The Risk of Eating Disorders Among Female Undergraduates in Taiwan

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The objective of this study was to investigate disordered eating among female college students. The study sought to establish a predictive model for the risk of eating disorders in young female university students in Taiwan. A group of 336 student participants were recruited with the results showing that more than one third (43.2%) of the college women surveyed were identified to be at risk for developing an eating disorder. The results of multiple logistic regression showed that bulimia score, elevated depression index, eating binges, the use of laxatives and medicine to control weight, and having lost 20 lb, or more, in the past 6 months were all considered to be risk factors for developing an eating disorder (the corresponding area under receiver operating characteristic curve = 0.905). The results demonstrate that unhealthy dietary behaviors are rapidly spreading among young Taiwanese female students. For the sample described in this article, 67.6% of the female college students had lost weight: 51% had dieted at least once to lose weight, 43% used exercise to lose weight, 24% used low-calorie diets to lose weight, 11% used healthy food to lose weight, 9.2% used rubber clothing and a diet patch to lose weight, 17.9% of the students used weight-loss drugs, and a few students sought medical assistance from weight-loss clinics or actually underwent liposuction (1.5%).
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EATING DISORDERS HAVE been extensively reported upon in Western countries, and it is considered common for Western female college students to report dissatisfaction with their body image (Page, Lee, & Miao, 2005; Shih & Kubo, 2005; Wong & Huang, 1999). Globally, female students have been reported to use weight-control methods, such as dieting, medications, and purging to lose weight when attending university. A similar phenomenon has been noticed to be increasing in Taiwan in recent years with young female students coming under increasing social and cultural pressure to be physically fit and to lose weight (Tsai, 2000). Some of the weight-control measures being used by Taiwanese students have had a severe impact on their physical and mental health (Fairburn & Harrison, 2003; Tseng, Lee, Lee, & Chen, 2004).

The incidence of anorexia nervosa for young women is reported to be 0.7% to 1.1% (Fairburn & Harrison, 2003), with the incidence of bulimia nervosa also at 0.7% to 11.7%. The ratio of male to females experiencing an eating disorder is 1:10 (Devlin, Jahraus, & Dobrow, 2005; Keel, Heatherton, Dorer, Joiner, & Zalta, 2006). In addition, it has been proposed that the ratio of patients with disordered eating symptoms against those who do not meet the diagnostic criteria for anorexia/bulimia is 5:1 (Szweda & Thorne, 2002). Long-term epidemic trend research further shows that the 10-year mortality rate of anorexia nervosa is 6% to 7%, and for those affected over a longer period (20–30 years), their mortality rate has increased to 18% to 20%; the mortality rate of bulimia nervosa is estimated at 0% to 19% (Clarkin-Watts, 1996). Furthermore, growing concern has been recently directed at the increasing level of eating disorders among young Asian women in Japan, Korea, Hong Kong, and China (Chang, Liou, Sheu, & Chen, 2004; Lee & Lee, 2000; Tang, Cheng, & Chen, 2004). Of the few studies that have been conducted in Asia, early intervention and diagnosis of eating disorder have had most of the focus (Lee & Lee, 2000; Tang et al., 2004). This is particularly so in the context of preventing a lifelong behavioral problem developing through early diagnosis and appropriate intervention (Ben-Tovim et al., 2001). Bendelius (2005) stressed that early detection is essential to enable early intervention to have an effect on long-term prognosis. Previous studies have also found that weight-loss behaviors could predict bulimia, including an abnormal diet, and risk of developing an eating disorder in the future (Beato-Fernandez, Rodriguez-Cano, Belmonte-Llario, & Martinez-Delgado, 2004; Neumark-Sztainer et al., 2006).

There has been no previous data reported on the identification of predictive risk factors for the development of anorexia or bulimia in female college students in Taiwan.

The objectives of this descriptive comparative study, therefore, were the following:

- identify the risk of eating disorder among a group of female undergraduate college students in Taiwan;
- compare and contrast participants' demographic characteristics, body image perception, depression, and the impact of social pressure on body image between students with and without the risk of eating disorder; and
- utilize results to enable future female students and those involved in the study to recognize the need for early intervention, education, and/or treatment if falling into the at risk category for developing an eating disorder.

LITERATURE REVIEW

Eating disorder is now a global health problem for adolescents and young adult women (Devlin et al., 2005; Keel et al., 2006). Studies also suggest that there may be different rates for the risk of developing eating disorders related to identified symptomatology in different ethnic female groups (Wiseman, Peltzman, Halmi, & Sunday, 2004). Individuals with disordered eating usually hide or deny their dietary problems or morbid behavior, and few are reported to voluntarily go to the doctor for a consultation about their disordered behaviors. Symptoms of eating disorders, such as uncontrollable bulimia, excessive diet, and psychological disturbances due to significant body image dissatisfaction, are quite common among young females with an eating disorder (Chang et al., 2004). In regard to the physical problem of a concomitant high ratio of individuals with anorexia nervosa and bulimia nervosa, common complaints from patients include fatigue, physical weakness, abdominal pain, dizziness, cold intolerance, diarrhea, constipation, dental problems, and irregular menstruation. Body disorders further include upper

gastrointestinal bleeding, salivary gland enlargement, amenorrhea, osteoporosis, edema, and erosion of dental enamel (Cartwright, 2004; Sadock & Sadock, 2003; Tseng, Ko, & Lee, 2001).

Previous studies have also demonstrated that demographic characteristics (gender), psychological characteristics (body image perception, negative emotion, premorbid depression), and social factors (the impact of social pressure on body image) are critical risk factors for the development of eating disorders in young adult women (Beato-Fernandez et al., 2004; Striegel-Moore et al., 2007). Eating disorders are one of the most common mental disorders for young females and girls, with the potential to ameliorate over the short time or conversely to become recurrent and chronic situations if not resolved early enough (Cotrufo, Gnisci, & Caputo, 2005; Fairburn, Cooper, Doll, Norman, & O'Connor, 2000; Lewinsohn, Striegel-Moore, & Seeley, 2000). The pathological characteristics of disordered eating serve to increase the risk of obesity, depression, and substance abuse (Stice, Hayward, Cameron, Killen, & Taylor, 2000). Weight-control behaviors (such as dieting, eating less fats, exercising, skipping meals, fasting, and vomiting) have been shown to be related to eating disorders (Wade, Davidson, & O'Dea, 2003; Wiseman et al., 2004). Studies further support the hypothesis that dieting and a negative emotional affect can facilitate the development of an unhealthy attitude toward body image, which then can lead to the development of individual behaviors characteristic of eating disorders (Cahill & Mussap, 2007). In the Chinese culture, for example, thinness is considered important by Chinese women, placing further pressure on women to remain thin. These women internalize the thin ideal, value and frequently engage in body comparisons with their peers, and experience a depressed mood. Individuals with an unclear body image would be most susceptible to social culture pressure, and this can in turn lead to the risk of developing disordered eating behaviors (Cahill & Mussap, 2007). On the basis of the foregoing literature and previous research, it appears that body image perception, dietary restraint, weight-control behaviors, depression, and the impact of social pressure to be thin are especially important for understanding the risk of a current or potential eating disorder in young adult women.

METHOD

Participants and Recruitment

Three hundred forty-two female college students, freshmen to seniors, were recruited from two universities in Northern Taiwan. The survey was conducted between February and May 2006. A research questionnaire with five sections was administered to all members of a particular class during the college semester. Ethical approval was obtained from the participating institutional Human Research and Ethics Committees prior to the study commencing. Students willing to participate in the research study were then provided with an information letter that asked them to give their written informed consent to completing the various survey measures and to publish results of the 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. Students who completed the questionnaire received a small gratuity for their participation in the study; 98.2% of the women ($N = 336$) completed the administered questionnaires.

Instruments

The study questionnaire itself contained five separate sections: (a) basic demographic characteristics, (b) the Multidimensional Body-Self Relations Questionnaire, (c) the Beck Depression Index II (BDI-II), (d) the Social Impact Scale, and (e) the Eating Disorders Inventory (EDI). Demographic characteristics asked for included the student's age, grade, height, weight, desired weight, dietary experience, regularity of menses, history of weight loss and the methods used to lose weight, and the student's reasons for trying to lose weight. Body image information was gathered with a Chinese-translated version of the Multidimensional Body-Self Relations Questionnaire (MBSRQ; Cash, 2002; Cash & Pruzinsky, 1990). The MBSRQ is a 69-item self-report questionnaire measuring attitudes toward body image. The MBSRQ includes seven factors and three additional subscales that measure appearance evaluation, appearance orientation, fitness evaluation, fitness orientation, health evaluation, health orientation, illness orientation, body areas satisfaction, overweight preoccupation, and self-classified weight. The MBSRQ contains a 5-point Likert scale scoring system, where the

score for each subscale represents each described aspect of a participant's body image.

The BDI-II was used to evaluate depressive symptoms over the past 2 weeks prior to the administration of the questionnaire. The 21 questions on the BDI-II evaluated emotion, cognition, behavior, and the level of depression experienced by each particular participant. The BDI-II was scored on a 4-point Likert scale of 0 to 3, according to severity. Subjects selected the most appropriate description of severity for each symptom. These descriptions conformed to "the condition experienced over the past 2 weeks, including today" (Beck, Steer, & Brown, 1996). The Chinese version of Beck's Depression Inventory is consistent with that of overseas research according to the receiver operating characteristic (ROC) curve, in that it uses the 10-point mark to separate normal and minimal depression. Reliability of the test results is indicated by an internal consistency (reliability) alpha value of .87; the split-half reliability test coefficient was 0.94. This questionnaire can effectively distinguish between severe, minimal, and no depression (Chang, Ko, Yeh, & Lu, 1996).

The Social Impact Scale includes three subscales: family, peers, and media. There are 5 questions about family members, 10 questions about peer influence, and 8 questions about media influence. The family influence scale measures the body evaluation made by family members of the subject and the degree of stress caused by their evaluation. The peer influence scale measures the participant's perception of the way peers evaluate their body and the extent of stress caused by a comparison with peers. A higher score on the scale indicates greater stress. The media influence scale includes three subscales, namely, incorporation of media messages, comparison with media personalities, and stress from media to lose weight or to conform to certain types of body image. Again, a higher score on the scale indicates greater stress. The internal consistency reliabilities of the three subscales ranged from 0.86 to 0.96 in a previous Taiwanese study (Tang et al., 2004).

Garner, Olmstead, and Polivy (1983) developed the EDI as a self-report measure of psychological and behavioral traits common in anorexia nervosa and bulimia nervosa. The EDI is widely used in related studies of eating disorder and has been translated into multiple languages and further used to study cross-cultural situations. The EDI has demonstrated cross cultural reliability with an alpha value of .95 in other Taiwanese research (AlSubaie et al., 1996; Lee, Lee, Leung, & Yu, 1997; Nakano, 2005; Tseng et al., 2001). The Eating Disorder Inventory-3 Referral Form (EDI-3-RF) was used as the basis for establishing the risk of eating disorder for the subjects involved in the study. Participants were classified as at risk for developing an eating disorder if they were (a) were more than 18 years of age and had a body mass index (BMI) less than 18.0 kg/m^2, (b) if their original scores of drive for thinness or bulimia were higher than the corresponding critical values of BMI, and (3) if over the last 3 months, they had binge-eaten more than twice per month, purged, used laxatives, exercised more than 60 minutes a day, or had a weight loss of at least 20 lb (9.1 kg) within the past 6 months (Garner, 2004).

Statistical Analysis

Descriptive characteristics of the samples were collated and described. For continuous variables, two independent sample t tests were used for the normally distributed data to compare the differences between two groups; otherwise, the Mann–Whitney U tests were applied for nonnormally distributed data. The Pearson chi-square tests were used for the comparisons of categorical data between two groups. To establish the potential risk factors of eating disorder, the univariate and/or multiple logistic regression models were used. The former was applied for evaluating the single-factor effect (ignoring the possible influence from other factors' effects), and the latter was applied for evaluating factor effect after adjusting the effects of other factors. The statistical packages used in this study were SPSS/PC 15.0 (SPSS Inc., Chicago, IL) and STATA 9.1 (StataCorp, Texas, USA). Statistical significance was defined as $P > .05$.

RESULTS

Demographic and Weight-Loss Characteristics

Participants were between 18 and 37 years of age (average age = 20.79 ± 1.98, mean value ± standard deviation). BMI ranged between 14.88 and 38.57 kg/m^2 (average = 20.73 ± 2.86 kg/m^2). There were no statistically significant differences between the two universities surveyed in age, BMI, and percentages of eating disorder. However, as

Table 1. MBSRQ Scores of Female College Students

Scales	Research Subjects (N = 336)	Group With Risk (n = 146)	Group Without Risk (n = 190)	Z and P Values
Appearance evaluation	3.02 ± 0.63	2.85 ± 0.67	3.16 ± 0.56	Z = −4.61, P < .001‡
Appearance orientation	3.84 ± 0.51	3.88 ± 0.52	3.82 ± 0.50	Z = −1.01, P = .31
Body areas satisfaction scale	2.85 ± 0.60	2.71 ± 0.61	2.95 ± 0.58	Z = −4.09, P < .001‡
Health evaluation	3.32 ± 0.67	3.22 ± 0.69	3.41 ± 0.65	Z = −2.28, P = 0.02*
Health orientation	3.38 ± 0.39	3.36 ± 0.40	3.40 ± 0.39	Z = −1.01, P = .31
Illness orientation	3.42 ± 0.62	3.37 ± 0.65	3.46 ± 0.59	Z = −1.39, P = .17
Overweight preoccupation	3.00 ± 0.79	3.18 ± 0.80	2.85 ± 0.76	Z = −4.00, P < .001‡
Fitness evaluation	3.19 ± 0.84	3.18 ± 0.86	3.20 ± 0.84	Z = −0.16, P = .87
Fitness orientation	3.27 ± 0.52	3.22 ± 0.55	3.31 ± 0.50	Z = −1.08, P = .28
Weight evaluation	3.52 ± 0.86	3.60 ± 0.96	3.46 ± 0.78	Z = −2.31, P = .02*

NOTE. Values are expressed as mean ± standard deviation.

  * P < .05.

  ‡ P < .001.

for a history of weight loss, 67.6% of all students had tried to lose weight. Methods used to lose weight for participants included dieting (51.2%), exercise (42.9%), low-calorie diet (24.4%), healthy food (10.7%), rubber clothing, applying a diet patch (9.2%), and ingesting diet pills (17.9%).

Data from the EDI-3-RF demonstrated that for the past 3 months, 31.3% of all the students had binge-eaten more than twice per week, and 33% had exercised for 60 minutes or longer more than twice per week. The data demonstrated that 5.4% of the students surveyed controlled their weight through purging, 8.9% used laxatives to control their weight, and 3.6% had more than a 20-lb weight loss within the past 6 months.

Risk of Eating Disorder and Related Factors

According to the EDI-3-RF, 43.2% of all subjects were at risk of developing an eating disorder.

Subjects at risk (n = 143) were an average of 20.62 ± 1.71 years old. This was not statistically different from the age of those (n = 181) who were not at risk of eating disorder (average age = 20.92 ± 2.17, t = 1.36, P = .18). The average BMI of the group at risk of eating disorder (n = 146) was 20.90 ± 3.37 kg/m^2, which was not statistically different from the group who were not at risk of eating disorder (20.61 ± 2.38, n = 188, t = −0.88, P = .38).

As for body image measured by the MBSRQ, the nonparametric test, that is, Mann–Whitney U, was used to compare the average scores of the different subscales due to the violation of normal distribution assumption, which was critical for independent t test. As shown in Table 1, women in the group at risk of eating disorder had lower average score in appearance evaluation, body areas satisfaction, and health evaluation than those in the group not at risk of eating disorder.

Table 2. EDI Scores Among Female Taiwanese College Students

Scale	Research Subjects (n = 335)	Group With Risk (n = 146)	Group Without Risk (n = 189)	Z and P Values
Body dissatisfaction	14.9 ± 7.12	17.4 ± 7.19	13.0 ± 6.46	Z = −5.91, P < .001†
Bulimia	3.76 ± 4.73	6.80 ± 5.40	1.40 ± 2.11	Z = −10.40, P < .001†
Drive for thinness	7.16 ± 5.17	9.36 ± 5.44	5.47 ± 4.25	Z = −6.52, P < 0.001†
Ineffectiveness	7.01 ± 6.35	8.92 ± 6.72	5.52 ± 5.64	Z = −4.82, P < .001†
Interceptive awareness	5.85 ± 5.83	8.19 ± 6.58	4.05 ± 4.20	Z = −6.13, P < .001†
Interpersonal distrust	3.49 ± 3.26	3.82 ± 3.32	3.24 ± 3.20	Z = −1.77, P < .08
Maturation fears	9.32 ± 5.23	10.7 ± 4.87	8.22 ± 5.25	Z = −4.90, P < .001†
Perfectionism	7.46 ± 4.69	8.18 ± 5.03	6.90 ± 4.35	Z = −2.35, P < .02*
Total score of scale	59.0 ± 27.2	73.5 ± 27.7	47.8 ± 20.9	Z = −8.59, P < .001†

NOTE. Values are expressed as mean ± standard deviation.

  * P < .05.

  † P < .001.

Table 3. BDI-II Scores for Female College Students and Different Percentages of Depression

Explanatory Variables	Research Subjects (n = 333)	Group With Risk (n = 144)	Group Without Risk (n = 189)	Z and P Values
Depression inventory	9.68 ± 8.18	12.99 ± 9.33	7.16 ± 6.10	$Z = -6.36, P < .001*$
Normal range				
n (%)	245 (73.6)	81 (33.1)	164 (66.9)	
0–13	5.81 ± 3.69			
Mild depression				
n (%)	53 (15.9)	34 (64.2)	19 (35.8)	Pearson's $\chi^2 = 42.19$
14–19	15.58 ± 1.35			$P < .001*$
Moderate depression				
n (%)	22 (6.6)	18 (81.8)	4 (18.2)	
20–28	23.18 ± 2.63			
Severe depression				
n (%)	13 (3.9)	11 (84.6)	2 (15.4)	
29–63	35.69 ± 5.39			

NOTE. Values are expressed as mean ± standard deviation unless otherwise indicated.

 * $P < .001$.

In contrast, their average scores on the two subscales in the MBSRQ, overweight and self-classified weight, were higher than those students not at risk of eating disorder. The aforementioned differences were statistically significant (Table 1).

On the EDI, students in the group at risk of eating disorder had a significantly higher average score on the subscales for body dissatisfaction, bulimia, drive for thinness, ineffectiveness, interceptive awareness, perfectionism, and maturation fears than those women in the group not at risk of eating disorder (Table 2).

On the BDI-II, overall scores ranged from 0 to 46; the average score was 9.68 ± 8.18. As shown in Table 3, the average BDI-II score for students in the group at risk of eating disorder was significantly (P

< .001) higher than that for the group of students who were not at risk of eating disorder (12.99 ± 9.33 vs. 7.16 ± 6.10, respectively). Furthermore, the depression index was graded based on the BDI-II. Within the normal range, there were 81 of 245 (33.1%) at risk of eating disorder. On the other hand, for those students with mild, moderate, and severe depression, the percentages at risk of eating disorder were 64.2%, 81.8%, and 84.6%, respectively. The result of Pearson chi-square test showed that there was a significant relationship between the severity of depression and the percentages at risk of developing an eating disorder (Table 3).

Moreover, among all 333 valid students, in the group at risk of eating disorder, 10.2% (n = 34) had mild depression, 5.4% (n = 18) had

Table 4. Examine the Effect of Risk Factor on the Odds of Having Risk of Eating Disorder, Ignoring Other Factors' Effects, by the Single-Factor Logistic Regression Model (N = 336)

Characteristics and Behaviors of Students Independent Variables (Reference Group)	B	SE	Wald's χ^2	Odds Ratio	95% CI for Odds Ratio	P
BMI	0.04	0.04	0.91	1.04	0.96–1.12	.340
Bulimia total raw score	0.40	0.05	68.25	1.50	1.36–1.65	<.001[‡]
Beck Depression Inventory total raw score	0.11	0.02	34.68	1.11	1.07–1.15	<.001[‡]
Gone on eating binges (eating a large amount of food while feeling out of control) more than twice per month in the past 3 months (once a month or less)	−0.65	0.25	6.78	0.52	0.32–0.85	.009[†]
Used laxatives to control weight or shape in the past 3 months (never)	2.65	0.62	18.19	14.08	4.18–47.45	<.001[‡]
Have lost 20 lb or more in the past 6 months (never)	2.73	1.05	6.74	15.30	1.95–119.95	.009[†]
Have used any kind of medicine to control weight (never)	2.21	0.37	35.62	9.08	4.40–18.73	<.001[‡]

NOTE. CI = confidence interval.

 [†] $P < .01$.
 [‡] $P < .001$.

Table 5. Examine the Effects of Risk Factors on the Odds of Having Risk of Eating Disorder, After Adjusting the Effects of Other Factors, by the Multiple Logistic Regression Model (N = 336)

Independent Variables (Reference Group)	B	SE	Wald's χ^2	Odds Ratio	95% CI for Odds Ratio	P
Characteristics and behaviors of students						
1. BMI	−0.177	0.07	6.99	0.84	0.74–0.96	.008[†]
2. Bulimia total raw score	0.436	0.06	53.54	1.55	1.38–1.74	<.001[‡]
3. Beck depression inventory total raw score	0.07	0.02	9.38	1.07	1.03–1.12	.002[†]
4. Gone on eating binges (eating a large amount of food while feeling out of control) more than twice per month in the past 3 months (once a month or less)	−0.61	0.36	2.93	0.54	0.27–1.09	.087
5. Used laxatives to control weight or shape in the past 3 months (never)	2.10	0.86	5.89	8.14	1.50–44.33	.015*
6. Have lost 20 lb or more in the past 6 months (never)	3.69	1.17	9.89	40.22	4.02–402.01	.002[†]
7. Have used any kind of medicine to control weight (never)	1.84	0.64	8.22	6.30	1.79–22.15	.004[†]

NOTE. CI = confidence interval.

  * $P < .05$.
  [†] $P < .01$.
  [‡] $P < .001$.

moderate depression, and 3.3% (n = 11) had severe depression. In the group not at risk of eating disorder, 5.7% (n = 19) of students had mild depression, 1.2% (n = 4) of students had moderate depression, and 0.6% (n = 2) students had a severe depression.

On the social impact index, the scores on the subscales of family, peers, and media influence for students at risk of eating disorder were all higher than the scores of students not at risk of eating disorder. The results of the Mann–Whitney U tests, with Z = −4.07, Z = −4.24, and Z = −3.94, respectively, showed that all these differences reached statistical significance (all $P <$ .001, not shown).

Identifying Risk Factors of Eating Disorder

To identify the potential risk factors of eating disorder, we used the logistic regression model with the binary dependent variable Y = 1, if the student was at risk of eating disorder, and Y = 0, if the student was not at risk of eating disorder. The whole procedure was separated into two stages. The first stage was done by using single factor logistic regression, which provided a simple indication of the strength of association between the fitted independent variable and the odds of eating disorder, ignoring the other factors' effects. The odds of eating disorder, in here, was defined as the probability of at-risk of eating disorder divided by the probability of not at-risk of eating disorder, that is, odds = Prob(Y = 1) / Prob(Y = 0) in terms of statistical notations. The second stage used multiple

logistic regression models to examine the impact of potential risk factors on the odds of eating disorder, after adjusting the effects of other factors.

As shown in Table 4, ignoring other factors' effect, the odds of eating disorder increase 4% (1.04−1) for each one unit increase in the BMI (P = .340). However, one point increase of the bulimia total raw score would significantly increase the odds of eating disorder 50% ($P <$ .001). Similarly, one point increase in the BDI corresponded to an 11.0% increase in the odds of eating disorder ($P <$ .001); the odds ratio of eating disorder for those gone on eating binges more than twice per month versus once a month, or less, in the past 3 months was 0.52 (P = .009); the odds of eating disorder for those who used laxatives to control weight or shape was 14.08 times significantly higher than that of those who never used laxatives ($P <$.001); the odds ratio of eating disorder for those who had lost 20 lb or more in the past 6 months versus those who never lost 20 lb was 15.30 (P = .009); the odds of eating disorder for those who used any kind of medicine to control weight was 9.08 times higher than that of those who never used weight-control measures ($P<$ .001).

The results of multiple logistic regression models showed that after adjusting the effects of other factors, most of the results remained almost the same as the single-factor model except the BMI and where the student had lost 20 lb or more in the past 6 months (Table 5). BMI was considered to be a confounding variable. Bulimia score, elevated depression index, eating binges, the use of laxatives
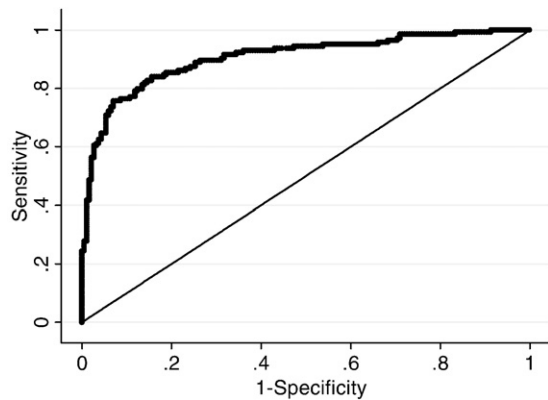
Fig 1. The corresponding ROC curve of the multiple logistic regression with AUC = 0.905.

and medicine to control weight, and having lost 20 lb or more in the past 6 months were all considered to be risk factors of developing an eating disorder. To demonstrate the predictive validity of the aforementioned model in Table 5, the corresponding ROC curve is shown in Figure 1 with the area under ROC curve (AUC) equal to 0.902.

Among the female college students in this study, 86.3% wanted to lose weight, and they expected to lose an average of 13.7 lb (6.24 kg) to achieve the weight that they were satisfied with. This result is consistent with Anstine and Grinenko's (2000) research where 91% of female college students wanted to lose weight, and an average weight loss of 11.4 lb was expected. In other published studies, the cutoff point for an increased risk of eating disorder is usually an EDI-bulimia subscale score higher than 14 (AlSubaie et al., 1996).

In this study, 5.95% of students had EDI-bulimia subscale scores higher than 14. Among students with an increased risk of eating disorder, 4.35% were freshmen, 4.17% were sophomores, 8.42% were juniors, and 6.06% were seniors. These percentages were moderately higher than those of the 2% female university freshmen in the United States reported by Miller, Schmidt, Vaillancourt, McDougall, and Laliberte (2006).

For the sample described in this article, 67.6% of the female college students had lost weight: 51% had dieted at least once to lose weight, 43% used exercise to lose weight, 24% used low-calorie diets to lose weight, 11% used healthy food to lose weight, 9.2% used rubber clothing and a diet patch, 17.9% of the students used weight-loss drugs, and a few students sought medical assistance from weight-loss clinics or actually underwent liposuction (1.5%).

DISCUSSION

The results of this Taiwanese study are consistent with those of the American and previous Asian studies reported earlier in this article. In 9,757 students surveyed in the United States for example (Kann et al., 1998), 59.7% of female college students had tried to lose weight the month before they entered the study; 7.5% used laxatives or purged; 6% used pharmaceutical products; 45.7% started a diet; and 65.4% exercised to try to control their weight.

This study analyzed the weight-loss methods utilized by female students of two colleges, and their use of exercise, rubber clothing, and diet patches was found to be significantly different between the two university samples surveyed. It can be suggested that this difference may be due to the different campus environments and the influence of peers. Several students for instance had answered the open question "Reason for taking weight-control measures," stating that their weight loss was encouraged by parents or friends.

In this study, a student who lost weight by using an unhealthy weight-loss method, such as skipping a meal, overexercising, restricting her diet, or taking medications or laxatives, would have a higher risk of having an eating disorder than would a student who did not use such weight-loss methods (Kirkley & Burge, 1989).

It is also worth noting that 17.9% of all female college students used weight-loss products such as laxatives or weight-loss drugs; 5.4% of all students tried to lose weight via purging. This percentage is higher than those reported in studies previously conducted elsewhere (Afifi-Soweid, Kteily, & Shediac-Rizkallah, 2002; Lin, 1995). The higher percentage of students using weight-loss products in Taiwan is worthy of further research. This is particularly the case where medications used to lose weight in this study are related to the easier access to diet drugs in Taiwan. In Taiwan, one can buy over the counter, without prescription, many drugs that in other countries would be controlled.

Students at risk of eating disorder had lower scores in appearance evaluation of body image; they were concerned about being overweight, were depressed, and were driven to be thin. The overall average scores of "body dissatisfaction," "bulimia,"

and "drive for thinness," for example, were higher than those reported by Hund and Espelage (2006).

Many studies have demonstrated the correlation between body dissatisfaction and disordered eating behaviors, and this study is not unique in this regard (Stice, Schupakneuberg, Shaw, & Stein, 1994; Striegel-Moore, Silberstein, & Rodin, 1986; Williamson, Cubic, & Gleaves, 1993). What is unique however is that these results are the first baseline results in Taiwan in a study of normal female college students. It is fair to say, based on the results presented, that the risk factor variables are indicative of eating disorder. Such behaviors highlight the need for therapeutic intervention during the student's academic enrollment. One limitation of the study perhaps is the need to identify the student's motivation to seek treatment if they fall into the group identified at being at risk of developing an eating disorder. It is also appropriate to suggest, especially given the community and kinship orientation to family and friendships in Taiwan, that any proposed intervention should have some family support and peer involvement (Davis, Shuster, Blackmore, & Fox, 2004; McLaren, Gauvin, & Steiger, 2001; Young, Clopton, & Bleckley, 2004; Zalta & Keel, 2006).

For the depression index used in this study, the risk of eating disorder highlights the correlation between depression and disordered eating. Wheeler, Greiner, and Boulton (2005) highlight the difficulty that some at-risk, bulimic women have in expressing emotion, especially if they are concomitantly depressed, with the depression placing them at an increased risk of bulimic behaviors occurring. Eating disorder combined with the symptoms of depression (Braun, Sunday, & Halmi, 1994; Goebel, Spalthoff, Schulze, & Florin, 1989; Williamson, Kelley, Davis, Ruggiero, & Blouin, 1985), or whether behaviors indicative of disordered eating is characteristic of a female being depressed, is still controversial (Lee, Rush, & Mitchell, 1985; Morrison, Waller, & Lawson, 2006).

CONCLUSION

This study revealed the range and severity of unhealthy diet-related behaviors among female college students in Northern Taiwan across two university campuses. In this study, 43.2% of the two groups of female college students were found to be at risk of an eating disorder. BMI, degree of body dissatisfaction, bulimia, use of laxatives, and the depression index were all effective risk factor predictive variables related to eating disorder.

One common expectation by young woman in Taiwan culture is that they must be thin, have white skin, and that these features of beauty can be compared with their peers. The morbid pursuit of "thinness representing beauty," through losing weight, often results in a loss of physiological and psychological health, which is a result not expected by young women seeking beauty.

The results of this study further highlight that it became part of the daily lives of some female students who were dissatisfied with their body image to adopt weight-control measures. It is normal for everyone to want to be attractive and confident; however, there are limits as to just how far one can go before physiological and psychological safety is placed at risk. Society and the media support and promote thinness as beauty, and this is widely accepted, hotly debated, and increasingly contested. Moderate weight control can lead to a healthy body and mind; however, unhealthy dietary behaviors, such as severely restricting one's diet, binge eating and purging, using drugs, forced exercise, or self-induced vomiting, are rapidly and covertly spreading among young women in Taiwan. The harm such behaviors cause to the physical and mental health of young women needs to be addressed by further research, developing mental health promotion programs, early intervention, and access to university-based treatment services.

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