Predictive factors of disordered eating among adolescents in Bosnia and Herzegovina

Martina Krešić Ćorić, Mirjana Graovac[1], Nikolina Pravdić[2], Ana Boban Raguž[3], Ana Kaštelan[1]

Abstract:

BACKGROUND: Due to excessive concerns and focus on weight control and body shape, adolescents often resort to inappropriate behaviours and attitudes towards eating, resulting in physical and psychological issues. This study aimed to assess possible relationships and predictor variables between disordered eating and age, BMI, body appreciation, self-esteem, quality of family interactions, psychosocial health and childhood trauma experience in adolescents of both sexes in the city of Mostar (Bosnia and Herzegovina).

MATERIALS AND METHODS: A cross-sectional study was carried out on a suitable sample of 724 high-school students aged 14-19 years. The following tools have been used: socio-demographic questionnaire, The Eating Attitudes Test (EAT-26), Body Mass Index (BMI), Body Appreciation Scale (BAS), Rosenberg's Self-Esteem Scale, Quality of Family Interaction Scale (KOBI), and Paediatric Quality of Life Inventory, version 4.0 (PedsQLTM) and Childhood trauma Questionnaire (CTQ). Collected data were analyzed in SPSS v. 20.0 software using Pearson's correlation coefficient and multiple regression analysis.

RESULTS: Body appreciation is the most significant predictor for developing disordered eating across the entire sample of adolescents (β = -0.325, $P < 0.05$) and individually for male adolescents (β = -0.199, $P = 0.010$) and female adolescents (β = -0.379, $P < 0.001$). In addition to this variable, BMI has proved to be a statistically significant predictor in explaining the eating behaviours of female adolescents (β = 0.185, $P < 0.001$), while this happens to be self-esteem for male adolescents (β = -0.211, $P < 0.022$).

CONCLUSION: The most significant risk factors for developing disordered eating in adolescents are body appreciation, BMI and self-esteem. Results of this research can contribute to enhancement of intervention programmes which promote a positive body image and aim to prevent disordered eating in adolescents of both sexes.

Keywords:

Adolescent, body image, body mass index, feeding and eating disorders, risk factors

Psychiatry Clinic, School of Medicine, University of Mostar, Mostar, Bosnia and Herzegovina, [1]Department of Psychiatry and Psychological Medicine, School of Medicine, University of Rijeka, Rijeka, Croatia, [2]Department of Neurology, University Clinical Hospital Mostar, Mostar, Bosnia and Herzegovina, [3]Pediatric Clinic, University Clinical Hospital Mostar, Mostar, Bosnia and Herzegovina

Address for correspondence:
Dr. Martina Krešić Ćorić, Psychiatry Clinic, School of Medicine, University of Mostar, Bijeli Brijeg bb 88000 Mostar, Bosnia and Herzegovina. E-mail: martinakresic5@ yahoo.com

Introduction

The use of strict criteria in the diagnosis of eating disorders may prevent detection of subclinical forms or the initial stage of such disorders. For this reason, studies are increasingly looking at the occurrence of disordered eating, which means exploring various inappropriate eating-related behaviours and attitudes, without establishing a diagnosis of an eating disorder.[1,2]

The aetiology of eating disorders is complex. Up until now, research has revealed a number of biological, psychological, family and socio-cultural factors that contribute to the emergence and continuation of eating disorders.[1] Disordered eating

exists in a large percentage of adolescents (15-47%) and occurs most frequently during the middle and late phases of adolescence.[3] They are more frequent in the female gender[4] and sex differences become more pronounced in adolescence.[5] Adolescence is a typical period for emergence of dissatisfaction with one's body image, which is associated with increasing awareness of socio-cultural attitudes about the ideal physical appearance, which implies being thin for female adolescents and being muscular for male adolescents.[6] Adolescents of both sexes with a higher BMI are more inclined to use weight reduction strategies, but there are also gender differences: female adolescents with lower BMI are more satisfied with their appearance, while male adolescents with lower BMI resort to muscle-enhancing strategies.[6-8]

Due to pronounced preoccupation of adolescents with external appearance, studies tend to frequently use body dissatisfaction scales,[6,9] while the benefits of a positive body image[10] are much less recognised. Most research of body appreciation on disordered eating were carried out in young adult population,[11] while adolescent research tends to be rare.[12,13] Adolescents of both sexes with lower body appreciation exhibit more frequent disordered eating.[12] Lower self-esteem is also described as a predictor of disordered eating in adolescents.[14,15] The impact of parents on the occurrence of disordered eating was also identified.[1] Adolescents who show symptoms of eating disorders report unsatisfactory family relations, characterised by lower acceptance by parents through lack of familial warmth, empathy and emotional support.[16]

To date, research has focused more significantly on the psychosocial functioning of adolescents with already developed eating disorders,[17] while research on the link between psychosocial functioning and disordered eating is lacking. Recent meta-analysis concluded that disordered eating was significantly associated with poor psychosocial health and lower overall health-related quality of life among children and adolescents.[18]

Traumatic childhood experience is increasingly recognised as a non-specific risk factor for disordered eating.[19,20] A longitudinal study has shown that childhood abuse/neglect prospectively predicts elevated risk for disordered eating.[21]

Several psychosocial factors related to disordered eating have been investigated and none of them can independently explain the onset of the disorder. This study will try to determine the relationship and prediction of eating behaviours with age, BMI, body appreciation, self-esteem, quality of family interactions, psychosocial functioning, and childhood trauma history on the entire sample of the surveyed adolescents of both sexes, which is not investigated on a larger sample of the general population in Bosnia and Herzegovina.

Material and Methods

Study design and setting
From October 2018 to February 2019, a cross-sectional study was carried out among high school students of the city of Mostar, aged 14-19.

Study participants and sampling
A total of 724 students were surveyed, 454 of which were female adolescents (62.7%) and 266 male adolescents (36.7%), with an average age of 16.7 years (min = 14, max = 19, SD = 1.126). Upon request the, Ministry of Science, Education, Culture and Sports, provided us with an official list of 22 high schools for the school year 2018/2019 in the city of Mostar. For each of them, we recorded the total number of students, as well as the type of school: general education high schools and vocational schools, with a ratio of 1:3. High schools were divided into two groups: general education high schools and vocational schools. Each of the 22 schools was assigned a number and the random number generator randomly selected which schools will participate in the research, with the ratio between the general education high school and vocational schools corresponding to the ratio in the actual population (1:3 to in favour of vocational schools). After school sampling, according to the 'cluster' sampling method, all students of all grades of sampled schools who were present in class on the day of the research were selected for the sample and the number of schools sampled depended on the number of students at the sampled school. Out of the total number of students attending classes, 13 students (1.8%) refused to participate in the study.

Data collection tool and technique
After obtaining the written approval for conducting the research from the Ethics Committee of School of Medicine University of Mostar (code No: 01-I-1641/17) and the Ministry of Science, Education, Culture and Sports, the principals of the schools in which the research was to take place were notified. A written notice was sent to the parents and the students were briefly informed about the objectives, method and approach of conducting the research. If both, the parents and the student, agreed to participate in the study, they signed a consent form. Testing was conducted in groups, during the two-hour period of regular classes (block hours). The order of completion of the questionnaires was varied in such a way that the order of the questionnaires is shifted one step forward (the last questionnaire in one class was the first in the next class, the first one became the second, etc.) The maximum possible number of adolescents in the

classrooms was arranged to sit alone and, if necessary, paper partitions were placed between participants. During testing administration, a member of the research team was present in the classroom and available for a conversation or assistance. After filling out a battery of tests, the height and weight of the students was measured in a separate room (light clothing, without footwear). Data collection was anonymous, and participants had the right to withdraw at any time. The tools that were used in the study:

- A socio-demographic questionnaire designed for the purpose of this study was used to collect socio-demographic data. It contains general socio-demographic data (age, sex, place of residence, parents' marital status).
- The Eating Attitudes Test (EAT-26) was used to investigate disordered eating, which is the most commonly used measuring instrument to assess symptoms of eating disorders. The questionnaire consists of 26 items assessed on a Likert-type scale from 1-6 (from 1 = never to 6 = always). Each answer provides a score ranging from 0 to 3 after converting the 6-item Likert scale to units. Summing up the units of all 26 questions provides a final score ranging from 0 to 78. Higher scores indicate higher levels of eating pathology and a value equal to or greater than 20 is used to identify disordered eating.[22]
- To calculate the Body Mass Index (BMI), the students' height was measured using a stadiometer to the nearest 0.1 cm and they were weighed on a medical scale with an accuracy to the nearest 0.5 kg. BMI is calculated by dividing the weight expressed in kilograms by the square of the height expressed in metres.[23]
- Body appreciation Scale (BAS) containing 13 items was used to measure body appreciation. BAS items are rated on a five-point scale (from 1 = never to 5 = always). A higher total score reflects a more positive body appreciation. For the purpose of this survey, the questionnaire has been translated from English into Croatian language, as required by the standards for translation of psychological instruments, followed by a reverse translation by a translator not related to this research. The reverse translation pointed to minor omissions, which were corrected in the Croatian version of the questionnaire.[24]
- Adolescent self-esteem, i.e. positive and negative feelings about themselves were examined by Rosenberg's Self-Esteem Scale. It is a scale of 10 items, with five statements defined in a positive and five in a negative direction. The respondent selects the extent to which an individual claim relates to him/her, on an assessment scale of five (1 = strongly disagree to 5 = strongly agree). The result is achieved by the sum of all responses on the individual items with inverse scoring on the five statements going in negative direction. A higher score indicates a higher level of self-esteem.[25]
- The Quality of Family Interaction Scale (KOBI) was used to determine the quality of family interactions. It measures adolescent-parent interactions on two dimensions corresponding to those aspects of family interaction most commonly described in the literature as acceptance (emotional warmth, intimacy) and rejection (control, emotional rejection). Family Satisfaction subscale (11 statements) used in this study examines how an adolescent feels in his/her family and his/her satisfaction with family life. The total score is determined for each subscale separately and is obtained by simply adding up the points.[26]
- The Paediatric Quality of Life Inventory, version 4.0, (PedsQLTM) was used to determine the psychosocial functioning of adolescents. The questionnaire consists of 23 self-assessment statements measuring physical (8 items), emotional (5 items), social (5 items) and school functioning (5 items). Participants respond on a Likert-type scale of 0 to 4 (0 = never to 4 = almost always). The responses are transformed into a scale of 0-100 (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0). The combined psychosocial health scale containing questions on emotional, social and school functioning was used for the purpose of this research.[27]
- The Childhood Trauma Questionnaire (CTQ) was used to determine childhood trauma experienced within the family circle. This is a standardised retrospective self-assessment questionnaire containing 28 questions, which measures the severity of different types of childhood trauma. The questionnaire contains five subscales, each with five items, corresponding to emotional, physical and sexual abuse, and emotional and physical neglect. Participants answer each question in the context of 'while you were growing up' and the answer follows a Likert-type scorecard (from 1 = never to 5 = very often). For each subscale, it is possible to obtain a sum of 5 to 25 points.[28]

Ethical considerations

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Ethics Committee of School of Medicine University of Mostar (code No: 01-I-1641/17), Bosnia and Herzegovina, and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study and their parents.

Statistical analysis

Data were collected in an MS Excel database (version 11. Microsoft Corporation, Redmond, WA, USA) and the

SPSS 20.0 was used for statistical analysis (IBM Corp., Armonk, NY, USA). Data have been processed using descriptive statistical methods, where categorical variables are presented in terms of frequency and percentage. Pearson's correlation coefficient was used to assess the relationship between risk factors for the development of disordered eating. Regression analysis was used to check the ability of predicting the results of the EAT-26 Questionnaire. The probability level of $P < 0.05$ was taken as statistically significant.

Results

Relationship between eating behaviours and BMI, individual psychosocial factors and traumatic childhood experiences

Using Pearson's correlation coefficient on the overall sample and female adolescents specifically established a statistically significant correlation between the results of the EAT-26 questionnaire and all examined factors, except for the results on the sexual abuse scale (r = -0.027, $P > 0.05$ F; 0.023, $P > 0.05$ total) and physical neglect (r = 0.055, $P > 0.05$). On average, female adolescents with a higher BMI (r = 0.280, $P < 0.001$), low body appreciation (r = -0.421, $P < 0.001$), low self-esteem (r = -0.221, $P < 0.001$), low family satisfaction (r = -0.213, $P < 0.001$) and poor psychosocial health (r = -0.219, $P < 0.001$), will score higher on the EAT-26 questionnaire. Furthermore, female adolescents who score higher on the scales of emotional (r = 0.209, $P < 0.001$) and physical abuse (r = 0169, $P < 0.001$) and emotional neglect (r = 0142, $P < 0.001$) will also have higher scores on the EAT-26 questionnaire [Table 1].

In male adolescents, a statistically significant correlation was found between the results of body appreciation scales, self-esteem and physical abuse with total score in the EAT-26 questionnaire. On average, male adolescents with low body appreciation (r = -0.278, $P < 0.001$), low self-esteem (r = -0.237, $P < 0.001$), and exposed to more physical abuse (r = 0130, $P < 0.05$), had higher scores on the EAT-26 questionnaire [Table 1].

Contribution of socio-demographic variables, BMI, psychosocial factors and childhood trauma experience in explaining adolescent eating behaviours

Multiple regression analysis sought to verify the impact of certain predictor variables on total score on the EAT-26 questionnaire. The selected set of predictors explains a total of 17.1% of the variance of results on the EAT-26 questionnaire. Of these, characteristics of the participants such as the BMI (β =0.136), age (β = -0.079) and body appreciation (β =-0.325) were shown to be significant, with BMI positively correlated with the

results on the EAT-26 questionnaire, while the age and body appreciation are negatively related [Table 2]. The most significant predictor in this model, i.e. the one that largely contributes towards explaining the variance of the results on the EAT-26 questionnaire was the variable of body appreciation.

Multiple regression analysis sought to verify the impact of certain predictor variables on the total EAT-26 questionnaire score for male and female participants separately.

The results obtained for female adolescents indicate a significant predictive value of the BMI variables and body appreciation in explaining the variance of the results on the EAT-26 questionnaire. The selected set of predictors explains a total of 23.6% of variance of results on the EAT-26 questionnaire, where BMI is positively linked to the results on the EAT-26 questionnaire (β = 0.185, $P < 0.001$), while body appreciation is

Table 1: Presentation of correlations of result on the EAT-26 questionnaire with the individual factors on total sample and on the sample of male and female adolescents

	EAT-26 total result		
	F	**M**	**Total**
BMI	0.280**	0.095	0.204*
Body appreciation	-0.421**	-0.278**	-0.373**
Self-esteem	-0.221**	-0.237**	-0.228*
Family satisfaction	-0.213**	-0.091	-0.171**
Psychosocial health	-0.219**	-0.070	-0.169**
Emotional abuse	0.209**	0.108	0.171**
Physical abuse	0.169**	0.130*	0.152**
Sexual abuse	-0.027	0.090	0.023
Emotional neglect	0.142**	0.063	0.102**
Physical neglect	0.055	0.111	0.074*

*P<0.05; **P<0.001

Table 2: Presentation of regression coefficients and percentage of explained variance of total results on the EAT-26 questionnaire with respect to individual predictor variables

Predictors	*R*	*R²*	B	F	P
	0.414	0.171		11.646	<0.001
Age			-0.079		0.027*
Gender			0.022		0.551
BMI			0.136		<0.001
Body appreciation			-0.325		<0.001
Self-esteem			-0.014		0.780
Family satisfaction			-0.040		0.446
Psychosocial health			0.009		0.836
Emotional abuse			0.064		0.245
Physical abuse			0.060		0.221
Sexual abuse			-0.044		0.255
Emotional neglect			-0.091		0.094
Physical neglect			0.013		0.757

P<0.05

negatively correlated with the results on the EAT-26 questionnaire (β = -0.379, P < 0.001) [Table 3].

In male adolescents, the selected set of predictors explains a total of 12.5% result variance on the EAT-26 questionnaire. Of these, significant predictors were body appreciation (β = -0.199, P = 0.010) and self-esteem (β = -0.211, P < 0.022) (self-esteem for male adolescents is the most significant predictor), both of which are negatively correlated with the criterion variable.

Discussion

According to the results, female adolescents with a higher BMI, lower body appreciation, lower self-esteem, less family satisfaction, worse psychosocial health and have experienced emotional abuse and neglect and physical abuse in childhood will also have more disordered eating. The finding coincides with studies carried out to date, which looked at risk factors for the development of disordered eating and eating disorders.[3,18,20] On the total sample, as well as on the sample of female adolescents separately, a statistically significant correlation was found between the results on the EAT-26 questionnaire and all aspects tested, except for the results on sexual abuse and physical neglect. Up until now, worldwide, the link between physical and sexual abuse and the phenomenon of disordered eating and eating disorders[20] has been thoroughly explored, so this finding was unexpected. Data requested in the CTQ's are of a very intimate nature and force participants to recall unpleasant childhood experiences, which may be associated with feelings of shame, guilt and sadness, so it is possible that a certain number of adolescents did not answer truthfully and have given answers that did not match their actual childhood experiences.

On average, male adolescents with lower body appreciation, lower self-esteem, and more experience of physical abuse, experience more disordered eating. Most of the research so far had been carried out on female adolescents; therefore, the research on male adolescents is significantly underrepresented. The findings indicate that body appreciation and self-esteem are variables which are negatively related to eating behaviours for both male and female adolescents, which means that they represent potential risk factors for both sexes. This finding is not surprising, given that body dissatisfaction is one of the most studied factors associated with disordered eating,[6] along with self-esteem which can have a two-way impact. That is, low self-esteem may affect the occurrence of disordered eating, and on the other hand, disordered eating has an impact on the reduction of self-esteem.[29]

Multiple regression analyses carried out showed different significance of individual variables in explaining the eating behaviours of the whole sample and individually in male and female adolescents. In the total sample, the most significant predictor was body appreciation. In addition to this variable, age and BMI were statistically significant, i.e. the younger the adolescents, the higher BMI and the lower body appreciation, the more disordered their eating behaviours. Echoing previous research, adolescents with a higher BMI feel more pronounced socio-cultural pressure to be thin and have dissatisfaction with their own appearance, which further leads to the emergence of disordered eating in order to control body weight.[30] This is all the more pronounced in younger adolescents of both sexes who are significantly developmentally focused on external appearance and body changes.[2]

Looking at female adolescents and male adolescents separately, it was determined that female adolescents with higher BMI and lower body appreciation will show more disordered eating, while male adolescents will have more disordered eating if they have lower self-esteem

Table 3: Overview of regression coefficients and percentage of explained variance of total results on the EAT-26 questionnaire by male and female participants with respect to individual predictor variables

Predicators	Female					Male				
	R	R²	F	B	P	R	R²	F	B	P
	0.486	0.236	11.753		<0.001	0.353	0.125	3.153		0.001*
Age				-0.039	0.370				-0.123	0.052
BMI				0.185	<0.001				0.079	0.223
Body appreciation				-0.379	<0.001				-0.199	0.01*
Self-esteem				0.085	0.155				-0.211	0.022*
Family satisfaction				-0.092	0.171				0.058	0.504
Psychosocial health				-0.061	0.264				0.097	0.199
Emotional abuse				0.093	0.173				-0.04	0.672
Physical abuse				0.033	0.560				0.144	0.239
Sexual abuse				-0.087	0.053				0.002	0.98
Emotional neglect				-0.127	0.067				-0.094	0.293
Physical neglect				0.019	0.712				0.038	0.627

P<0.05

and lower body appreciation. The findings of this research are in line with the principles of objectification theory,[31] which looks at the development of disordered eating, i.e. eating disorders, in the female population as a result of constant evaluation and criticism of the appearance of the female body by the society in which they live. Young female adolescents live in a society that sends the message that 'thin equals beautiful' and face societal pressure to meet this standard of beauty. As a result of the failure to achieve the socially ideal body appearance, which, for women, is an unrealistically thin body, women become dissatisfied with their body and start to be ashamed of it.[32,33] Because of this, many female adolescents use different methods of weight reduction, weight control and body shaping that lead to the development of disordered eating. When it comes to male adolescents, the relationship between the BMI and the eating habits has proved to be somewhat different. Men with low BMI tend to want to gain weight, that is muscle, while those with high BMI want to get rid of excess fat, that is to lose weight.[34]

The more frequent objectification of the male body through the representation of muscular male bodies and the increasing focus on certain male body parts in the media have dramatically changed the way male adolescents think about themselves and how they view and treat their bodies.[35] Much like female adolescents, male adolescents struggle with distorted body image, which affects their self-confidence. Unlike female adolescents, who usually think that they are overweight, male adolescents with a distorted body image think that their muscles are not large enough, in particular the muscles of the chest, arms, abdomen and back, without looking at their body as a whole, resulting in a discrepancy between real and ideal self.[36] Research has shown that male adolescents with lower self-esteem are more susceptible to socio-cultural pressures to modify their body.[37] Due to increased socio-cultural pressure to achieve a muscular body, male adolescents who are dissatisfied with their body are more likely to use harmful eating strategies and body shape control to reduce perceived imperfections and achieve the ideal male body shape.[36]

It is important to point out that the most significant predictor in the explanation of disordered eating on the whole sample of participants, as well as on a sample of female adolescents and no less for male adolescents, has shown to be body appreciation. Considering the protective role of a positive body image, it is important to further explore the connection between body appreciation and health-related lifestyles, especially in adolescence. Adolescence is a period of dramatic psychological and physical changes, and body image plays one of the most important roles.[38] A positive body appreciation may constitute a protective factor against self-objectification and dissatisfaction with one's own body.[39]

Similar to our results, a survey carried out in Lithuania on a large number of adolescents aged 15-18 found that body appreciation, along with physical functionality and self-esteem, was the most significant predictor of less pronounced disordered eating for male and female adolescents.[12] These findings provide empirical support for the development of intervention programmes that promote a positive body image and aim to prevent the occurrence of eating disorders in adolescents of both sexes.[12]

Limitations and recommendations

While interpreting the results obtained in this study, we should take into account the specific methodological limitations. The analyses that were carried out are of correlation-type, cross-sectional style, hence, we cannot draw reliable conclusions about the causal consequential relationship between the examined factors. Further Longitudinal research is needed to confirm prospective causal link between investigated factors and development of disordered eating among adolescents.

It is important to emphasise that the questionnaire used was not fully tailored to male participants and, in future research, it would be important to use measures specifically designed to deal with the self-image and body relationship that male adolescents might have, such as a desire for a muscular body.

The generalisation of the results obtained by this research is limited to high school students of the city of Mostar. In order to complete the data obtained by this research, the same research should be repeated in several cities of Bosnia and Herzegovina, as well as on both younger and older students (university students).

Conclusion

Current research has sought to contribute to a better understanding of the development of disordered eating among adolescents of both sexes. The identification of risk factors, therefore, seems necessary in order to detect the symptoms of eating disorders in a timely manner and to apply appropriate intervention procedures to avoid the potentially drastic consequences inherent in this group of disorders. Further efforts are needed to promote a healthy body image which includes a normal BMI, and thus giving female and male adolescents the opportunity to accept their body as it is, especially in the midst of the changes they face during the adolescence period. Another reason for the promotion of a healthy body appearance is that the sense of self-worth in adolescents is largely determined by their physical appearance.

Conflicts of interest

There are no conflicts of interest.

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