAI, etc.) might be regarded as another strength of our study.

## Conclusion

We believe that determination of life quality of a certain individual through employing standardized procedures is important to evaluate conditions of patients at pre- and posttreatment, as well as being able to assess efficiency and consequences of treatment.

For all these reasons, carrying out further studies that focus on improving overall quality of life, specifically for children and adolescents with chronic health issues is important. Moreover, clinicians need to be able to evaluate psychiatric symptomatology such as depression and anxiety in cases of vitiligo, and refer them for appropriate treatment. Results of our study support prior findings that suggest lower levels of life quality in vitiligo patients.

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## Disclosure statement

No potential conflict of interest was reported by the authors.

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