Eating Disorders and Their Associated Factors among Women Aged 18-50 Years: A Cross-sectional Study

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Abstract   **Background**: Eating Disorders (EDs) are serious mental illnesses that can affect health and overall well-being. The present study aimed to determine (1) the prevalence and types of EDs among women aged 18-50 years, (2) the association between age, level of study, the university sector, and EDs. **Methods:** An epidemiological, cross-sectional facility-based study design was conducted. Women aged 18-50 years who were not previously diagnosed with ED and were employees or students at Taibah University, Saudi Arabia, were included. The EAT-26, DSM-V, and the Ortherxia Nervosa (ON) inventory determined the presence of EDs and their types. In addition, information about age, college or sector, and year of study (for students) were obtained. Statistical analysis was carried out using SPSS version 26. **Results:** Women (n = 1700) were screened. Women (n= 288, 17%) had disordered eating attitudes, and 213 of them completed the study. Of the 213 women with disordered eating, 14% suffered from bulimia nervosa (BN), 23.9% from eating disorders not otherwise specified (EDNOS), and 28% from ON. Women aged ≥43 years suffered mostly from binge eating disorders. Most of the women with EDs were in their first year of study. The most common types of EDs among students were ON, EDNOS, BN, a combination of ON and atypical anorexia nervosa (AN). Moreover, atypical AN was prevalent among year four students, whereas night-eating disorders were common among year two and three students. **Conclusion:** Age, university sector, and year of study are associated with EDs among women. Nutrition education programs targeting young women, their parents, and those from specific colleges need to be initiated at Taibah University.

Keywords: eating disorders, women, age, Saudi Arabia, university sector, level of study

What is Already Known on This Subject

Eating disorders (EDs) are serious mental health disorders that impact the health status of several people worldwide. They are 3-8 times higher in women than men. However, no previously published work focused on EDs and their association with age, university sectors, and level of study (semesters and/or years) among university women aged >18 years in Al Madinah Al Munawarah, Saudi Arabia.

What This Study Adds

The current study revealed that ED was prevalent among Taibah university women, and their types vary according to age, university sectors, and level of study.

Research Implication

Dieticians and other health professionals need to develop and provide prevention, counselling, and treatment sessions focusing on the healthy eating pattern and the risk of disordered eating.

1. Introduction

Eating Disorders (EDs) are serious mental illnesses that can affect health and overall well-being irrespective of age, gender, ethnicity, and socioeconomic status [1]. There are many types of EDs, including Anorexia Nervosa (AN), Orthorexia Nervosa (ON), Bulimia Nervosa (BN), Binge Eating Disorder (BED), Other Specified Feeding or Eating Disorder (OSFED), and Eating Disorder Not Otherwise Specified (EDNOS) [2,3].

Worldwide, the prevalence of EDs is increasing, affecting millions of people. Several epidemiological studies investigated this health problem among different age groups. In a nationally representative sample of 36,306 American adults, lifetime prevalence estimates of AN, BN, and BED were 0.80%, 0.28%, and 0.85%, respectively [4]. In addition, a cross-sectional survey across six European countries (Belgium, France, Germany, Italy, the Netherlands, and Spain) which assessed the

prevalence of EDs amongst adults, reported that the lifetime estimated prevalence of AN, BN, BED, sub-threshold BED and any BED were 0.48%, 0.51%, 1.12%, 0.72%, and 2.15%, respectively. Moreover, EDs are more common among women than men, around 3-8 times higher in women [5], with risk factors ranging from biological, psychological, and sociocultural issues [6,7]. Among the college-aged population, 10-20% of the South-East Asian countries, including Indonesia, Thailand, and Malaysia, have been identified as being at risk of an ED [8].

The prevalence of ED in Gulf countries, including Saudi Arabia, is underestimated at the national level due to the limited number of published studies. A study at Taif University revealed that 35.4% of students were at risk of ED [9]. Moreover, the most common EDs among under-training female nurses at Al-Amal Psychiatric Complex in Al Madinah Al Munawarah were BED, BN, and EDNOS, with a prevalence of 3.5%, 3.2%, and 1.4%, respectively; none of the nurses suffered from AN [10]. Furthermore, 31.4% of Emirati female students suffered from disordered eating attitudes [11]. A cross-sectional study aimed to examine the prevalence of EDs amongst Taif university students aged 17-33 years. That study showed that 35.4% of students suffered from ED [9].

A literature search revealed no information about the prevalence of ED among females aged 18-50 years. Many previous studies focussed on school-aged adolescents. Also, no published work was found related to the types of ED as categorized by the various university sectors and levels of study (semesters and/or years) among women aged >18 years in Al Madinah Al Munawarah, Saudi Arabia. Therefore, the current study aimed to assess (1) the prevalence and types of ED among women aged 18-50 years at Taibah University and (2) determine the relationship between age, level of study, the university sector, and ED. It is hypothesized that ED is prevalent among women at Taibah University. There are variations in the type of ED based on the age, level of study, and university sector of eating disordered women.

2. Materials and Methods

2.1. Study Design and Area

The current epidemiological, cross-sectional, facility-based study was conducted at Taibah University, Al Madinah Al Munawarah, Saudi Arabia, between January and May 2019.

2.2. Study Participants and Sampling Method

Two thousand females were recruited from various sectors at Taibah University, including students (n = 1767) and employees (n = 233). Women aged 18-50 years were targeted. Pregnant and lactating women, those with upper and lower gastrointestinal tract disease, sufferers of chronic diseases that might affect eating habits such as diabetes, hypertensive, or those with thyroid disorders were excluded. A flow chart for the selection of women is presented in Figure 1.
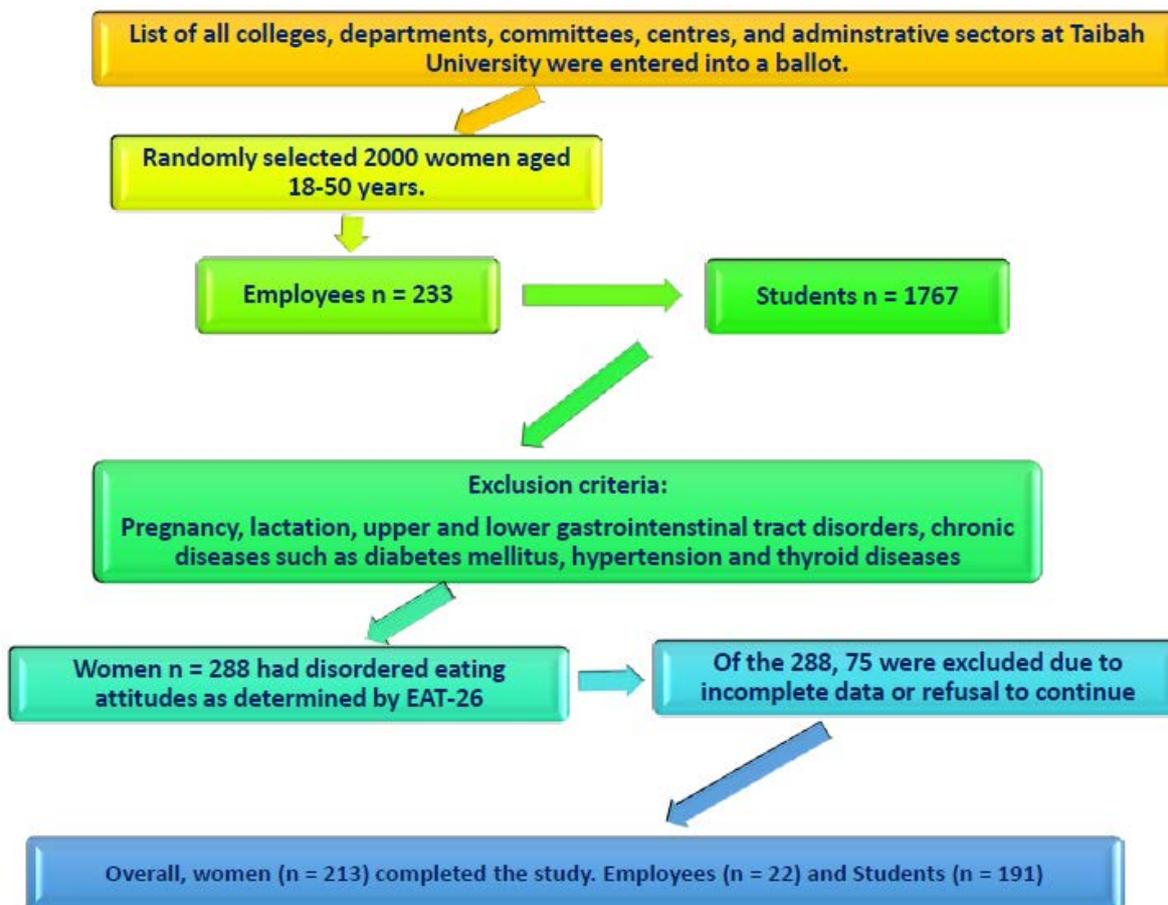

Figure 1. Flow chart for the selection of women, Ahlam Badreldin El Shikieri, "Online Supplementary Material"

A systematic random sampling technique was followed to recruit the study population. First, a list of the different colleges, committees, centres, and administrative units were obtained from the official website of Taibah University (www.taibahu.edu.sa). They were then entered into a ballot to select the sites randomly. Finally, the required number of participants was selected proportionally according to the total number of students and employees, as shown below:

$$\frac{\text{Participants from one sector}\ (e.g.\ College\ of\ Medicine\ n=365)}{\text{Total number of females from different sectors}\ (n=6868)}$$
$$x\ Total\ Number\ of\ students\ select\ (1700)$$

2.3. Data Collection Method

In order to determine the prevalence of EDs among women, a screening questionnaire was administered. It included questions to assess their sociodemographic characteristics such as age, marital status, student or employee, educational level, and chronic disease status. Those who fulfilled the inclusion criteria were invited to proceed with the study.

2.4. Defining and Diagnosing EDs

2.4.1. The EAT-26

This test was used to determine women with risk for disordered eating attitudes and behaviours. It was previously validated in a study conducted in Saudi Arabia [9]. It has three sets of questions: In Part A, information about current and ideal body weight was obtained; Part B included three subscales: dieting, bulimia, food preoccupation, and oral control, which were questioned with a total of 26 items. Each item (except the 26th item) had six response options ranging from 0 to 3. Finally, in Part C, four behavioural questions aimed to determine extreme weight-control behaviours and estimate their frequency, e.g., self-induced vomiting over the preceding six months. Overall, females who scored ≥ 20 on the EAT-26 were classified as "at-risk" for disordered eating attitudes and behaviours [12,13].

2.4.2. Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)

After the EAT-26, all women diagnosed with ED completed the DSM-5, a 23-component self-reported questionnaire that identifies EDs, namely AN, BN, BED, OSFED and UFED [14,15]. Anorexia nervosa, BN, and BED are the *typical* EDs, whereas OSFED and UFED are the *atypical* forms of ED [16]. The OSFED includes the atypical AN, low frequent BN, low frequent BED, night eating syndrome (NES), and purging disease (PD). The DSM-5 questionnaire starts with questions about physical appearance and how shape influenced judgement as a person. Scores ranged from zero to six, where zero means not at all (not suffering from this problem), and six means extremely (highly suffering from the problem). Then, questions about eating with a loss of control episodes, feeling through and after overeating, e.g., eating much and

more rapidly, were asked. Moreover, DSM-5 included information about the highest weights at the current height.

2.5. Orthorexia Nervosa Inventory (ORTO-15)

The ORTO-15 questionnaire assessed ON's emotional symptoms, cognitive status, and peculiar behavioural patterns [17]. It consists of 15 self-reported multiple-choice questions scored from one to four, where *one* indicates a tendency to have ON and *four* for those who had normal eating habits. By summing each score, the total would range between 15 and 60. A score of <35 indicates a high risk of ON.

2.6. Ethical Considerations

Ethical clearance was obtained from the College of Applied Medical Sciences' IRB at Taibah University (CODE # CLN 201812). Permission was obtained from the various sectors of the university, and women signed informed consent before starting the study. They were assured that they had the right to withdraw from the study without any obligation. All information was confidential and only shared with the authors. Any woman with ED based on their EAT-26 score was advised to visit the Medical Unit at the university for further follow-up.

2.7. Quality Assurance

All assessment tools were pretested for clarity and understanding on 30 participants, and adjustments were carried out accordingly. In addition, DSM-5 was collected twice from females to ensure their responses. A registered translator translated both the DSM-5 and ORTO-15 to the Arabic language. In order to save time and effort, an electronic version of ORTO-15 was created.

2.8. Data Analysis

Descriptive statistics, Pearson's correlation, and One Way ANOVA was carried out using the Statistical Package Age for Social Sciences (SPSS) software, version 26. Ages were grouped as 18-25, 26-33, 34-42, and ≥ 43 years. Marital status was defined as being single, married, or divorced. The education level for students was defined as 1st, 2nd, 3rd, and 4th year of study. Results will be presented based on the women's age, educational level, and university sectors. A *P*-value of ≤ 0.05 was set as the level of significance.

3. Results

3.1. Background Information and General Characteristics

The study recruited 1700 women from various sectors at Taibah University. Women (n = 288) had a possible disordered eating risk as defined by their EAT-26 values of > 20 (Table 1), leading to a prevalence of 17%. The mean and standard deviation of EAT-26 score were 30±9.2. However, of the 288 women, 75 did not complete

the study either because it was difficult to contact them, refused to continue, or incomplete data. Thus, the total number of women with EDs who completed the study was 213, i.e., 74% of women with possible ED risk.

Table 1. EAT-26 scores, ORTO-15 inventory scores, and Demographic characteristics among women at Taibah University

	Number of Women (%)
Age (years)	
Mean (SD)[#]	22 (5.3)
1st Quartile	19
2nd Quartile	21
3rd Quartile	22
Marital status	
Single	182 (85.4)
Married	28 (13.2)
Divorced	3 (1.4)
Year of study	
1st year	77 (36.2)
2nd year	40 (18.7)
3rd year	43 (20.2
4th year	31 (14.5)
University sectors	
Deanship of Educational services (Preparatory year)	65 (30.5)
College of Science	62 (29)
College of Business Administration	48 (22.5)
Medicine and Allied Medical Colleges	17 (8)
Others[‡]	21 (10)
ORTO-15 scores	
Mean (SD)[#]	34.7 (4.7)
≥35	110 (52)
<35	103 (48)
1st Quartile	32
2nd Quartile	34
3rd Quartile	38
ON and Atypical AN	35 (16.4)
BN, ON, and NES	5 (2.3)
BN and NES	3 (1.4)
ON, Atypical AN, and NES	2 (0.9)

§EAT-26: Eating Attitudes Test-26; # Geometric Mean and Standard Deviation; Values are numbers and percentages. The total number of women with eating disorders is 213 out of 1700 screened. ‡Others: College of Law; Centres of Statistics and Information Technology; English Language and Talent; creativity and excellence. Deanship of Student Affairs; Community Service and Continuing Education; Distance Learning; Girls Academic Studies; Graduate Studies and Scientific Research; Department of Operation and Maintenance, Security and Safety; ORTO-15= Orthorexia Nervosa Inventory; AN= Anorexia nervosa; BN = Bulimia nervosa; BED = Binge Eating Disorder; Atypical AN = Atypical Anorexia Nervosa; NES = Night eating syndrome; ON = Orthorexia Nervosa.
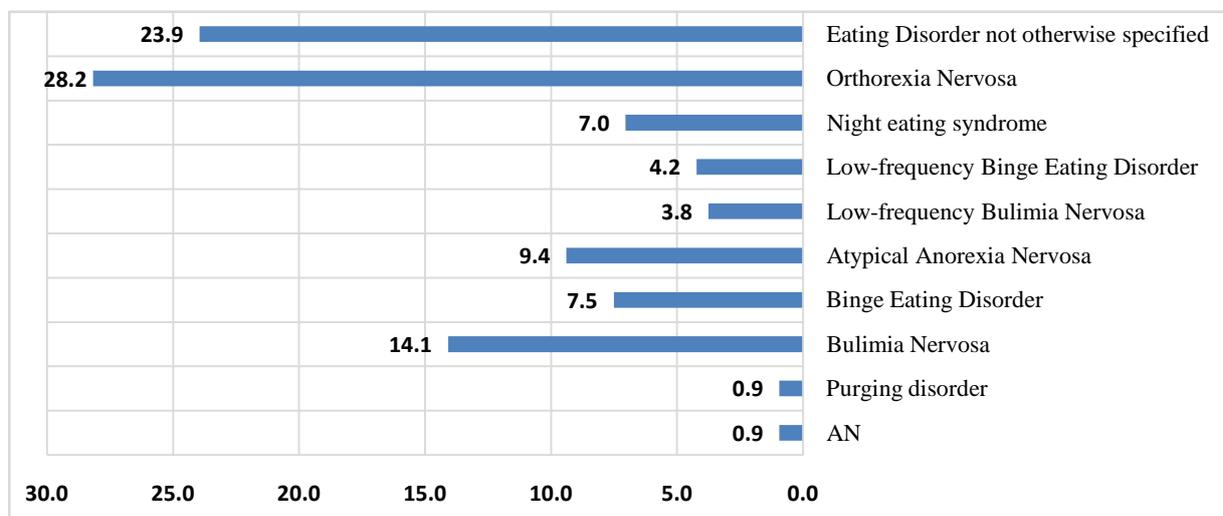

Figure 2. Prevalence of the various types of ED diagnosed among women aged 18-50 years at Taibah University (n = 213). Values are percentages; DSM-5 was used to diagnose the types of ED. AN = Anorexia Nervosa; Most of the women suffered from Orthorexia Nervosa and Eating disorders not otherwise specified

Of the 213 women with EDs, 90% (n = 191) were students and 10% (n = 22) employees with an age range between 18 and 50 years. All employees had university degrees. Many women with EDs were unmarried, in their first year and from the Preparatory year and the College of Science (Table 1). Moreover, BN was the commonest typical ED, and EDNOS was the atypical ED among women. Orthorexia Nervosa was found among 28% of the ED women (Figure 2). Based on the ORTO-15 inventory, many women had a combination of ON and atypical AN (Table 1).

3.2. Prevalence of EDs as Categorized by Age Group

Many women were students aged <26 years, were not married and were from the Preparatory year (Table 2). Overall, younger women suffered from most of the various types of EDs. Women generally suffered from either ON alone or combined with Atypical AN, BN, and EDNOS.

Those ≥43 years suffered mostly from BED (Table 2).

3.3. Prevalence of EDs as Categorized by the Year of Study

Most of the women with disordered eating were in their first year of study. The most prevalent ED types among students were ON, EDNOS, BN, and a combination of ON and Atypical AN. Moreover, atypical AN was prevalent among year four students, whereas NES was common among year two and three students. The ORTO-15 inventory revealed that NES and ON, combined with other EDs' types were more prevalent among year four students (Table 3). Many women at "Other" sectors of the university suffered either from ON alone or combined with Atypical AN. Also, many women at the Colleges of Science, Preparatory Year, and Business Administration suffered from EDNOS and ON. On the other hand, BN, and ON were prevalent among women at the Colleges of Medicine and Allied Medical Sciences (Table 4).

Table 2. Demographic characteristics and the Prevalence of EDs among Taibah University women as categorized by age (n = 213)

	18-25 years n = 91	26-33 years n = 8	34-42 years n = 12	≥43 years n = 2
Age (years)#	20.4 (1.7)	30 (2.3)	38.2 (2.6)	46.5 (3.5)
Students	190 (99.5)	2 (25)	-	-
Employees	1 (0.5)	6 (75)	12 (100)	2 (100)
Marital status				
Single	179 (94)	2 (25)	1 (8.3)	-
Married	10 (5)	5 (62.5)	11 (91.7)	2 (100)
Divorced	2 (1)	1 (12.5)	-	-
University sectors				
Deanship of Educational services (Preparatory year)	65 (34)	-	-	-
College of Science	56 (29)	4 (50)	1 (8.3)	1 (50)
College of Business Administration	46 (24)	-	2 (16.7)	-
Medicine and Allied Medical Colleges	15 (8)	1 (12.5)	1 (8.3)	-
Others‡	9 (5)	3 (37.5)	8 (66.7)	1 (50)
Year of study				
1st year	77 (40)	-	-	-
2nd year	40 (21)	-	-	-
3rd year	43 (22)	-	-	-
4th year	31 (17)	2 (25)	-	-
EAT-26 score#	30.1 (9.3)	31.4 (9.5)	30.7 (9.4)	24.5 (2.1)
ORTO-score#	35.0 (4.6)	32.8 (4.4)	32.7 (4.8)	38.0 (10)
Types of ED as determined by DSM-5				
AN	2 (1)	-	-	-
BN	27 (14)	1 (12.5)	2 (16.7)	-
BED	14 (7)	-	-	2 (100)
Atypical AN	16 (8)	2 (25)	2 (16.7)	-
Low-frequency BN	8 (4)	-	-	-
Low-frequency BED	9 (5)	-	-	-
NES	15 (8)	-	-	-
ON	53 (28)	2 (25)	5 (41.7)	-
EDNOS	47 (25)	2 (25)	2 (16.7)	-
PD	-	1 (12.5)	1 (8.3)	-
ORTO-15				
ON and Atypical AN	30 (16)	1 (12.5)	3 (25)	1 (50)
BN, ON and NES	5 (3)	-	-	-
BN and NES	3 (2)	-	-	-
ON, Atypical AN and NES	-	1 (12.5)	-	-

Values are numbers and percentages; #Geometric Mean and Standard Deviation; ‡Others: College of Law; Centres of Statistics and Information Technology; English Language and Talent; creativity and excellence. Deanship of Student Affairs; Community Service and Continuing Education; Distance Learning; Girls Academic Studies; Graduate Studies and Scientific Research; Department of Operation and Maintenance, Security and Safety; EAT-26: Eating Attitudes Test-26; Values are numbers and percentages; Types of ED were determined by DSM-V; AN= Anorexia nervosa; BN = Bulimia nervosa; BED = Binge Eating Disorder; Atypical AN = Atypical Anorexia Nervosa; Low-frequency BN = Low-frequency Bulimia Nervosa; Low-frequency BED = Low-frequency Binge Eating Disorder; NES = Night eating syndrome; PD = Purging Disorder; EDNOS = Eating Disorder not otherwise specified; ON = Orthorexia nervosa; ORTO-15= Orthorexia Nervosa Inventory.

Table 3. Prevalence of ED types categorized by the year of study (n = 191 students)

Type of ED as determined by DSM-5	1st year n = 77	2nd year n = 40	3rd year n = 43	4th year n = 31
AN	1 (1.3)	-	-	1 (3.2)
BN	12 (15.6)	6 (15)	6 (14)	3 (9.7)
BED	6 (7.8)	2 (5)	3 (7)	3 (9.7)
Atypical AN	5 (6.5)	3 (7.5)	3 (7)	6 (19.4)
Low-frequency BN	2 (2.6)	2 (5)	3 (7)	2 (6.5)
Low-frequency BED	5 (6.5)	1 (2.5)	2 (4.7)	-
NES	4 (5.2)	5 (12.5)	5 (11.6)	1 (3.2)
ON	22 (28.6)	9 (22.5)	13 (30.2)	8 (25.8)
EDNOS	20 (26)	12 (30)	8 (18.6)	7 (22.6)
ORTO-15				
ON and Atypical AN	11 (14.3)	7 (17.5)	5 (11.6)	7 (22.6)
BN, ON and NES	2 (2.6)	2 (5)	2 (4.7)	-
BN and NES	1 (1.3)	-	1 (2.3)	1 (3.2)
BED and NES	-	1 (2.5)	-	1 (3.2)
Atypical AN and NES	-	-	1 (2.3)	1 (3.2)
Low frequencey BED and NES	-	-	1 (2.3)	-

Values are numbers and percentages; Types of ED were determined by DSM-5; AN= Anorexia nervosa; BN = Bulimia nervosa; BED = Binge Eating Disorder; Atypical AN = Atypical Anorexia Nervosa; Low-frequency BN = Low-frequency Bulimia Nervosa; Low-frequency BED = Low-frequency Binge Eating Disorder; NES = Night eating syndrome; PD = Purging Disorder; EDNOS = Eating Disorder not otherwise specified; ON = Orthorexia nervosa. ORTO-15= Orthorexia Nervosa Inventory.

Table 4. Age, EAT-26 score, ORTO-score and prevalence of ED types categorized by the university sectors (n = 213)

Types of ED	College of Science n = 62	Deanship of Educational services (Preparatory year) n = 65	College of Business Administration n = 48	Medicine and Allied Medical Colleges n = 17	Other[‡] n = 21
Age (years)[#]	22.4 (4.7)	19.0 (0.7)	21.8 (4.0)	23.0 (4.8)	30.2 (8.5)
EAT-26[#]	29.2 (8.6)	30.7 (8.8)	30.5 (11)	30.6 (8.7)	30.3 (7.4)
ORTO-15[#]	34.8 (4.1)	35.2 (5.3)	35.6 (4.5)	32.8 (3.1)	32.3 (4.2)
AN	1 (1.6)	-	1 (2.1)	-	-
BN	9 (14.5)	11 (16.9)	4 (8.3)	3 (17.6)	3 (14.3)
BED	4 (6.5)	5 (7.7)	3 (6.3)	-	4 (19)
Atypical AN	11 (17.7)	5 (7.7)	3 (6.3)	-	1 (4.8)
Low-frequency BN	2 (3.2)	2 (3.1)	1 (2.1)	3 (17.6)	-
Low-frequency BED	1 (1.6)	5 (7.7)	3 (6.3)	-	-
NES	5 (8.1)	3 (4.6)	6 (12.5)	1 (5.9)	-
ON	14 (22.6)	20 (30.8)	9 (18.8)	8 (47.1)	9 (42.9)
EDNOS	15 (24.2)	14 (21.5)	18 (37.5)	2 (11.8)	2 (9.5)
PD	-	-	-	-	2 (9.5)
ORTO-15					
ON and Atypical AN	12 (19.4)	10 (15.4)	3 (6.3)	4 (23.5)	6 (28.6)

#*Geometric Mean and Standard Deviation; EAT-26: Eating Attitudes Test-26; ORTO-15= Orthorexia Nervosa Inventory; Types of ED were determined by DSM-V*
Values are numbers and percentages; ‡Others: College of Law; Centres of Statistics and Information Technology; English Language and Talent; creativity and excellence. Deanship of Student Affairs; Community Service and Continuing Education; Distance Learning; Girls Academic Studies; Graduate Studies and Scientific Research; Department of Operation and Maintenance, Security and Safety
AN= Anorexia nervosa; BN = Bulimia nervosa; BED = Binge Eating Disorder; Atypical AN = Atypical Anorexia Nervosa; Low-frequency BN = Low-frequency Bulimia Nervosa; Low-frequency BED = Low-frequency Binge Eating Disorder; NES = Night eating syndrome; PD = Purging Disorder; EDNOS = Eating Disorder not otherwise specified; ON = Orthorexia nervosa.

Pearson's correlation revealed that there was a negative correlation between the ORTO-15 scores and the university sectors ($r = -0.16$, $P = 0.024$), level of study ($r = -0.14$, $P = 0.048$), and EAT-26 scores ($r = -0.19$, $P = 0.004$). One way ANOVA revealed that age categories ($P = 0.03$), being a student ($P = 0.005$), and university sectors ($P = 0.002$) influenced the type of ED (dependent variable; determined by DSM-5) among Taibah University women. Age was significantly different among various sectors when categorized by their university sectors. Those from colleges such as Law and various centres (referred to as Others) were the oldest ($P = 0.0001$). In terms of the ORTO-15 score, there were significant differences among the various sectors at the university ($P = 0.028$).

4. Discussion

Eating disorders are chronic conditions that are increasing worldwide, especially among women. They are always thought of as Western society disorders rather than non-Westernized communities [18]. Disordered eating has adverse health effects and impairs the quality of life. Moreover, EDs interfere with interpersonal and academic performances and increase the risk of other complications, such as anxiety, depression, and even suicide, among college students [19].

The present study aimed to determine the prevalence, types of EDs, and associated factors among women aged 18-50 years at Taibah University, Al Madinah Al Munawarah. Our study hypothesis stated that EDs are prevalent among women. This theory is being accepted since the prevalence of disordered eating attitudes and behaviour measured by EAT-26 was 17%. A study by Alhazmi & Al Johani [20] conducted at Taibah University reported a prevalence of 38% among students from various health specialities. Similarly, our results are far below what has been previously reported among Jordanian women. In their study, Madanat and coworkers [21] showed that among 800 women whose mean age was 33 years, the prevalence of EDs was 54.8%, and the mean EAT-26 score was 19. In our study, the prevalence of EDs was lower than in Qatarians (20.4%) aged 18->26 years [22]. Moreover, the prevalence of ED among females in our study is lower than their counterparts at the Preparatory year at the Imam Abdulrahman bin Faisal University in Saudi Arabia. In their study, women (n = 656, age 18-23 years) from four speciality colleges had a 29.4% high risk for concern for EDs. A high prevalence was reported among students from the College of Science (31.7%) and Community Medicine (31.2%) compared to Interior design (24.4%) [23].

Furthermore, our findings revealed that EDs are common among younger women (18-25) who also suffer from more than one type of EDs. These findings are similar to the Jordanian (15.7%; aged 18-22) [24] and Lebanese students (17%; aged 19->25) [25]. Contradictory to our study findings, American students had a three times lower risk of ED (6.8%) [22]. Also, the number of women with disordered eating attitudes in our study was very high compared to their Turkish counterparts (2.2%) [26].

In addition, AN's prevalence in our study is relatively high (0.9%) and is present among first- and fourth-year students. Anorexia nervosa is not expected in a Muslim community such as Saudi Arabia. A previous study that assessed the prevalence of ED among training nurses at the Amal Hospital in Al Madinah Al Munawarah reported no AN cases, mainly related to cultural and religious factors [10]. Contrary to our study, no AN was reported among Turkish students [26]. In Egypt, AN was more common among students with hysterical personalities [27]. The prevalence of AN among the Saudi women in our study is similar to westernized countries, a warning sign that needs extensive attention and deep thought about possible causes. As in our study, Americans (0.8%) [4] and Chinese adults (1.1%) [28] had a high prevalence of AN.

Moreover, the prevalence of BN (14.1%) and BED (7.5%) in our study are higher than the findings from the Saudi nurses at the Amal Hospital in Al Madinah Al Munawarah (BN = 3.2% and BED = 3.3%) [10], the Turkish (BN = 1.6% and BED = 0.3%) [26], the Australian (BN = 0.66% and BED = 5.6%) [29], and the American counterparts (BN = 0.46 and BED = 1.25) [4].

The year of study and the university sectors have influenced the development of EDs in our study population. Thus, the study hypothesis, which stated that age, the university sector, and year of study are associated with EDs, is accepted. Students from the Medical and Allied Medical colleges were at more risk of most EDs types. These findings are similar to the Lebanese Medical students [25]. Also, the prevalence of NES was 5.2% for year one students, 6% for Medical students, and up to 12.5% for students at the College of Business Administration. The prevalence of NES among Medical students is lower than was previously reported (10%) [30]. American students from Nutrition majors and those in their Freshman/Sophomore year were at higher risk for EDs [31], similar to students in our study. Other studies also supported our findings [32].

The question that arises: Why do Taibah university women and specifically students have a high prevalence of ED influenced by age, level of study, and university sectors? A well-structured study should be performed to be able to answer this important question. Perfectionism needs to be considered among the many possible reasons [33]. Students in their first years of university life strive to get total marks (e.g. 10 out of 10). From personal experience, students argue that they want to keep their high standards as they used during their senior schooling years. This thinking and practice itself are factors for stress, food avoidance (so as not to waste time), and disturbed eating practices. Although not assessed, perfectionism is more common and a possible cause among women with BN [34]. In our study, the prevalence of BN among females was relatively higher (14%) than previously reported.

Furthermore, emotional stress is an important factor associated with EDs, and its severity depends on the individual's coping mechanisms [35]. Students usually face stress from various sources, including their families, peers, homework, assignments, living in hostels, and other factors [36]. As such, there is an urgent need for screening newly admitted students, as previously advised in other studies, for the risk of developing EDs [31].

In conclusion, the current study revealed that EDs are prevalent among Taibah university women. The types of EDs vary according to age, university sector, and level of study. The study has several strengths. This study is considered the first to screen a significant number of women, following the randomized selection method, with a wide age range and belonging to various university levels and sectors. It used the latest version of DSM-5 to determine the different ED types, typical and atypical. In addition, ORTO-15 was used to assess ON. However, the missing of women (n = 75) might have affected the findings and does not reflect the actual prevalence and types of EDs in the screened sample. The study only focused on women. The prevalence and types of EDs among men could be similar or different. Thus, the generalizability of the study findings should be taken with caution. In addition, a critical drawback of the study is its cross-sectional design, which will not lead to causal

relationships. The study recommends screening students on admission to the university and following them up yearly by a mental health centre attached to the university. Parents need to be informed of their daughter's health. Also, the inclusion of dieticians is highly recommended to develop and provide prevention, counselling, and treatment sessions focusing on the healthy eating pattern and the risk of disordered eating. Also, further studies need to focus on the possible causes of EDs and find ways to overcome them.

Conflict of Interest

Data Sharing

The data that support the findings of the current study are available on request. The data are not publicly available due to privacy and ethical restrictions.

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References

[1]   Qian J, Hu Q, Wan Y, Li T, Wu M, Ren Z, Yu D. Prevalence of eating disorders in the general population: a systematic review. Shanghai Arch psychiatry. 2013; 25: 212.

[2]   National Collaborating Centre for Mental Health (UK). (2004). Eating Disorders: Core Interventions in the Treatment and Management of Anorexia Nervosa, Bulimia Nervosa and Related Eating Disorders. 1st ed. Leicester, British Psychological Society. PMID: 23346610.

[3]   National Guideline Alliance (UK). (2017). Eating Disorders: Recognition and Treatment. London: National Institute for Health and Care Excellence (UK); 2017 May. (NICE Guideline, No. 69.) 9, Treatment and management of atypical eating disorders (eating disorders not otherwise specified) Available from: https://www.ncbi.nlm.nih.gov/books/NBK533153/).

[4]   Udo, T., & Grilo, C.M., (2018). Prevalence and Correlates of DSM-5–Defined Eating Disorders in a Nationally Representative Sample of U.S. Adults, Biological Psychiatry, 84(5): 345-54.

[5]   Preti, A., Girolamo, Gd., Vilagut, G., Alonso, J., Graaf, Rd., Bruffaerts, R., Demyttenaere, K., Pinto-Meza, A., Haro, J.M., Morosini, P.; ESEMeD-WMH Investigators. (2009). The epidemiology of eating disorders in six European countries: results of the ESEMeD-WMH project. J Psychiatr Res. Sep; 43(14): 1125-32.

[6]   Prendergast, G., West, D.C., Yan, L.K., (2015). Eating Disorders– The Role of Advertising and Editorial. In: Spotts H. (eds) Proceedings of the 2002 Academy of Marketing Science (AMS) Annual Conference. Developments in Marketing Science: Proceedings of the Academy of Marketing Science. Springer, Cham.

[7]   Nivedita, N., Sreenivasa, G., Sathyanarayana R.T.S., Malini S.S., (2018). Eating disorders: Prevalence in the student population of Mysore, South India 60(4): 433-7.

[8]   Pengpid, S., & Peltzer, K., (2018). Risk of disordered eating attitudes and its relation to mental health among university students in ASEAN. Eating and Weight Disorders Studies on Anorexia, Bulimia and Obesity, 23(3), 349-355.

[9]   Taha, A.A., Abu-Zaid, H.A., & Desouky, D.E., (2018). Eating Disorders Among Female Students of Taif University, Saudi Arabia. Arch Iran Med. 21(3): 111-7.

[10]   Hussein, R.A., Hamed, R.A., Raya, Y.M., Abdelghani, M., Hafiz, A.H., (2016). Prevalence of and attitudes toward eating disorders among female nurses. Middle East Curr Psychiatry 23: 44-9.

[11]   Al Sabbah, H., Muhsineh, S., (2017). Disordered Eating Attitudes and Exercise Behavior among Female Emirati College Students in the United Arab Emirates: A Cross-Sectional Study. Arab Journal of Nutrition and Exercise (AJNE). 1. 62.

[12]   Pengpid, S., Peltzer, K., & Ahsan, G.U., (2015). Risk of eating disorders among university students in Bangladesh. International Journal of Adolescent Medicine and Health, 27(1): 93-100.

[13]   Rogoza, R., Brytek-Matera, A., & Garner, D. (2016). Analysis of the EAT-26 in a non-clinical sample. Archives of Psychiatry and Psychotherapy, 18(2), 54-58.

[14]   Krabbenborg, M.A., Danner, U.N., Larsen, J.K., Veer, N., Elburg, A.A., Ridder, D.T., & Engels, R.C., (2011). The Eating Disorder Diagnostic Scale: Psychometric Features Within a Clinical Population and a Cut-off Point to Differentiate Clinical Patients from Healthy Controls. European Eating Disorders Review 20(4): 315-320.

[15]   Bohon, C., Stice E., (2015). Eating Disorder Diagnostic Scale. In: Wade T. (eds) Encyclopedia of Feeding and Eating Disorders. Springer, Singapore.

[16]   Galmiche M, Déchelotte P, Lambert G, Tavolacci MP. (2019). Prevalence of eating disorders over the 2000–2018 period: a systematic literature review Am J Clin Nutr; 109: 1402-1413.

[17]   Humme, S. (2015). Folgen der Orthorexia nervosa. Gesund, Gesünder, Orthorexia Nervosa, 29-34.

[18]   Nasser, M., (1988). Eating disorders: The cultural dimension. Social Psychiatry and Psychiatric Epidemiology, 23, 184-187.

[19]   Shatkin, J.P., (2020). Increasing Access for the Treatment of Eating Disorders Among College Students. JAMA Netw Open. 3(8): e2016117.

[20]   Alhazmi, A.H., & Al Johani, A., (2019). Prevalence and associated factors of eating disorders among students in Taiba university, Saudi Arabia: A cross-sectional study Malay J Publ Health Med 19(1): 172-6.

[21]   Madanat, H., Brown, R., & Hawks, S. (2007). The impact of body mass index and Western advertising and media on eating style, body image and nutrition transition among Jordanian women. Public Health Nutrition, 10(10), 1039-1046.

[22]   Kronfol, Z., Khalifa, B., Khoury, B., Omar, O., Daouk, S., deWitt, J.P., et al., (2018). Selected psychiatric problems among college students in two Arab countries: Comparison with the USA. BMC Psychiatry 24:18.

[23]   Alwosaifer, A.M., Alawadh, S.A., Abdel Wahab, M.M., Boubshait, L.A., Almutairi, B.A., (2018). Eating disorders and associated risk factors among Imam Abdulrahman bin Faisal university preparatory year female students in Kingdom of Saudi Arabia Saudi Med J 39(9): 910-921.

[24]   Kilani, B.F., (2017). Prevalence of eating disorders among students at the University of Jordan. Arab Journal of Psychiatry 28: 76-82.

[25]   Bizri, M., Geagea, L., Kobeissy, F., Talih, F., (2020). Prevalence of Eating Disorders Among Medical Students in a Lebanese Medical School: A Cross-Sectional Study. Neuropsychiatr Dis Treat 16: 1879-1887.

[26]   Kugu, N., Akyuz, G., Dogan, O., Ersan, E., Izgic, F., (2006). The Prevalence of Eating Disorders Among University Students and the Relationship with Some Individual Characteristics Australian and New Zealand Journal of Psychiatry 40(2): 129-35.

[27]   Okasha, A., Kamel, M., Sadek, A., Lotaif, Z.B., (1977). Psychiatric morbidity among university students in Egypt. Br J Psychiatry. 131: 149-154.

[28] Tong, J., Miao, S., Wang, J., Yang, F., Lai, H., Zhang, C., Hsu, L. K. (2013). A two-stage epidemiologic study on prevalence of eating disorders in female university students in Wuhan, China. Social Psychiatry and Psychiatric Epidemiology, 49(3), 499-505.

[29] Hay, P., Girosi, F. & Mond, J., (2015). Prevalence and sociodemographic correlates of DSM-5 eating disorders in the Australian population. J Eat Disord 3(19).

[30] Ahmed, S., Al Harbi, F.S., Al Saeed, O., Ali, S.I., (2019). Prevalence of night eating syndrome amongst medical students in Saudi Arabia Intern J Med Develop Count 3(1): 022-5.

[31] Yu, Z., Tan, M., (2016). Disordered Eating Behaviors and Food Addiction among Nutrition Major College Students. Nutrients 8(11): 673. Published 2016 Oct 26.

[32] Lipson, S., & Sonneville, K. (2017). Eating disorder symptoms among undergraduate and graduate students at 12 U.S. colleges and universities. Eating Behaviors, 24, 81-88.

[33] Hilbert, A., Pike, K., Goldschmidt, A., Wiffley, D., Fairburn, C., Dohm, F., Walsh, T., & Weissman, R.S., (2014). Risk factors across the eating disorders. Psychiatry Research, 220(1-2), 500-506.

[34] Boone, L., Soenens, B., Braet, C., & Goossens, L., (2010). An empirical typology of perfectionism in early-to-mid adolescents and its relation with eating disorder symptoms. Behaviour Research and Therapy, 48(7), 686-691.

[35] Smith, M., Mann, L., Pruitt, J., & Thelen, M.H., (1986). Attitudes and knowledge regarding bulimia and anorexia nervosa. International Journal of Eating Disorders 5(3): 545-553.

[36] Azhar, M., Nadeem, S., Naz, F., Perveen, F., & Sameen, A., (2013). Impact of parental education and socio-economic status on academic 427 achievements of university students Int J Acad Res Refl 1(3): 25-33. 428.