



Associations of Eating Disorder with Sleep Status and Anthropometric Measurements in Female Adolescents in Zanjan, Iran



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ABSTRACT

Background: Eating disorders (EDs) are diseases of mental origin, which are associated with unusual eating behaviors. The structure of eating behaviors may differ depending on body weight and sleep status. The present study aimed to assess the prevalence of disordered eating attitudes and its associations with weight and sleep status in female adolescents in Zanjan, Iran.

Methods: This cross-sectional study was conducted on 359 female students selected from the secondary high schools of Zanjan via random cluster sampling. Disordered eating attitudes and recent sleep quality were evaluated using the eating attitude test (EAT-26) and Pittsburgh sleep quality index (PSQI), respectively. In addition, anthropometric measurements were performed using standard protocols.

Results: In total, 22.3% of the subjects had disturbed eating attitudes. Moreover, comparison of disordered eating attitude in these subjects with healthy students indicated significant differences in terms of body weight ($P < 0.05$) and body mass index (BMI) ($P < 0.05$).

Conclusion: According to the results, abnormal eating attitude was highly prevalent in the students. Furthermore, the subjects with EDs had higher body weight, BMI, and PSQI scores, as well as shorter duration of sleep, compared to the others. And PSQI score along with shorter sleep duration than others.

1. Introduction

Eating disorders (EDs) are diseases of mental origin, which are characterized by unusual eating behaviors ranging from nonclinical disorders (e.g., sense of being obese, adherence to specific diets) to severe clinical syndromes, such as bulimia nervosa and anorexia nervosa [1]. Although EDs may affect a wide range of ages groups in both genders, they are reported to have a higher prevalence among female adolescents [2]. Adolescence is a period of growth in which boys and girls become conscious of their weight and appearance [3]. As a result, they tend to compare their looks and bodies with culturally defined ideal physiques, particularly those imposed by western cultures, which idealize slenderness for women and promote the

avoidance of proper eating only to receive social acceptance [3,4]. Such idealism has influenced both western and Asian countries [5].

In an attempt to lose weight, overweight adolescents may adopt disordered eating behaviors [6]. The cross-sectional studies in this regard have compared adolescents with normal weight to their overweight peers, with the latter reported to be more likely to become involved in the use of laxatives or self-induced vomiting [6]. Furthermore, a study focused on the strategies for the treatment of EDs in adolescents indicated that 36.7% of the participants previously weighed more than the 85th percentile for age and gender [7]. Efforts for weight loss may encourage malicious behaviors, such as the severe restriction of food, elimination of the main meals, long-term starvation,

Self-induced vomiting, and use of laxatives [8].

Lack of sleep is considered to be another important influential factor in obesity and eating behaviors. Recent data from the National Health and Nutrition Examination Survey (NHANES) suggest that the structure of eating behaviors differs depending on the duration of sleep, with short sleepers skipping their main meals and receiving more energy from snacks. Furthermore, consumption of sugars, fiber, caffeine, and alcohol may alter the duration of sleep [9]. Although some studies have investigated the associations between eating behaviors, sleep, and body mass index (BMI) in adolescents, the proposed findings are inconsistent [10]. Furthermore, these issues have not been investigated in Zanjan province, Iran.

The present study aimed to assess the prevalence of EDs and identify their correlations with weight and sleep status in female adolescents in Zanjan, Iran.

2. Materials and Methods

2.1. Participants and Procedures

This descriptive, cross-sectional study was performed on 359 secondary school female students aged 16-18 years in Zanjan in 2018. The sample size was calculated using the prevalence of 24.16% of ED high-risk behaviors [11], at 95% confidence interval and absolute precision of five percentile points. High schools were selected via random cluster sampling from all the high schools in Zanjan, and the participants were selected via simple random sampling only from among the adolescents who were willing to participate in the study, providing written informed consent. The inclusion criteria of the study were the absence of physical disabilities rendering the anthropometrical evaluation impossible, absence of diseases, and no dietary restrictions.

The study protocol was approved by the Ethics Committee of Qazvin University of Medical Sciences (ethics code: IR.QUMS.REC.1396,380). The required coordination was made with the educational authorities to obtain the permit for the start of the research project. Initially, the objectives and procedures of the study and approaches to completing the questionnaires were explained to the students in each class. Afterwards, the questionnaires were distributed and collected after completion. During the collection of the questionnaires, anthropometric measurements were performed by trained researchers and recorded in the questionnaires. It is also notable that the questionnaires were completed anonymously, and the data of the students remained confidential.

2.2. Data Collection Tools

2.2.1. Demographic Questionnaire

A questionnaire was used to collect the basic demographic data of the participants, including age, education level, major, menstrual status, menstrual pain status, and frequency of fast food consumption.

2.2.2. Eating Attitudes Test-26 (EAT-26)

Disordered eating behaviors were evaluated using the eating attitudes test-26 (EAT-26). EAT-26 is a modified

version of the EAT-40 and a valid, self-reporting scale, which consists of 26 items to assess the risk factors of various EDs, such as food restriction, bingeing, purging, and environmental effects on food intake [12]. The items in the instrument are scored based on six-point Likert scale. Items 1-25 represent the scales of Always (score 3), Usually (score 2), and Often (score 1), and the scales of Never, Rarely, and Sometimes are scored zero. In item 26, the scores of Never, Rarely, and Sometimes are three, two, and one, respectively, while the other three scales are scored zero. The total score of the questionnaire is calculated within the range of 0-78, and the total score of ≥ 20 is interpreted as the risk of EDs. It is notable that the Persian version of EAT-26 has been validated [13].

2.2.3. Sleep Behaviors

The Pittsburgh sleep quality index (PSQI) [14] was used for sleep assessment. The PSQI is a valid questionnaire consisting of seven scales to evaluate subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction due to sleep quality within the past one month. The conventional rating method of this instrument has been described by Buysse et al. (1989) [14]. The score of each scale is calculated within the range of 0-3. Following that, the scores of the scales are summed up to produce a global index score within the range of 0-21, indicating the quantitative and subjective aspects of sleep, and the global scores of ≥ 5 represent poor sleep quality [15]. The PSQI has been translated to Persian by Yazdi et al. (2012) [16], and its validity (94%) and reliability (72%) have been confirmed at the Cronbach's alpha coefficient of 0.77 by Farrahi Moghaddam et al. (2012) [17].

2.3. Physical Assessments

Weight measurement was performed with minimal clothing and without shoes to the nearest 0.1 kilogram using a calibrated balance (model: Seca 813 scale; capacity: maximum 200 kg, Germany). Height was measured with the subjects in the standing position without shoed and with their hair bends, and the normal position of the shoulders was set to the nearest 0.1 centimeter using a stadiometer (model: Seca 206 stadiometer; range: 0-220 cm, Germany).

BMI was calculated using the formula with standard deviation (SD) scores (BMI z scores), which were derived using the age- and gender specific World Health Organization (WHO) percentile reference data (2007). It is also notable that the adolescents were divided into the groups of underweight, normal weight, overweight, and obese in accordance with the WHO growth reference data (2007) [18].

2.4. Statistical Analysis

Data analysis was performed using SPSS 17.0 software, and the normality of data distribution was confirmed. Descriptive statistics were used to assess the mean and standard deviation of the continuous variables and proportions of the categorical variables. In addition, independent t-test, Chi-square, Spearman's and Pearson's correlation-coefficients, and analysis of variance (ANOVA)

were applied at 95% confidence interval (CI) for each variable. In all the statistical analyses, P-value of less than 0.05 was considered significant.

3. Results and Discussion

In total, 359 participants were enrolled in the study, and the response rate of the questionnaires was 100%. The mean age of the students was 16.04 ± 0.646 years. Based on the age- and gender specific WHO percentiles, the BMI of the majority of the students (79.9%) was within the normal range, while 5% of the students were underweight, 10% were overweight, and 4.7% were obese. Table 1 shows the obtained mean values, and Table 2 shows the correlations between the variables.

The EAT-26 scores of 22.3% of the participants were ≥20, and EAT-26 scores of ≥ 20 in terms the four weight classes (underweight, normal weight, overweight, and obese) were obtained by 5%, 71.2%, 16.2%, and 7.5% of the students, respectively. Furthermore, most of the students with disordered eating attitudes were in the normal weight group.

According to the information in Table 2, positive significant correlations were observed between the variables of eating behaviors, BMI (r = 0.143; P= 0.007), and weight (r = 0.11; P= 0.02), suggesting that increased BMI or weight was associated with the higher risk of EDs and vice versa (Table 2).

Table 3 shows the comparison of weight and BMI between the healthy subjects and those with disordered eating attitudes. Accordingly, significant differences were observed in the mean weight and mean BMI between the two groups (P< 0.001). Therefore, it could be concluded that the students with the eating behavior scores of ≥20 had significantly higher mean BMI and mean weight compared to their healthy peers (Table 3).

The obtained results indicated positive significant correlations between the EAT-26 scores and all the indices of sleep quality, with the exception of subjective sleep quality, sleep duration, and sleep medication use. In addition, the scores of EAT-26 and PSQI were significantly correlated (r = 0.18; P= 0.001) (Table 2).

In the present study, no significant correlations were observed between BMI and any of the sleep quality indices (Table 2), and the mean total PSQI score was calculated to be 8.1 ± 1.92. The students with the EAT-26 scores of ≥20 achieved significantly higher mean total PSQI scores (8.5 ± 2.13) compared to the healthy students. However, no significant differences were observed between the two groups in terms of the sleep quality indices (Table 3).

Among the studied participants, only 18.8% reported sleeping more than seven hours per night. As can be seen in Figure 1, 51.9 % of the students with disordered eating attitudes and 39.9% of the healthy subjects had the sleep duration of 5-6 hours per night, which was considered statistically significant (P= 0.045).

The present study aimed to assess the prevalence of EDs and determine the possible associations with weight and sleep status in female adolescents. According to the findings, the risk of eating disorders was high among these students, and 22.3% of the sample population at the risk of disordered eating attitudes. This is consistent with the previous findings reported in this regard in Iran [19-21] and other countries [22-24].

The difference in the prevalence of eating disorders might be due to the diversities in culture, nationality, and socioeconomic factors. After dividing the students into two groups of high-risk and safe in terms of eating disorders, our findings indicated that the group with disordered eating attitudes had higher BMI, weight, and PSQI scores. Moreover, the prevalence of the sleep duration of 5-6 hours per night was higher in this group.

Table 1: Mean Variables

Variable	Mean	SD	Variable	Mean	SD
Age	16.04	0.64	Sleep latency	1.31	0.9
Weight	55.63	10.28	Daytime dysfunction	0.93	0.84
BMI	21.56	3.67	Habitual sleep efficiency	0.08	0.35
EAT-26 score	14.5	8.89	Subjective sleep quality	2.97	0.8
Sleep duration	1.46	0.92	Use of sleep medication	0.18	0.56
Sleep Disturbance	1.19	0.48	PSQI global score	8.1	1.92

Table 2: Correlationsa of Variables

	Age	Weight	BMI	Eat-26	Durat	Distb	Latent	Dyed	HSE	Qual	Med
Age											
Weight	0.05										
BMI	0.051	0.92**									
Eat-26	0.012	0.11	0.143**								
Duration	0.09	0.025	-0.009	0.088							
Disturbance	-0.01	0.06	0.064	0.123*	0.098						
Latency	-0.005	0.027	0.025	0.13*	0.14**	0.299**					
Day	-0.061	0.046	0.021	0.141**	0.132*	0.268**	0.178**				
HSE	0.104*	0.086	0.074	0.112**	-0.178**	0.015	0.04	0.019			
Qual	0.07	-0.018	0.004	-0.09	-0.23**	-	-	-0.28**	-0.08		
						0.368**	0.353**				
Med	0.053	0.04	0.037	0.071	0.105*	0.326**	0.176**	0.181**	0.045	-0.28**	
PSQI	0.088	0.08	0.059	0.18**	0.524**	0.504**	0.59**	0.557**	0.116**	-0.18**	0.48**

N =359

Dayd: daytime dysfunction; HSE: habitual sleep efficiency; Qual: subjective sleep quality; Med: use of sleep medication; PSQI: PSQI global score; ^a two-tailed Pearson's correlation-coefficient in SPSS

*P< 0.05
**P< 0.01

Table 3: Comparison of Variables between Healthy Subjects and Those with Disordered Eating Attitudes

Variables	eat < 20	eat ≥ 20	Mean. dif	Pvalue
	mean ± SD	mean ± SD		
Weight	54.97 ± (10.14)	57.94 ± (20.5)	-2.96	0.023
BMI	21.3 ± (3.55)	22.46 ± (3.95)	-1.16	0.012
Sleep Duration	1.44 ± 0.91	1.53 ± 0.95	-0.089	0.449
Sleep latency	1.27 ± 0.89	1.45 ± 0.95	-0.17	0.14
Subjective sleep Quality	2.99 ± 0.77	2.91 ± 0.90	0.079	0.446
Habitual sleep efficiency	0.07 ± 0.30	0.15 ± 0.48	-0.079	0.167
Sleep disturbance	1.17 ± 0.47	1.26 ± 0.52	-0.09	0.165
Sleep medication	0.17 ± 0.54	0.21 ± 0.63	-0.042	0.555
Daytime dysfunction	0.89 ± 0.80	1.1 ± 0.97	-0.207	0.084
PSQI	7.98 ± 1.84	8.5 ± 2.13	-0.535	0.044

^a Pvalue estimated by independent t-test

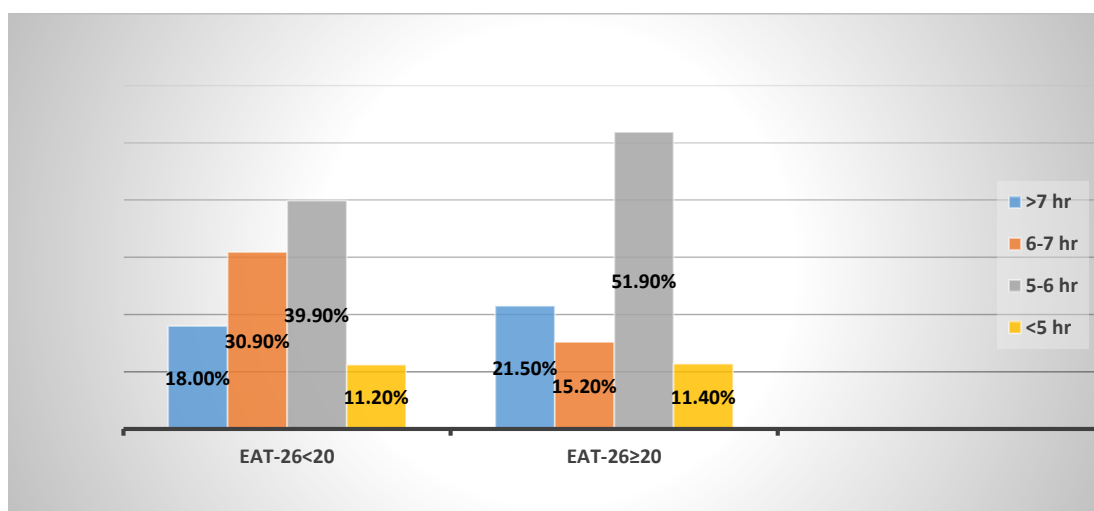


Figure 1: Prevalence of Sleep Duration Based on Eating Attitudes

However, no significant correlations were observed between the EAT-26 scores and other sleep quality indices. These findings are consistent with the previous studies evaluating the associations between eating disorders and BMI in students [25,26]. In a study examining the association between overweightness and risk of eating disorders in adolescent females, significant correlations were reported between the EAT scores and BMI [27]. In contrast to our findings, Soares et al. (2011) investigated 870 students using the EAT-40 tool for eating behaviors, in which two items assessed the difficulties of initiating sleep and difficulties of maintaining sleep, reporting an association between eating behaviors and sleep disturbances, particularly in terms of bulimic behaviors in both genders [25]. In another research, Chardon et al. (2016) evaluated 225 youth aged 8-17 years, suggesting that interventions to amend sleep disturbances and daytime sleepiness could potentially reduce disordered eating behaviors in the subjects [26].

The findings of another study, which was conducted on students aged 18-24 years using the PSQI and eating competence questionnaire, suggested that in comparison to less competent eater students, competent eaters had better sleep quality and fewer sleep-related problems (e.g., daytime dysfunction and sleep disturbances). Additionally, low eating competence and poor sleep quality were reported to be correlated with overweightness and obesity [28]. Inconsistently, the results of the present study demonstrated no significant correlations between BMI and sleep quality, which is also in contrast to a recent meta-analysis, which denoted that obesity was associated with shorter sleep duration [29,30]. The meta-analysis performed by Chen et al. (2008) indicated that children and

Adolescents with shorter sleep duration had the pooled odds ratio (OR) of 1.58 (95% CI: 1.26-1.98) for overweight/obesity, while those with the shortest sleep duration were at a higher risk of these disorders compared to the subjects with longer sleep duration (OR: 1.92, 95% CI: 1.15-3.20) [29]. On the same note, Fatima et al. reported that in comparison to children and adolescents with longer sleep duration, the subjects with shorter sleep duration were twice more likely to become overweight or obese [30].

4. Conclusion

According to the results, disordered eating attitudes were highly prevalent among the high school students. Furthermore, the students with eating disorders had higher weight, BMI, and PSQI scores, as well as lower sleep duration, compared to the other groups. Therefore, it is essential to expand proper strategies for the prevention, early detection, and treatment of these problems from a broad perspective.

Authors' Contributions

S.M., A.R., and M.R.S.S, conceived and developed the idea for the article and revised the manuscript; S.M., A.R., and M.R.S.S., contributed to data collection; S.M., wrote numerous drafts; S.M., and M.J., contributed to statistical analysis; all the authors read and approved the final manuscript.

Conflict of Interest

The Authors declare that there is no conflict of interest.

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