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Original Article

Emotion regulation in adolescents with acne vulgaris: correlates of medication adherence, clinical dimensions and psychopathology symptoms: a cross-sectional study

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ABSTRACT

Background. Acne vulgaris causes profound negative physical, psychological and social effects on self-image and a negative impact on the quality of life. Most research so far has been limited to adults, and little is known about the emotion regulation, medication adherence, clinical dimensions and psychopathology symptoms in young people with acne vulgaris.

Methods. A cross-sectional analytical study was conducted in a center in western Turkey. Ninety-six adolescents with acne vulgaris and 100 controls participated in the study. All participants completed self-report questionnaires including the Strength and Difficulties Questionnaire (SDQ), Difficulties in emotion regulation scale (DERS) and Morisky medication adherence scale-8 (MMAS-8). Acne severity was assessed with The Global Acne Grading Score (GAGS).

Results. Acne vulgaris patients showed poorer SDQ and DERS scores reflecting the emotional regulation problems and psychopathological symptoms compared to healthy controls. The percentages of high, medium and low adherence were 6%, 36% and 58% for oral medication; and 17.39%, 56.52% and 26.09% for topical medication, respectively. There were significant correlations between all SDQ subscale scores and the scores for the impulsivity subscale and total scores of DERS. A statistically significant positive correlation was found between MMAS-8 and the choice of topical/oral medication. Likewise, GAGS were correlated with three specific SDQ domains: emotional symptoms, prosocial behavior and total scores, and with three specific DERS domains: clarity, strategy and total scores.

Conclusions. Maladaptive emotion regulation strategies of patients with acne vulgaris may be associated with higher psychopathological symptoms and lower beliefs in treatment efficacy. It is important to include emotional regulation interventions to improve medication adherence and quality of health care in young acne patients.

Key words: acne vulgaris, adolescent, Difficulties in emotion Regulation Scale, medication adherence, psychopathological profile.

Acne vulgaris is a chronic inflammatory skin condition that primarily affects adolescents. It is characterized by comedones, papules, pustules, nodules, atrophic or hypertrophic scars, preferentially affecting the face and trunk.[1] The estimated worldwide prevalence of acne among young people in Europe has been reported to range from 42.2% to 73.5%.[2]

Acne vulgaris is now considered a chronic condition that not only negatively affects the physical status of an individual, but also imposes a threat to the psychological and social health of those affected.[3] Published literature has documented that acne is associated with anger, anxiety, depression; and patients with acne have difficulties in their social and functional aspects of life.[6,7] Considering the well-

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known psychosocial impact of acne vulgaris in adult patients, it can be predicted that acne vulgaris may also cause a negative impact on the psychosocial and social development of adolescents.[5]

Adolescence is a critical stage of life in the development of personal identity, which is a time marked by the interplay of biological, social and physiological factors. Observations from various sources indicate that physical appearance and body image are very important in adolescence.[4] As a disfiguring and highly visible condition, acne may cause emotional dysregulation in this group of patients. Moreover, excessive manipulation of the skin by emotionally stressed individuals can also complicate the course of acne with facial scarring that in turn leads to a vicious cycle of psychological problems.[8] Poor treatment adherence is the other common problem among acne patients which may lead to worse outcomes and greater health-care use.

According to the accumulated evidence, psychopathology can be described as a set of failures in emotional regulation. Deficits in such skills may contribute to the development and maintenance of mental disorders such as anxiety, mood disorders, depression, panic disorders, social phobia, posttraumatic stress disorder, eating disorders, substance disorders, somatoform disorders and psychotic disorders. Moreover, emotional dysregulation is accepted as the most important facet of personality disorders. Several studies emphasize that focusing on enhancing emotion regulation skills may be a promising transdiagnostic target in the treatment and prevention of mental disorders. Since the period of adolescence represents a vital opportunity to intervene to prevent the detrimental effects of poor mental health being carried through to adulthood, knowledge of the prevalence of emotion regulation difficulties in adolescents with acne vulgaris is crucial to appropriately plan emotional regulation strategies in a global health perspective and to have psychologically healthy generations.[9]

In this study, we hypothesized that acne vulgaris causes significant emotional impairment in adolescents which may also be associated with medication adherence and psychopathology symptoms. With this purpose, we analysed sociodemographic and clinical findings, emotional and behavioral aspects of psychosocial functioning and the degree of treatment adherence in a sample of Turkish adolescents with acne vulgaris.

Methods

Ethics

The study was performed in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of The Dokuz Eylul University (Date: 08.05.2019, Number: 2019/12-34). All patients and their legal guardians signed informed consent forms prior to participation in this study.

Study design

The sample size of this cross-sectional, case–control study was calculated using the OpenEpi Programme, Version 3.01. Precision (α) was set at 0.05 with a 95% confidence interval (CI), and power 80%. The estimated sample size per group came to 92. Ninety-six adolescents with acne vulgaris and 100 age- and gender-matched control subjects who were consecutively admitted to the outpatient clinics of The Dermatology Department of Dokuz Eylul University Hospital, Izmir, Turkey between January 2019 and March 2019 were enrolled in the study. The controls were subjects referred during the study period for complaints other than acne vulgaris including benign nevi on the trunk, plantar corns, calluses or warts. Apart from acne vulgaris, neither patients nor control participants had any other chronic inflammatory disorder. Inclusion criteria were as follows: aged 12–17 years and having a diagnosis of acne vulgaris. Exclusion criteria were as follows: the presence of a major central nervous system disease, cognitive

impairment, psychiatric comorbidity, presence of an additional dermatological disease affecting appearance, chronic disease or malignancy, and use of systemic medications (e.g., retinoids) that may cause psychiatric diseases. After signing the informed consent, all cases and controls were evaluated for acne by a dermatologist (I.T.K.). Thereafter, a child and adolescent psychiatrist (S.T.) conducted the psychiatric evaluation according to The Kiddie Schedule for Affective Disorder-Lifetime Version (K-SADS), which is a semi-structured interview to measure current and past symptoms of mood, anxiety, psychotic, and disruptive behavior disorders in children aged 6-18 years. K-SADS was applied to all of the participants and their psychiatric diagnoses were determined according to the DSM-V criteria. Sociodemographic findings such as age, gender, education, family type, socioeconomic level, home conditions, the status of parents, background and family history were registered in a sociodemographic data form. Acne severity, emotional regulation and clinical psychopathological profile symptom tests were performed at baseline. All acne patients received topical or oral medications. Evaluations were performed at baseline and after 4, 8 and 12 weeks of treatment. Medication adherence and treatment outcomes were assessed at week 12 (end of treatment) using a five-point scale; 0: worsening or unchanged, 1: mild improvement, 2: moderate improvement, 3: good improvement and 4: excellent improvement.

Instruments

Strengths and Difficulties Questionnaire (SDQ)

The SDQ is a screening tool developed to assess behaviors, emotions, and relationships in young children and adolescents.[12] It consists of 25 items that are grouped into five scales (Hyperactivity-inattention, Conduct disorder, Emotional problems, Peer problems, and Prosocial skills) of five items each. Of the 25 items, 14 are generally thought of as difficulties, 10 as strengths, and 1 as a neutral question. It is one of the most widely used brief screening instruments of its kind and it is used in both community and clinical samples. Higher scores on the four subscales and the total score reflect more serious problems, while higher scores on the prosocial behavior subscale mean better social behavior such as being kind to others. The total difficulties score is obtained from the first four subscales (excepting the prosocial scale). A reliability and validity study of the SDQ in the Turkish language has been performed.[13]

Difficulties in Emotion Regulation Scale (DERS)

The DERS comprises 36 items and is designed to measure difficulties in emotion regulation across six dimensions. These dimensions include non-acceptance of emotional responses (Non-acceptance), lack of emotional awareness (Awareness), difficulties engaging in goal-directed behaviors (Goals), limited access to emotion regulation strategies (Strategies) and lack of emotional clarity (Clarity).[10] Participants are asked to rate their agreement with the statements on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). Higher scores indicated greater difficulties in regulating emotions. The Turkish version of DERS for adolescents was conducted by Sarıtas and Gencoz in 2011, and was found to be a valid and reliable instrument for clinical population.[11]

Morisky Medication Adherence Scale (MMAS-8)

The scale consists of eight questions, first seven items having a dichotomous answer (yes/no) that indicates adherent or non-adherent behavior.[14] For item 8, a patient can choose an answer on a 5-point Likert scale, expressing how often happens that a patient does not take his medications. MMAS-8 scores can range from 0 to 8 points. Cut-off values for categorizing patients as having a high, medium or low adherence rate were chosen based upon association with acne. The original MMAS-8 was translated to Turkish language and has been validated in the Turkish population in previous studies.[15]

Global acne grading system (GAGS)

This system divides the face, chest, and upper back into 6 areas: the forehead, right cheek, left

cheek, nose, chin, and torso (chest and upper back combined). Each acne lesion is described and scored as a comedo (1 point), papule (2 points), pustule (3 points), or nodule (4 points); the absence of an acne lesion in an area results in a score of 0 points. The local score for each anatomic area is determined by multiplying the score of the most severe lesion by an area factor (1 to 3), and the local scores of the 6 areas are then added together to obtain the total score. Acne severity is graded as none (total score, 0 points), mild (total score, 1–18 points), moderate (total score, 19–30 points), severe (total score, 31–38 points), and very severe (total score 39-44 points).[16]

Statistical analysis

Differences in all study variables were analyzed using the Statistical Package for the Social Sciences (IBM, NY), version 22 for Windows. Before the statistical analysis were performed, it was checked whether the data met the assumptions of the parametric tests, the normal distribution and the homogeneity of variance by using the Shapiro–Wilk test. Descriptive statistics for the obtained data were given as number, percentage and mean ± standard deviation. Variables that don't show normal distribution were evaluated by appropriate analysis. In the interpretation of the variables, descriptive statistical techniques and quantitative data analysis were used. Chi-square analysis was used to compare categorical variables between groups. The Pearson Correlation Test was used to determine the direction and level of correlation between the variables, and the results were indicated by "r" (correlation coefficient) and p value (significance level). P <0.05 was considered statistically significant.

Results

Over a period of six months, 96 acne patients and 100 controls were enrolled in the study. The acne group was made up of 46 (47.92%) males and 50 (52.08%) females with an average age of 15.22 ± 1.43 years; and the control group was made up of 43 (43%) males and 57 (57%) women with an average age of 15.01 ± 1.49. No statistically significant differences were determined between patients and controls regarding sociodemographic findings such as age, gender, education level and economic status (p >0.05).

The comparisons of behavioral problem areas between the acne vulgaris and healthy groups using the SDQ and DERS subscales are presented in Table I. Individuals in the acne vulgaris group assigned significantly higher scores to subscale items of SDQ including emotional problems, conduct problems, hyperactivity, peer relationship problems and total difficulty scores than the individuals of the control group. Prosocial behavior subscale scores in SDQ were also interestingly found to be higher in the patient group. All subscale scores and overall scale scores of DERS (except the awareness subscale) were also found significantly higher in the acne vulgaris group compared to healthy controls (p<0.001).

In the patient group, 50 patients received topical medications including antibiotics, benzoyl peroxide, retinoic acid and salicylic acid either single or in combination. The remaining 46 patients received doxycycline 100 mg/day in systemic therapy. Treatment outcomes at week 12 were excellent in 26 (56.5%), good in 12 (26.1%), moderate in 6 (13.04%) and mild in 2 (4.3%) patients in the systemic medication group; excellent in 10 (20%), good in 12 (24%), moderate in 19 (38%), mild in 8 (16%) and worse in 1 (2%) patients in the topical medication group. Patients' adherence levels were evaluated after a follow-up of 12 weeks. The percentages of high, medium and low adherence were 6%, 36% and 58% for oral medication, and 17.39%, 56.52% and 26.09% for topical medication, respectively (Table II). The overall adherence status was significantly better for topical medication than for oral medication.

Table III shows the correlations between SDQ scores, DERS scores, topical/oral medication, GAGS and MMAS-8 scores for the acne vulgaris

Table I. Strengths and Difficulties Questionnaire (SDQ), Difficulties in Emotion Regulation Scale (DERS) and Global Acne Grading System (GAGS) scores of the patients and controls.

Scales, (mean ± sd)	Acne Vulgaris (n= 96)	Controls (n= 100)	t	p
SDQ				
Emotional symptoms	4.65 ± 2.51	2.99 ± 1.44	5.703	** < 0.001
Conduct problems	4.21 ± 2.34	3.22 ± 1.63	3.447	**p < 0.01
Hyperactivity	5.41 ± 1.98	4.53 ± 1.45	3.546	**p < 0.01
Peer problems	3.71 ± 1.64	2.99 ± 1.36	3.350	**p < 0.01
Prosocial behavior	4.86 ± 2.90	2.43 ± 1.42	7.528	**p < 0.01
Total	17.97 ± 5.52	13.68 ± 3.33	6.620	**p < 0.01
DERS				
Goal	14.18 ± 3.97	13.34 ± 4.38	1.399	**p < 0.01
Strategy	15.92 ± 5.76	12.75 ± 3.30	4.751	**p < 0.01
Impulsivity	13.54 ± 4.74	11.10 ± 3.81	3.983	**p < 0.01
Awareness	15.49 ± 3.35	14.54 ± 3.59	1.913	0.057
Clarity	11.71 ± 3.38	9.88 ± 2.90	4.067	**p < 0.01
Non-acceptance	10.47 ± 3.05	9.11 ± 2.30	3.530	**p < 0.01
Total	81.71 ± 15.04	70.93 ± 12.13	5.534	**p < 0.01
GAGS	15.78 ± 6.42			

*p<0.05, **p<0.01. p values from Pearson correlation test.

Table II. Treatment-related features in patients with acne vulgaris.

Features	n (%)
Frequency of hospital visits (per the past half year)	
At least once	72 (75)
Less than once or unknown	24 (25)
Oral medication	
Experience of drug effectiveness	34 (73.91)
Experience of adverse events	12 (26.09)
Topical medication	
Experience of drug effectiveness	40 (80)
Experience of adverse events	10 (20)
Overall satisfaction with treatment	
Satisfied	59 (61.46)
Unsatisfied	37 (38.54)
Medication adherence for oral medication	
High	3 (6%)
Medium	18 (36%)
Low	29 (58%)
Medication adherence for topical medication	
High	8 (17.39%)
Medium	26 (56.52%)
Low	12 (26.09%)

Table III. Two-tailed Spearman's rank-order correlations between Strengths and Difficulties Questionnaire, Difficulties in Emotion Regulation Scale, Morisky Medication Adherence Scale and Global Acne Grading System for the Acne Vulgaris sample.

Variables	Topical/ Oral	SDQ-1	SDQ-2	SDQ-3	SDQ-4	SDQ-5	SDQ-Total	DERS-1	DERS-2	DERS-3	DERS-4	DERS-5	DERS-6	DERS-Total	MMAS-8
SDQ-1 (Emotional symptoms)	-0.039														
SDQ-2 (Conduct problems)	-0.131	0.103													
SDQ-3 (Hyperactivity)	-0.071	0.382**	0.354**												
SDQ-4 (Peer problems)	0.057	0.361**	0.089	0.194**											
SDQ-5 (Pro-social behavior)	-0.013	0.553**	0.441**	0.448**	0.366**										
SDQ-Total	-0.082	0.722**	0.612**	0.729**	0.566**	0.697**									
DERS-1 (Goal)	-0.059	0.091	0.038	0.077	-0.019	0.053	0.072								
DERS-2 (Strategy)	-0.019	0.285**	0.094	0.158*	0.110	0.158*	0.254**	0.438**							
DERS-3 (Impulsivity)	0.031	0.285**	0.187**	0.248**	0.170*	0.276**	0.340**	0.424**	0.470**						
DERS-4 (Awareness)	0.053	0.084	0.191**	0.064	0.115	0.114	0.174*	-0.002	0.080	0.008					
DERS-5 (Clarity)	0.034	0.209**	0.120	0.125	0.051	0.200**	0.204**	0.122	0.440**	0.343**	0.364**				
DERS-6 (Non-acceptance)	-0.038	0.093	0.037	0.026	0.124	0.075	0.104	0.408**	0.521**	0.442**	-0.163*	0.143*		,	
DERS-Total	-0.008	0.298**	0.168*	0.205**	0.171*	0.249**	0.324**	0.631**	0.780**	0.715**	0.321**	0.639**	0.586**		
MMAS-8	0.325**	-0.042	-0.146	-0.149	-0.046	-0.136	-0.148	0.057**	0.083**	-0.012	-0.058	0.164	0.062	0.079	
GAG-Score	0.121	0.142*	0.110	0.091	0.054	0.204**	0.160*	0.086	0.186**	0.103	0.152	0.179*	0.068	0.175*	0.089

n, number; SD, standard deviation; SDQ, Strengths and Difficulties Questionnaire; DERS, Difficulties in Emotion Regulation Scale, GAG, global acne grading system; MMAS-8, Morisky Medication Adherence Scale.

**.Correlation is significant at the 0.01 level (2-tailed).

*.Correlation is significant at the 0.05 level (2-tailed).

sample. There were significant correlations between all SDQ subscale scores and the scores for the impulsivity subscale and total scores of DERS. On the other hand, the DERS and SDQ subscale scores correlated with each other except some subscale scores. A statistically significant positive correlation was found between MMAS-8 and the choice of topical/oral medication. Likewise, GAGS was correlated with three specific DERS domains: clarity, strategy and total scores; and with three specific SDQ domains: emotional symptoms, prosocial behavior and total scores.

Discussion

Although acne vulgaris has long been regarded as an adolescent skin condition without significant sequelae, it is now considered a chronic disease with negative psychological and sociological impacts on those affected.[17] Considering the high prevalence of the condition, the profound impact of the disease on patients' well-being cannot be overemphasized. Although health-related quality of life and emotional state have been widely studied in the field of acne patients, no previous study comprised a detailed clinical psychiatric evaluation in adolescents. In this study, we investigated the psychopathology symptoms and related clinical dimensions, emotion regulation and medication adherence in young people with acne vulgaris. To our knowledge, we demonstrated for the first time significantly higher impairment on the SDQ and DERS scores that could explain a set of inabilities in adolescents with acne vulgaris in their social interactions compared with age and sex-matched control subjects.

Emotion regulation refers to the process of how, which, and when negative and positive emotions are expressed and experienced and may include strategies such as suppression and/re-appraisal of stressful conditions.[18] Emotions help inform others about one's internal states that are essential for relationships and are the crucial determinants of social and psychological well-being. In our study, all dimensions of emotion regulation difficulties were found to be significantly elevated among adolescents with acne vulgaris compared to the controls. These parameters were also found to be correlated with the examined psychopathological symptoms of the SDQ, such as the emotional symptoms, peer problems, hyperactivity-inattention and conduct problems, and with the severity of acne vulgaris. It has been well known that, emotion regulation deficits are predictive of increased risk for mental health disorders, and a failure to meet any of these dimensions may result with the development and maintenance of different psychopathologies, such as anxiety, depression, addictive behaviors, eating disorders, deliberate self-harm and suicidal ideation.[19] Previous studies have shown that 18-44% of acne patients have clinically evident depression and anxiety leading to a decrement in productivity and performance in work or school.[20] Furthermore, acne vulgaris has been shown to contribute to suicidal thoughts and behavior in 6-7.2% of patients, which is much higher than that seen in other skin disorders.[21,22] Our findings are in accordance with the results of previous studies indicating that acne vulgaris negatively influences social interactions by challenging interpersonal relationships and limiting opportunities to engage in social interactions.

As a facial and disfiguring chronic disease, severe acne may be responsible for a significant source of emotional distress and may cause feelings of shame, humiliation and social stigmatization in patients. On the other hand, a paucity of high-quality research data indicates that stress can cause or exacerbate acne lesions by itself, which creates a classic "chicken and egg" dilemma. Stress has often been associated as a result of the physical changes experienced by the patient suffering from acne, and the body's response to stress by inducing the secretion of some neuropeptides and hormones, such as cortisol, catecholamines, corticotropin releasing hormone and substance P, which contribute to the development and severity of acne, eventually leading to a vicious circle.[23] In this study, acne severity was found to be directly

correlated with the total scores of the SDQ and DERS, supporting the relationship between acne and stress. Correlational patterns were also found between the emotional symptoms and the hyperactivity, peer problems areas of the SDQ subscale; and the strategy, impulsivity, clarity and total areas of the DERS subscale indicating that individuals with acne vulgaris tend to express their unstable emotions by suppressed and disagreeable behaviors.

Determination of factors related to medication adherence in acne is critical because identification of these factors associated with adherent and non-adherent behavior is important for positive patient outcomes. The limited number of research on improving the medical adherence for individuals with acne vulgaris shows that the accompanying psychiatric comorbidity is one of the strongest predictors of poor compliance with the treatment.[24] This correlational pattern between medication adherence and the goal and strategy subscales of the DERS was also detected in young acne patients in our study. The inability to behave in accordance with goals in the presence of negative affect or to access to emotion regulation strategies that are perceived to be effective for feeling better in these group of patients with acne vulgaris may be contributing to the lower beliefs about drug efficacy, treatment refusal, under treatment and dissatisfaction. A full understanding and management of these factors are critical steps in the process of developing effective therapeutic strategies.[25]

This study has certain limitations. First, consecutive sampling may cause sampling bias. Second, our samples came from a general hospital and may not represent the general population. Third, our study was a single centre study, so further large-scale multicenter studies are necessary to better understand the physiological burden associated with the disease.

In conclusion, acne vulgaris has a negative impact on adolescents. It is necessary to know that dermatological diseases affecting patients during their childhood or adolescence will have a significant effect on the formation of their personality. Considering that difficulties in school, family life and personal relationships during these ages may cause long-term sequelae such as psychiatric morbidities, integration of assessment of clinical dimensions and psychopathology symptoms in the treatment process, and emotional regulation interventions might be beneficial for prevention of invisible effects of acne. The patient's psychological distress is also correlated with the severity of the disease, which can be modified by effective treatments. Therefore, it is important to take care of young people and their opinions about their skin condition.

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