

Original Article

Survey on eating disorders related thoughts, behaviors and dietary intake in female junior high school students in Taiwan

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OBJECTIVE: The purpose of this study was to investigate body weight satisfaction, eating attitudes and dietary intake related to eating disorders of female junior high school students in Taiwan. **METHODS:** In a cross-sectional survey, 835 female junior high school students participated in this study. The questionnaire items included respondents' demographic information as well as weight and body image concerns. Developmental and attitudinal scales such as the body shape-related teasing scale, Pubertal Development Scale, Eating Attitudes Test-26 (EAT-26) and 24-hour dietary recall were also used to collect data. Data were analyzed using a Student's *t* test, chi-square test and logistic regression. **RESULTS:** Disturbed eating attitudes and behaviors were found in 10.4 % of participants (measured by EAT-26 \geq 20). The multivariate logistic regressions showed that disturbed eating attitudes and behaviors were associated with weight/shape-related teasing experiences and dissatisfaction with body weight. The reported intakes of energy, protein, fat, carbohydrate, cholesterol, zinc and vitamins B-6, B-12, were significantly lower in participants with disturbed eating patterns than in participants without disturbed eating. Conversely, participants with disturbed eating patterns had higher dietary and crude fiber intake than participants without disturbed eating. **CONCLUSION:** Disturbed eating behaviors exist among female adolescents in Taiwan, and these behaviors jeopardize their necessary dietary intake requirements. More research using the EAT-26 as a measure to predict the quality and quantity of food intake among female adolescents warrants further study.

Key Words: eating disorders, body image, EAT-26, body shape-related teasing, female junior high school students

INTRODUCTION

Anorexia nervosa and bulimia nervosa are major clinical problems not only in Western countries^{1,2} but in Eastern countries as well.³ Problematic eating attitudes and behaviors pertaining to the fear of fatness^{3,4} are now commonly found among young females in high income East Asian societies such as Japan,⁵ Singapore,⁶ Hong Kong,^{3,7,8} and the Republic of Korea.⁹ A similar phenomenon has also been found in Taiwan.¹⁰ The mass media has influenced Taiwanese society by emphasizing the concept that femininity and thinness are synonymous. Therefore, many Taiwanese women want to be thin in order to be considered beautiful.⁹ Hence, not surprisingly, women in Taiwan tend to be preoccupied with losing weight and achieving a slim physique at a young age. Due to all of these factors, body shape dissatisfaction is prevalent in all Taiwanese adolescents, but particularly for girls.¹¹ A study conducted in Taiwan indicated that approximately 65.5% of 10-14 year-old school girls, including severely underweight and underweight girls, wanted to be thinner. Further, 38% of the severely underweight and underweight girls have ever attempted to lose weight.¹²

Various biological and psychological factors appear to be associated with eating disorders in Western countries. For example, negative comparisons between an individual's body shape and that of the ideal contribute to poor self-esteem.¹³ Criticism, teasing, and bullying focused on food, weight, and shape issues increase the risk of developing eating disorders.¹⁴ In addition, food-related and weight-related harmful experiences also increases the risk of developing an eating disorder.¹⁵ Considering the many unanswered questions related to female adolescent eating disorders in Taiwan, identifying the predictive risk factors serve as an important step for prevention.

Eating disorders are especially prevalent during adolescence and early adulthood.^{16,17} Since food restrictions

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serve as the primary behavioral feature of most eating disorders, the results of nutritional disturbances of varying degrees of energy, protein and nutrient depletion, illustrate the importance to understanding the actual food intake of adolescents with eating disturbances. This is also important due to consequences of poor nutrition on the brain. The brain consumes 20% of all caloric intake and is especially dependent on glucose. Therefore, poor nutrition effects brain function, in addition to the specific effect on the appetite system. Most eating disorders emerge during adolescence, a vulnerable period of brain reorganization. Therefore, malnutrition during this crucial period could promote illness later in life.¹⁵

Numerous studies focused on investigating the food intake of clinical samples with eating disorders.¹⁸⁻²⁰ However, few studies investigated school-based samples focusing on the energy and nutritional intake of Taiwanese female adolescents with eating disturbances. Interestingly, investigating whether or not participants with disturbed eating pattern decreased their energy and nutrient intake compared with normal participants, served as necessary, yet unexplored research that will promote understanding on how disturbed eating attitudes affect Taiwanese female adolescents' eating patterns.

Therefore, the purpose of this study was to investigate the prevalence of disturbed eating attitudes and behaviors in female junior high school students in Taiwan, and identify the risk factors related to body image, weight teasing, and pubertal development. Comparisons of food intake patterns between the participants with and without disturbed eating attitudes were also included in this study.

MATERIALS AND METHODS

Study design and sample

The study population was students at public and private junior high schools in Taichung City, Taiwan. Participants were selected by multiple-stage sampling with regard to districts, schools, grades, classes. Seventeen junior high schools were selected, and one class was randomly selected from each grade.

Parented and student consent forms were obtained before the study. A total of 916 questionnaires were distributed and 889 questionnaires were returned. Questionnaires that were not filled out completely or with unreliable information were excluded. Therefore, a total of 835 questionnaires were eligible for this study. All participation was voluntary, and confidentiality was assured and protected by not using names or student numbers. Each questionnaire was given a specific coded number. The study protocol was approved as ethical when reviewed by the Institutional Review Board of Chung Shan Medical University (Taichung City, Taiwan).

Instrument and data collection

Information were collected by anonymous questionnaires. The questionnaires were completed by students in their classrooms under the standardized direction of well-trained research assistants. To protect participants' privacy, students were led to a private area to measure height and weight after the completion of the questionnaires. All research assistants were trained on survey conduction, question answering, height and weight meas-

urement, and the 24-hour dietary recall interview procedures. The questionnaire contained five measurement sets (1) demographics, concerns and behaviors related to body weight, (2) body shape-related teasing scale, (3) Pubertal Development Scale (PDS), (4) Eating Attitudes Test 26 (EAT-26) and (5) 24-hour dietary recall.

Some items on the questionnaire assessed concerns and behaviors related to body weight such as (1) "What do you think of your weight category?" Possible responses ranged from "severely underweight" to "obese" using a five-point scale. The responses represented their self-perceived body size, such as (2) "How do you desire your weight to be?", the possible responses were "thinner", "heavier", "maintain current weight". Finally, (3) "what is your desired body weight", the respondents needed to provide their weight in kilograms.

Body mass index (BMI) was computed from height (meter) and weight (kilograms) measurements as kg/m^2 . Participants were classified into five groups: severely underweight ($\text{BMI} \leq 5^{\text{th}}$ percentile), underweight ($5^{\text{th}} < \text{BMI} \leq 15^{\text{th}}$ percentile), acceptable weight ($15^{\text{th}} < \text{BMI} \leq 85^{\text{th}}$ percentile), overweight ($85^{\text{th}} < \text{BMI} \leq 95^{\text{th}}$ percentile) and obese ($\text{BMI} > 95^{\text{th}}$ percentile), according to the gender and age-specific BMI reference performed in Chen's study.²¹ In 2003, the Taiwan Department of Health announced that this standard would be the standard indicator of obesity among Taiwanese children and adolescents. Desired body size was calculated from students' self-reported desired weight in Kg to BMI, then classified into weight categories by the above standard.

To compare discrepancies between perceived body size, desired body size and actual body size, scores of 1 to 5 were assigned: 1 indicating severely underweight, 2 indicating underweight, 3 indicating acceptable weight, 4 indicating overweight, and 5 indicating obese. Scores were calculated by subtracting the actual body size number from the number of the perceived body size, called "perceived-actual discrepancy". While the desired body size number subtracted from the actual body size number was expressed as the "actual-desired discrepancy". A zero "perceived-actual discrepancy" indicated that the participants perceived body size agreed with their actual body size. A positive "perceived-actual discrepancy" score indicated the perceived body size was larger than actual body size. A zero "actual-desired discrepancy" score indicated that the actual body size agreed with the desired body size. A positive "actual-desired discrepancy" score indicated that the desired body size was smaller than actual body size. Finally, the "perceived-actual discrepancy" score indicated whether participants overestimated their body size, and "actual-desired discrepancy" score showed whether participants had unrealistic weight goals.

The Pubertal Development Scale (PDS) consisted of two different versions, varying from gender. Both scales consist of five questions related to developmental changes of puberty. According to means of the scales, the participants were divided into five groups, pre-puberty, early puberty, mid-puberty, late puberty and post-puberty.²² A previous study showed that the classification of the degree of puberty according to PDS was in agreement with the examination by pediatricians, and also presented sound

reliability and validity.²³ In this study, the internal consistency reliability of PDS was 0.79.

The body shape-related teasing scale designed by Lin was used to measure participants' history of being teased about body weight and size, and how they felt when the teasing occurred.²⁴ Four items were offered in the body shape-related teasing scale along with the five-point Likert scale for respondents to specify their level of agreement to each of them. Item responses were summed to create a score that defined the level of being teased for the body size of an individual. The higher the score, the greater the level of teasing experienced. In Lin's study of Taiwanese adolescents, the internal consistency among the participants (n=822) was found to be acceptable (Cronbach's alpha=0.77).²⁴ In this study, the internal consistency reliability of the body shape-related teasing scale was 0.78.

Eating attitudes were assessed by EAT-26,²⁵ an abbreviated version of 40-item scale (EAT-40) with a high correlation (r=0.98).²⁶ Items are rated on a 6-point Likert-scale, with answers ranging from 1 (always) to 6 (never). The EAT has been translated into many languages and

significant cultural differences in its scores have been reported.²⁷ The Chinese version of EAT-26 is suitable for use among Taiwanese adolescents and has been shown to be highly reliable and valid with a cut-off point of 20.²⁸ In this study, all participants who scored 20 and above were expressed in EAT(+) while others are EAT(-). The EAT-26 was found to have good internal consistency (Cronbach's alpha=0.80).

Data on food intake were obtained by using 24-hour dietary recalls. The 24-hour dietary recalls used in this study was modified slightly to fit the food culture in Taiwan. A set of food models were used that included a dozen food-piece models designed for mixed dishes, and various kinds of abstract models. Nutrition and Health Survey in Taiwan (NAHSIT) also used this method to obtain the data on dietary nutrient intake.^{29,30}

Data analysis

The SPSS (version 12.01,2004, SPSS) was used for data compilation and statistical analysis. The nutrition composition of 24-hour dietary recall was calculated using E-Kitchen Nutrition Professional software (E Kitchen Busi-

Table 1. Numbers and percentages of the adolescent girls with and without disorder eating attitudes and behaviors across the independent variable

Independent variable	Levels	EAT(+)		EAT(-)		Chi-square statistic
Age, yrs (n=816)	≤12	13	(15.1)	125	(17.1)	0.536
	13	27	(31.4)	242	(33.2)	
	14	31	(36.0)	238	(32.6)	
	≥15	15	(17.5)	125	(17.1)	
Actual body weight category** (n=812)	Severely underweight	3	(3.5)	81	(11.2)	20.8
	underweight	3	(3.5)	80	(11.0)	
	Acceptable weight	55	(63.9)	457	(62.9)	
	Overweight	11	(12.8)	63	(8.7)	
	Obese	14	(16.3)	45	(6.2)	
Body shape-related teasing scale** (n=809)	Never get teased	8	(9.4)	142	(19.6)	57.0
	Lower level of being teased	36	(42.4)	449	(62.0)	
	Moderate level of being teased	21	(24.7)	100	(13.8)	
	Higher level of being teased	20	(23.5)	33	(4.6)	
Pubertal development scale (n=633)	Pre-puberty	0	(0)	6	(1.1)	1.44
	Early puberty	1	(1.6)	8	(1.4)	
	Mid-puberty	5	(7.8)	52	(9.1)	
	Late puberty	57	(89.0)	495	(87.0)	
	Post puberty	1	(1.6)	8	(1.4)	
Perceived-actual discrepancy* (n=809)	-1 (underestimation)	4	(4.6)	73	(10.1)	9.52
	0 (correct estimation)	29	(33.7)	318	(44.0)	
	1 (overestimation)	44	(51.2)	292	(40.4)	
	≥2 (overestimation)	9	(10.5)	40	(5.5)	
Actual-desired discrepancy** (n=796)	≤-2	0	(0)	24	(3.4)	22.4
	-1 (desired fatter)	0	(0)	53	(7.5)	
	0 (equal to desire)	32	(37.2)	342	(48.2)	
	1 (desire thinner)	32	(37.2)	201	(28.3)	
	≥2 (desired thinner)	22	(25.6)	90	(12.7)	
Satisfaction with body weight** (n=814)	Hope to be heavier	0	(0)	90	(12.4)	41.0
	Hope to be thinner	82	(95.3)	440	(60.4)	
	Keep current weight	4	(4.7)	198	(27.2)	

The number in the table indicates the number of subjects and the number in parentheses represents percentage.

Chi-square analysis is used to compare difference in the tendency of eating disorders across independent variables. *p<0.01. **p<0.001.

Participants had score of EAT-26 above the cutoff score (≥20), which showed EAT (+), otherwise showed EAT (-)

Perceived-actual discrepancy: score of subtracting actual body size from perceived body size (≥1: overestimation; =0: correct estimation; ≤1: underestimation).

Actual-desired discrepancy: Score of subtracting desired body size from actual body size (≥1: desired body size less than actual body size; =0: desired body size agree with actual body size; ≤-1: desired body size higher than actual body size).

ness Corporation, Taiwan, 2002), and the nutrient database was based on the Taiwan food composition table (Department of Health, 1998). Chi-square test was used to compare the distributions among the dependent variables (age, body size, body image concern, body shape-related teasing scale, pubertal development scale) between participants with and without disturbed eating attitudes and behaviors. First, univariate logistic regression was used to assess the association between independent variables and disturbed eating attitudes/behaviors. Factors potentially associated with disturbed eating attitudes/behaviors ($p < 0.05$) identified with univariate analysis were then entered simultaneously into a multivariate logistic regression model to assess association. Student's *t* test was used to assess the difference between nutritional intake among participants with and without disturbed eating pattern.

RESULTS

There were 835 participants in this study. With ages ranging from 11 to 15 years, and a mean \pm SD age of 13.5 ± 0.96 years, the height of the participants was 156 ± 6.34 cm (range, 112-178 cm); the weight was 48.3 ± 9.57 kg (range, 24.9-113 kg); and the actual BMI was 19.7 ± 3.33 (kg/m^2). The majority of participants (63.1%) was in the acceptable weight category and 16.4% were overweight or obese (overweight 9.1%, obese 7.3%). A total of 20.5% of the participants were underweight or severely underweight, 10.2% and 10.3%, respectively.

In this study, the mean EAT-26 score was 9.17 ± 7.57 . An EAT-26 score greater than or equal to 20 indicated a tendency to develop eating disorders. The rate of adoles-

cent girls with disturbed eating attitudes/behaviors in this study was 10.4%.

Table 1 showed that there were significant differences between participants with and without disturbed eating with regard to: actual body size, body shape-related teasing experience, perceived-actual discrepancy, actual-desired discrepancy, and satisfaction with body size. Table 2 summarized how disturbed eating attitudes/behaviors were associated with varying features in the girls. There were significant associations between disturbed eating attitudes/behaviors (based on EAT-26) and overweight/obese, moderate level and higher level of being teased, overestimation of body size, desired smaller BMI, hope to be thinner. Table 3 showed the multivariate association between independent factors and disturbed attitudes/behaviors. We found that a higher level of being teased and the hope to be thinner were two factors significantly associated to EAT(+) participants.

Table 4 shows that the average daily caloric intake of EAT(+) adolescent girls was significantly lower than those of EAT(-) ($p < 0.0001$). The reported daily intakes, in grams, of the three major nutrients (protein, carbohydrate, and fat) in EAT(+) girls were significantly lower than those in EAT(-) girls ($p < 0.001$; $p < 0.0001$; $p < 0.001$). The crude and dietary fiber intake in EAT(+) adolescent girls was significantly higher than those of EAT(-) ($p < 0.001$; $p < 0.001$). The zinc intake of EAT(+) adolescent girls was 6.54 ± 2.03 mg, which was significantly lower than that of EAT(-) (7.59 ± 2.71 mg) ($p < 0.001$) (Table 5). No statistically significant differences were found in dietary intake of other minerals between the two

Table 2. Univariate association with disturbed eating attitudes and behaviors

Independent variable	Levels	Eating Attitudes Test-26 (EAT-26)		
		EAT(+) (%) (Disturbed eating)	RR (Relative Risk)	95% Confidence Interval
Actual body weight category (n=812)	Severely underweight	3.5	Ref	
	Underweight	3.5	1.01	0.20-5.17
	Acceptable weight	63.9	3.25	0.99-10.6
	Overweight*	12.8	4.71	1.26-17.6
	Obese***	16.3	8.40	2.29-30.8
Body shape-related teasing scale (n=809)	Never get teased	9.4	Ref	
	Lower level	42.4	1.42	0.65-3.13
	Moderate level***	24.7	3.72	1.59-8.74
	Higher level***	23.5	10.75	4.56-26.5
Perceived-actual discrepancy (n=809)	-1 (underestimation)	4.6	0.62	0.21-1.76
	0 (correct estimation)	33.7	Ref	
	1 (overestimation)*	51.2	1.65	1.01-2.71
	≥ 2 (overestimation)*	10.5	2.48	1.09-5.59
Actual-desired discrepancy (n=796)	≤ -1 (desired fatter)	0	-	-
	0 (equal to desire)	37.2	Ref	
	1 (desire thinner)*	37.2	1.70	1.01-2.86
	≥ 2 (desired thinner)**	25.6	2.61	1.45-4.72
Satisfaction with body weight (n=814)	Hope to be heavier	0	-	-
	Hope to be thinner**	95.3	9.23	3.34-25.5
	Keep current weight	4.7	Ref	

For the correlate analysis, univariate logistic regression was used between independent variables and disturbed eating attitudes and behaviors. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Perceived-actual discrepancy: score obtained from subtracting actual body size from perceived body size (≥ 1 : overestimation; =0: correct estimation; ≤ -1 : underestimation).

Actual-desired discrepancy: score obtained from subtracting desired body size from actual body size (≥ 1 : desired body size less than actual body size; =0: desired body size agree with actual body size; ≤ -1 : desired body size higher than actual body size).

Table 3. Multiple logistic regression model for disturbed eating attitudes and behaviors

Independent variable	Levels	Relative Risk	95% confidence interval
Actual body weight category (n=812)	Severely underweight	Ref	
	Underweight	0.36	0.35-1.60
	Acceptable weight	0.26	0.66-1.44
	Overweight	0.31	0.41-1.63
	Obese	0.24	0.48-2.70
Body shape-related teasing scale (n=809)	Never get teased	Ref	
	Lower level of being teased	1.07	0.46-2.47
	Moderate level of being teased	1.87	0.71-4.95
	Higher level of being teased**	4.88	1.71-13.9
Perceived-actual discrepancy (n=809)	-1 (underestimation)	1.19	0.42-3.36
	0 (correct estimation)	Ref	
	1 (overestimation)	1.46	0.78-2.71
	≥2 (overestimation)	1.86	0.66-5.25
Actual-desired discrepancy (n=796)	≤-1 (desired fatter)	-	-
	0 (equal to desire)	Ref	
	1 (desire thinner)	1.54	0.82-2.91
	≥2 (desired thinner)	1.71	0.79-3.70
Satisfaction with body weigh n=814	Hope to be heavier	-	-
	Hope to be thinner**	4.76	1.57-14.4
	Keep current weight	Ref	

Multiple logistic regression was used to compare difference in odds ratios for tendency of eating disorders across independent variables. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Perceived-actual discrepancy: score obtained from subtracting actual body size from perceived body size (≥1: overestimation; =0: correct estimation; ≤-1: underestimation).

Actual-desired discrepancy: Score obtained from subtracting desired body size from actual body size (≥1: desired body size less than actual body size; =0: desired body size agree with actual body size; ≤-1: desired body size higher than actual body size).

Table 4. Daily macronutrient intakes between participants with and without disturbed eating attitudes and behaviors

	EAT(+) n=80	EAT(-) n=680
Energy intake, Kcal***	1403 ± 419	1617 ± 406
Protein, g**	52.4 ± 16.2	59.6 ± 18.1
Carbohydrate, g***	193 ± 65.4	222 ± 62.3
Fat, g**	47.7 ± 16.9	55.0 ± 18.7
Crude fiber, g**	3.41 ± 1.99	2.86 ± 1.79
Dietary fiber, g**	10.2 ± 5.64	9.08 ± 4.61

Participants had score of EAT-26 above the cut-off score (≥20), which showed EAT(+), otherwise showed EAT(-)

Student's *t* test was used to assess the difference in nutrient intakes between EAT(+) and EAT(-). * $p < 0.05$. ** $p < 0.001$. *** $p < 0.0001$.

groups. The mean dietary intake of vitamins B-6 and B-12 in EAT(+) participants were 0.78 ± 0.33 mg and 1.99 ± 1.32 µg, respectively, which were significantly lower than those in EAT(-) participants (0.88 ± 0.36 mg and 3.79 ± 5.34 µg, $p < 0.05$ and $p < 0.001$, respectively). No statistically significant differences were found in dietary intake of other vitamins between the two groups. The cholesterol intake of EAT(+) adolescent girls was significantly lower than that of EAT(-) ones (Table 4). Overall, the results of the 24-hour dietary recall showed that EAT(+) adolescent girls had a lower level of nutritional intake than EAT(-) adolescent girls.

DISCUSSION

Many Asian countries have used the EAT-26 questionnaire to measure the rate of eating disturbance among adolescent girls. For example in Japan, Nishizawa found

Table 5. Comparison of minerals, vitamins and cholesterol intake between participants with and without disturbed eating attitudes and behaviors

	EAT(+) n=80	EAT(-) n=680
Calcium, mg	375 ± 292	344 ± 239
Magnesium, mg	154 ± 58.8	160 ± 50.8
Phosphorus, mg	733 ± 271	773 ± 265
Iron, mg	7.01 ± 3.30	7.96 ± 3.59
Zinc, mg**	6.54 ± 2.03	7.59 ± 2.71
Vitamin A, µg RE	1150 ± 1347	1111 ± 1079
Vitamin E, α-TE	5.30 ± 2.80	5.35 ± 2.50
Vitamin B-1, mg	0.72 ± 0.31	0.81 ± 0.72
Vitamin B-2, mg	0.95 ± 0.48	0.98 ± 0.52
Niacin, mg NE	10.9 ± 5.80	12.3 ± 6.27
Vitamin B-6, mg*	0.78 ± 0.33	0.88 ± 0.36
Vitamin B-12, µg**	1.99 ± 1.32	3.79 ± 5.34
Cholesterol, mg*	242 ± 150	289 ± 189

Participants had score of EAT-26 above the cut-off score (≥20), which showed EAT(+), otherwise showed EAT(-)

Student's *t* test was used to assess the difference in nutrient intakes between EAT(+) and EAT(-). * $p < 0.05$. ** $p < 0.001$

that high school girls overall scored 8.0 ± 5.0 .⁵ In Hong Kong, Lee's result was 9.74 ± 7.19 ,⁷ and Ku's finding in Taiwan was 10.8 ± 8.9 .³¹ Therefore our result of 9.17 ± 7.57 were similar to that from previous studies.

The rate of disturbed eating attitudes and behaviors (measured by EAT-26) in adolescent girls was 10.4%, which was similar to the 10.3% in Korean and 11.2% in Japanese female adolescents who scored above the recommended cut-off (≥20) for disturbed eating pattern on the EAT-26.^{5,32} However, this result was significantly higher than the 6.3% reported by Lai in 2002 from female

middle school students who scored above the EAT-26 cut-off (≥ 20) in Taipei County, Taiwan.³³ This data should be followed up to determine the possibility of increasing prevalence of disturbed eating attitudes and behaviors among adolescent girls in Taiwan. However, it was still lower than the 17.3% (measured by $EAT-26 \geq 20$) found in female adolescents in Canada.³⁴

Disturbed eating behaviors were believed to be a phenomenon among female adolescents. In our study, no differences in the rate of disturbed eating were noted across age groups (11-15 years old). These findings were consistent with observations from the West.³⁵ Further, a study on secondary school students in Hong Kong conducted by Tam *et al.*,³⁶ also indicated no significant relationship between eating disorders and age (aged 11-18).

Adolescents face significant challenges that relate to psychological and physical development; therefore, puberty is a risky time for adolescents with regard to the development of eating disorders.³⁷ According to our study, there is no significant difference between participants with or without disturbed eating across the degree of pubertal development (Table 1). However, a longitudinal study indicated that boys or girls who enter puberty earlier will most likely undertake unhealthy weight loss approaches when compares to those who enter puberty later.³⁸ Another study also found that adolescence was a phase in which many cases of eating disorder developed, and also showed that many adolescents occasionally or frequently undertook inappropriate dieting behaviors like fasting, skip meals, taking laxatives, or intentional vomiting.⁴ Therefore, further longitudinal research is needed to evaluate the connection between adolescents' development and disturbed eating attitudes and behaviors among female adolescents.

In this study, overweight and obesity were associated with EAT-26 scores in univariate analysis. However, this association disappeared after the multivariate analysis was performed. In previous adolescent and adult studies, Alves *et al.* found that participants with disturbed eating (based on $EAT-26 \geq 21$) tended to have large body sizes,³⁹ and Marano *et al.* indicated that there was a significant positive correlation between participants' BMI and the score of EAT-26.⁴⁰ However, studies in adolescents from Taiwan and Korea reported that there were no significant associations between elevated EAT-26 scores and actual body size.^{33,41} The differences between Western and Eastern studies may vary based on ethnicity. Chinese women have been found to have higher body fat percentages compare to western groups with the same BMI.^{42,43} Furthermore, body dissatisfaction relate not only the body weight but, particularly in females, specific body parts such as circumference of hips, which indeed may predict body shape dissatisfaction better than fatness perception. The intense loathing of body parts such as the stomach or thighs may predispose non-obese individuals to weight control measures and eating disorders.^{44,45} The limitation to our study was that we did not measure students' body fat percentage, waistline, circumference of hips and thighs. Therefore, the hypothesis on the aforementioned factors, which may be more associated with the increased prevalence in eating disorders than actual body weight, could not be investigated.

This study showed that history of being teased because of reasons related to body size was a risk factor for developing disturbed eating attitudes and behaviors among Taiwanese adolescents both in the univariate and multivariate analyses (Tables 2 and 3). This finding supports Thompson's results from a longitudinal study that followed up 210 adolescent girls (aged 10-15 years) for 3 years,⁴⁶ and showed that adolescent girls with more experience of being teased had lower body satisfaction. A study by Libbey *et al.* also indicated that frequent teasing was associated with greater disordered eating thoughts and behaviors.⁴⁷ The more adolescents were bothered by peer and family teasing, the more often they reported a greater value on thinness. Therefore, they were more likely to develop eating disorders.

Our results showed that the greater the difference between perceived body size and actual body size, the higher the risk of developing disturbed eating attitudes/behaviors in univariate analysis. Similar results from other studies on adolescent girls showed that inaccurate self-perceived body image was an important risk factor for developing disturbed eating behaviors.^{28,46,48} Numerous studies have demonstrated that overestimation of body weight, body dissatisfaction and inappropriate body image all relate closely to the development of eating disorders.^{3,31,49,50} A longitudinal study on junior high school students in England indicated that the participants who had a negative weight image during puberty tended to have disturbed eating attitudes and behaviors (measured by EAT-26).⁵¹ However in multivariate analyses, perceived-actual discrepancy was not a significant factor among other variables for disturbed eating in this sample. Therefore, more research focusing on Asians are needed to investigate the factors related negative body image, and thus the development of disturbed eating among adolescents.

Unrealistic weight loss goals is another important factor leading to eating disorders.¹¹ Our results showed similar observation on desired-actual discrepancy, which associated with disturbed eating in univariate analysis. This finding was also consistent with the results of many other studies.^{17,49,52} The greater the difference between actual body size and desired body size, the higher the risk of having a tendency to develop eating disorders. However in multiple analysis, actual-desired discrepancy was not a significant factors among other variables for disturbed eating in this sample. One possible reason for this result could be related to the accuracy of expression on self-reported desired weight responses in the survey from 11-15 year-old girls.

Adolescent girls' attitude of "hope to becoming thinner" has been found to be the most important factor for developing disturbed eating attitudes/behaviors (table 2 and 3). The results resembled that of Mellor *et al.* and Moreau *et al.*'s that found that body dissatisfaction was the main cause of eating disorders.^{53,54} Moreover, research in Hong Kong also showed that "body dissatisfaction" was a predictor of eating disorders.³⁶

Analyses of food intake during meals and through dietary recalls found caloric intake in patients with anorexia nervosa to be significantly less than healthy controls.^{18-20,55} A similar phenomenon was found in the participants with disturbed eating attitudes/behaviors in our study.

Another study also showed similar findings, with the energy intake of female athletes was negatively related to EAT scores.⁵⁶ Furthermore, a study showed that the 24-hour dietary recall of eating disorder sufferers have higher reliability than the general participants, because eating disorders sufferers are more concerned about their energy and food intake consumption than the participants without eating disorders.⁵⁷ In addition, Hadigan indicated that in general, people who apply 24-hour dietary recalls and records to evaluate food intake commit to an underestimation tendency.⁵⁷ Therefore, based upon the aforementioned studies, the difference between EAT(+) and EAT(-) participants in terms of energy and nutrient intakes was possibly greater than our present research findings.

This study found that the reported daily average caloric intake of EAT(+) adolescent girls was significantly lower than that of EAT(-) adolescent girls, and that the reported daily intake of three major macronutrient groups in EAT(+) adolescent girls were significantly lower than those of EAT(-) adolescent girls. Crude fiber and dietary fiber intake of EAT(+) adolescent girls were significantly higher than those of EAT(-) adolescent girls (Table 4). These results were similar to those of Chang's study, which found that total energy, protein, and carbohydrate intake of EAT(+) female high school students were significantly lower than their EAT(-) counterparts. Again, crude fiber and dietary fiber intake of EAT(+) participants were also significantly higher than those of EAT(-) participants.⁴⁸

This study showed the significant lower fat intakes in the EAT(+) group than in the EAT(-) group. Roefs *et al.* found that patients with anorexia will choose not to eat high-fat meat, including bacon, sausage, steak, or lamb chops. Instead, they will select low-calorie and low-fat foods,⁵⁸ which may explain why the fat intake of EAT(+) participants was significantly less than that of EAT(-) participants. Beals and Manore studied the difference in actual nutritional intake between female with anorexia and a comparison group. They found that energy and intake of three major nutrients were significantly lower in female with anorexia than in the comparison group.⁵⁹ In addition, the research conducted by Mortenson and others also indicated that the participants who were dissatisfied with weight and currently were dieting consumed lower quantities of meat and high-calorie snacks than those who were satisfied their weight.⁶⁰ Our results seemed to respond to their observation.

The zinc intake of EAT(+) adolescent girls was significantly lower than that of EAT(-). One possible reason is because the main sources of zinc are animal products such as red meat, seafood, milk, eggs.⁶¹ Since EAT(+) participants consumed less protein, this may be the reason for their lower zinc intakes when compared to EAT(-) participants. A similar phenomenon was also found by Chang's study and some other studies that discovered anorexia nervosa sufferers had zinc deficiency.^{48,62,63} In addition, patients with bulimia and anorexia often exercise excessively, which may increase the body's demand for zinc. Zinc deficiency can occur easily if dietary zinc intake is not adequate.⁶⁴ Moreover, the body's demand for zinc increased during puberty; therefore, adolescents are at a higher risk of being zinc deficient than people at oth-

er developmental stages.⁶⁵

Cholesterol intake of EAT(+) adolescent girls was significantly lower than that of EAT(-) (Table 5). Again, this may be due to less animal protein consumption among individuals in EAT(+) group. This same reason may also explain why EAT(+) adolescent girls had less Vitamin B6 and B12 intake than their EAT(-) counterparts. However, EAT(+) group had higher BMIs, so some of them may practice food restriction or have abnormal binge episodes. These abnormal behaviors could possibly affect the accuracy of these participants' 24-hour dietary recall and thus confound the results.

The limitations of this study include problems inherent in any cross-sectional survey. For example, since this was not a longitudinal study, we were not able to assess the progression of our participants' symptoms over time. Also, we utilized self-reported measurements, which may have concerns in terms of underreporting or underestimation of eating disorder's symptoms. This may influence the reliability of our results. Lastly, we collected data only from participants who agreed to participate in this study, so the results may not be representative of all Taiwanese girls aged 11-15.

CONCLUSION

Disturbed eating behaviors do exist in female adolescents in Taiwan, which may jeopardize their nutritional status. EAT(+) participants had poor nutritional intake in comparison to EAT(-) participants. The possibilities of using EAT-26 as a reference to predict the quality and quantity of food intake among female adolescents warrants further research.

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AUTHOR DISCLOSURES

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Original Article

Survey on eating disorders related thoughts, behaviors and dietary intake in female junior high school students in Taiwan

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臺灣國中女生對病態飲食行為相關的思維、行為及飲食攝取狀況

本研究主要目的在瞭解台中市國中女生與病態飲食行為相關的體型滿意度、飲食態度及飲食攝取狀況。本研究為橫斷式調查，共有 835 位國中女生參與本研究。以匿名自填式問卷為研究工具，內容包括：基本資料、體型意識、體型受嘲笑經驗量表、青春期發展量表、飲食態度測驗及 24 小時飲食回憶法。結果發現，有 10.4% 的受試者為具病態飲食行為傾向的高危險群（EAT-26 \geq 20）。多元邏輯回歸顯示「體型受嘲笑經驗」及「體型不滿意度」與病態飲食行為傾向間有顯著相關性。具病態飲食行為傾向的高危險群，其熱量、蛋白質、醣類、脂質、膽固醇、維生素 B₆、B₁₂ 及鋅的攝取量顯著低於低危險群（EAT-26 $<$ 20）；但在粗纖維及膳食纖維的攝取，則顯著高於低危險群。病態飲食行為相關問題確實存在於台灣的青春女性，且已經影響其飲食攝取狀況，飲食態度測驗(EAT-26)是否可預測青少年的飲食攝取狀況值得更進一步研究。

關鍵字：病態飲食行為、體型意識、EAT-26、飲食態度測驗、國中女生