Received: 29 July 2020 | Revised: 24 November 2020 | Accepted: 28 November 2020

DOI: 10.1002/eat.23440

ORIGINAL ARTICLE

International Journal of EATING DISORDERS WILEY

Estimated prevalence of eating disorders in Singapore

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Funding information
Ministry of Education Singapore, Grant/Award Number: AcRF Tier 1 grant no.: RP 3/18 CSN; National Institute of Mental Health, Grant/Award Number: K08 MH120341

Action Editor: Jennifer Thomas

Abstract

Objective: There is a lack of research on the prevalence of eating disorders (EDs) in Singapore. The aims of our study were to (a) estimate the prevalence of EDs, risk status, and help-seeking behaviors among adults in Singapore, (b) examine gender differences between ED status groups, and (c) characterize clinical profiles of ED status groups.

Method: We administered a cross-sectional survey that included a validated EDs screening tool to adults in Singapore.

Results: A total of 797 Singaporean adults ages 21–77 years completed the ED screen. The majority of participants screened positive for a current DSM-5 clinical ED (6.2%), other specified feeding or ED (37.0%) or at high risk of developing an ED (19.5%). Only 1.6% of those who screened positive for an ED reported currently being in treatment. The ratio of males to females who screened positive for an ED was nearly 1:1. The clinical profiles of ED groups were consistent with the clinical presentations found in Western nations.

Discussion: This is the first study in Singapore to estimate the prevalence of EDs in a large sample of adults. Results highlight the urgent need for more ED research and expansion of prevention and treatment programs to address the high prevalence of ED psychopathology in Singapore.

KEYWORDS

adult, feeding and eating disorders, female, male, prevalence, psychopathology, screening, Singapore

1 | INTRODUCTION

Eating disorders (ED) have been traditionally viewed as Western culture-bound syndromes affecting primarily females (Thomas, Lee, & Becker, 2016; Tsai, 2000). Recent studies suggest a global increase in the prevalence of EDs, with the rise in prevalence in non-Western cultures coinciding with increased urbanization and globalization (Gorrell, Trainor, & Le Grange, 2019; Hoek, 2016). A systematic review of studies conducted in the past decade estimated that the point prevalence across Asia is 3.5%, compared to the point prevalence of 4.6% in North America and 2.2% in Europe (Galmiche, Déchelotte, Lambert, & Tavolacci, 2019). The majority of studies in Asia are conducted in China, Japan and South Korea (Thomas et al., 2016), and little is known about EDs prevalence in Singapore. Singapore is a high-income economy in South-East Asia, with a resident population of 4.03 million, and a multicultural society consisting primarily of ethnic Chinese (74.4%), Malays (13.4%), and Indians (9.0%; Department of Statistics, 2020). There has been a concerning increase in new cases at Singapore's national ED clinic (Lee & Hoodbhoy, 2013), and community surveys suggests high levels of dieting (57%; Goy, 2016) and dissatisfaction with weight (43%; Ho, 2019) among Singaporean adults. In this study, we administer an online EDs screening tool to adults in Singapore to estimate the prevalence of EDs, risk status, and help-seeking behaviors.

The international Institute of Health Metrics and Evaluation (IHME, 2020) estimates that the 2017 age-standardized 12-month prevalence of EDs (anorexia nervosa and bulimia nervosa [BN]) in Singapore to be 0.7% among females and 0.3% among males, with a one-year cumulative incidence of 0.04% for both genders. Due to the lack of Singapore data, the IHME estimates are extrapolated from prevalence in other Asian countries. Studies that gather data on EDs in Singapore are primarily based on the national treatment centers for EDs (Goh, Lee, Lim, & Lum, 2016; Lee, Lee, Pathy, & Chan, 2005; Ng, Kuek, & Lee, 2018). Between 1994 and 2002, 138 patients (91.3% females) with AN presented for treatment at a tertiary hospital (Lee et al., 2005); between 2003 and 2010, 281 patients (95.7% females, ages 12–40 years with a BMI < 18.5 kg/m^2 presented with AN (55.2% with AN-restrictive subtype, 24.9% with AN-binge/purge) and eating disorder not otherwise specified (EDNOS; 19.9%; Goh et al., 2016). A broader study of patients at a tertiary hospital between 2010 and 2012 (n = 257; 92.6% females) found 41.6% patients with AN, 29.6% with BN and 28.8% with EDNOS (Ng et al., 2018). Patients were usually ethnic Chinese females between the ages of 18 and 22 years.

In contrast to past research conducted in other Asian countries (Lee, Ho, & Hsu, 1993), the general clinical presentation of EDs in Singapore appears to be similar to that of Western cultures (Ng et al., 2018; Teh et al., 2020; Ung, Lee, & Kua, 1997). Patients with EDs reported the presence of body image disturbance, high weight and shape concerns and frequent engagement in compensatory behaviors. Community cross-cultural studies using the Eating Disorder Examination-Questionnaire (EDE-Q) among female university students found that Singaporean females reported similar (Mond, Chen, & Kumar, 2010) or higher levels of disordered eating behaviors and attitudes (Soh et al., 2007, 2008) compared to Australian females. Specifically, Singaporean females reported more episodes of binge eating and laxative misuse and higher levels of weight and shape concerns. To date, there is little evidence of nonfat phobic anorexia nervosa in Singapore.

There is limited research on cultural-specific risk factors of EDs in Singapore. An early study (n = 280, 51% females, ages 17–22 years) suggested that westernization (indicated by speaking English at home) promotes preference for thinness and body dissatisfaction among Chinese adolescents (Wang, Ho, Anderson, & Sabry, 1999). However another study conducted with a group of multi-ethnic female adolescents (n = 4,461, ages 12–26 years) found that it was traditional Malay households (indicated by speaking Malay at home) that was a risk factor for ED (Ho, Tai, Lee, Cheng, & Liow, 2006). Among university students (n = 383; 69% females; ages 18–25 years), negative maternal comments regarding body shape, weight and eating habits was associated with body dissatisfaction and disordered eating for both genders (Chng & Fassnacht, 2016).

Most of the research thus far in Singapore has focused on AN, BN, and EDNOS, and little is known about other EDs such as avoidant/restrictive food intake disorder (ARFID). A review of child and adolescent cases (n = 288; ages 9–19 years) from Singapore's national treatment center between 2010 and 2016 found that 3% of cases met diagnostic criteria for ARFID (Chew et al., 2020). Common presenting ARFID symptoms were the lack of interest in eating or food, and the avoidance of food based on sensory characteristics (Lai, Chee, & Kwok, 2019). Although there are no data on community prevalence of ARFID, there is a high prevalence of picky eating (47.2%) and feeding difficulties (15.2%) among Singaporean children (Goh & Jacob, 2012; Quah et al., 2017). Although the majority of picky eating cases remit within 3 years (Cardona Cano et al., 2015), it is possible that certain cultural eating and food practices increase the risk for the development of ARFID. A recent study reported that Chinese college students had higher levels of picky eating and higher risk of appetite disturbance and food-related fears compared to Western college students (He, Zickgraf, Essayli, & Fan, 2020). The authors suggested that the public nature and social meaning of meals in Chinese culture may exacerbate ARFID related fears and food restriction.

Singapore identifies as a "New Asian" country—a modern Westernized nation with core Asian values (Velayutham, 2017). Singapore was a British colony for 144 years and remains strongly influenced by modern Western culture (Ang & Stratton, 2018; Tan & Hawkins, 2017). For instance, English is the language of instruction in public schools and is the spoken language in the majority of households (Department of Statistics, 2016). The apparent lack of cultural differences in the clinical presentation of EDs has been attributed to Singapore's Western influences (Soh, Touyz, & Surgenor, 2006). Yet, Singapore's five national values are distinctively Asian, emphasizing collectivism, harmony, and consensus (Tan, n.d.). These are: (a) Nation before community and society above self; (b) Family as the basic unit of society; (c) Regard and community support for the individual; (d) Consensus instead of contention; and (e) Racial and religious harmony. It remains to be seen how Singapore's unique culture would influence the clinical presentation and prevalence of ARFID and other less-studied EDs.

It is also worth noting that there has been a shift in the importance of physical appearance for males in Asia (Brockhoff et al., 2016; Elfving-Hwang, 2011; Wardle, Haase, & Steptoe, 2006; Yamamiya et al., 2019). For example, the "beautiful flower boy" trend started in South Korea in 2009, when a live-action version of the Japanese manga (graphic novel), "Boys Over Flowers", was released (Monocello, 2020; Tai, 2018). The "Korean wave" (i.e., increase in popularity of South Korean culture in recent years) further popularized "soft masculinity" around Asia, where the ideal male image is characterized by his slim and toned physique, physical attractiveness, good fashion, and emotional sensitivity (British Broadcasting Corporation, 2018; Elfving-Hwang, 2011; Hyun, Lee, Ro, Gray, & Song, 2016; Monocello & Dressler, 2020). Similar concepts of soft masculinity are found in China and in Japan (Louie, 2012; see Gottzén, Mellström, & Shefer, 2020 for a recent review of masculinity in East Asia).

The increased importance of male physical attractiveness and beauty has been hypothesized to be a key contributing factor to the rise of disordered eating and attitudes among Asian males (Mitchison, Hay, Slewa-Younan, & Mond, 2014). A study conducted among university students (n = 3,148, mean age 20.5) in south-east Asian countries (Indonesia, Malaysia, Myanmar, Thailand, and Vietnam) found

that males (10.8%) and females (12.7%) were equally at risk of developing an ED (Peltzer & Pengpid, 2018). A number of other studies from Malaysia, Singapore's neighboring country, report similar gender parity in prevalence of disordered eating among children (Chong, Chin, Gan, & Nasir, 2017), adolescents (Cheah, Hazmi, & Chang, 2017), and university students (Chan, Samy, Tong, Islam, & Low, 2020; Edman & Yates, 2004; Gan, Nasir, Zalilah, & Hazizi, 2011).

The rise of clinical cases and high levels of weight and shape concerns in Singapore suggest that the prevalence of EDs may be much higher than the IHME 12-month prevalence of EDs (0.7% among females and 0.3% among males). To our knowledge, there is no study estimating the prevalence of EDs in the Singapore general population. The current study seeks to (a) estimate the prevalence of EDs, risk status, and help seeking behaviors among adults in Singapore; (b) examine gender differences between ED status groups; and (c) characterize the clinical profile of individuals who screen positive for an ED with regards to weight and shape concerns, and disordered eating behaviors.

2 | METHOD

We used a market research and data analytics company to administer the Stanford-Washington Eating Disorder Screen (SWED; Graham et al., 2019) to a panel of adult participants. This project received institutional review board (IRB) approval from Nanyang Technological University. Participants were given the option to opt out of answering the SWED completely or any items without penalty. Details of the nonprobability sampling methodology are reported in Appendix 1.

2.1 | Measures

2.1.1 | Demographic data

Participants self-reported on height (cm) and weight (kg), which was used to calculate body mass index (BMI), age (years), gender (“male,” “female”), ethnicity (“Chinese,” “Malay,” “Indian,” “other”), current marital status (“married,” “living with partner,” “in relationship, but not living with partner,” “widowed,” “divorced,” “separated,” “single”), monthly net household income (nine categories ranging from “below SGD 1000” to “above SGD 20000”), highest level of education completed (eight categories ranging from “Primary School Leaving Examination (PSLE)” to “professional higher education”), and current employment status (eight categories ranging “from not working” to “working full time”). Singapore does not legally recognize nonbinary or third gender classifications.

2.1.2 | Probable ED diagnoses and risk status

The SWED is a screening tool used to identify possible DSM-5 ED diagnoses and risk based on ED behaviors and impairment. This measure has been validated with female college students in the United States (Graham et al., 2019) and has been used widely among males and females across the United states (Fitzsimmons-Craft, Balantekin, et al., 2019; Fitzsimmons-Craft, Firebaugh, et al., 2019). This is the first time the SWED has been used in Singapore. Items were adapted from the EDE-Q (Fairburn & Beglin, 1994) and the Eating Disorder Diagnostic Scale (EDDS; Mond, Hay, Rodgers, Owen, & Beumont, 2004) to assess disordered weight control behaviors in the past three months (binge-eating, vomiting, use of diuretics/laxatives, excessive exercise and fasting). Current weight and shape concerns were measured using the 5-item Weight Concerns Scale (WCS; Killen et al., 1993, 1996). Participants also indicated whether they were currently in treatment for an ED, or had received treatment in the past.

Based on their responses, participants are categorized into one of the following DSM-5 diagnostic categories with a hierarchical order as follows: possible anorexia nervosa (pAN); BN; binge-eating disorder (BED), other specified feeding or eating disorder bulimia nervosa (of low frequency and/or limited duration (OSFED-BN), other specified feeding or eating disorder binge-eating disorder (of low frequency and/or limited duration (OSFED-BED), otherwise specified feeding or eating disorder-purging disorder (OSFED-PD), other specified feeding or eating disorder (OSFED); high risk for an ED (HR); ARFID, and not at risk or low risk for an ED (LR). SWED's operational definitions of the DSM-5 ED diagnostic categories used are listed in Appendix B. As the SWED uses a diagnostic hierarchical order, participants who screened positive for a specific ED or for the “at risk for an eating disorder” category were excluded from an ARFID diagnosis. It should be noted that in previous papers published on the SWED, OSFED-BN was referred to as “sub-clinical bulimia nervosa”, OSFED-BED was referred to as “sub-clinical binge-eating disorder”, and OSFED-other was referred to as “unspecified feeding or eating disorder” (UFED).

2.1.3 | Analysis

We recategorized monthly income into three groups using Pew Research Center's (2015) definition of a middle income household (two-thirds to double the national median income), as there is no official poverty line in Singapore. Based on the 2019 national median monthly income of SGD 7000 (Department of Statistics Singapore, 2020), we categorize low monthly household income as <SGD 4000, middle monthly household income as between SGD 4000 and SGD 14999 and high monthly household income as > SGD 14999. Education status was recategorized into “primary school” (grade school equivalent), “secondary school” (high school equivalent), “diploma/university,” “post graduate” and “other”. Employment status was recategorized to “full time work,” “part time work,” “full time student,” “retired/employed/not working,” and “other”.

The data were cleaned using the guidelines described in Fitzsimmons-Craft, Balantekin, et al., 2019; Fitzsimmons-Craft, Firebaugh, et al., 2019, whereby biologically implausible values for ED behaviors (>500 times over the past 3 months), weight (<12 kg or >200 kg), height (<100 cm or >250 cm; 0.6% of the sample), and BMI (BMI <10 kg/m^2 or BMI >80 kg/m^2, 0.1% of the sample) were removed and considered missing. Height, weight, and BMI cutoffs

was selected based on past studies conducted with Asian populations (Lam, Koh, Chen, Wong, & Fallows, 2015; Odegaard et al., 2009; Song et al., 2019). The distributions for BMI and ED behaviors were positively skewed. As height and weight values were self-reported, we used the Median Absolute Deviation (MAD) method (Leys, Ley, Klein, Bernard, & Licata, 2013), with a conservative cutoff of ±3 times the MAD to detect outliers (Templ, Gussenbauer, & Filzmoser, 2019). Based on the MAD cutoffs, 2.7 and 1.8% of weight and height values were considered implausible and considered missing. We did not remove outliers for ED behaviors as long as they were biologically plausible as it is reasonable that ED behaviors are uncommon behaviors (outliers) in a normal population.

We examined gender differences in the prevalence of any clinical/subclinical ED and risk status (low risk, high risk, and any clinical/subclinical ED), rather than separate diagnostic category, as the prevalence of certain ED diagnostic categories in males were low. As there was a high prevalence of OSFED-other, we categorized the frequency of disordered weight control behaviors in the past 3 months into three categories ("0–2", "3–10", "11 or more") to examine the percentage of respondents in the OSFED-other group endorsing these behaviors.

TABLE 1 Unweighted demographic characteristics of the sample of adults ages 21–77 (*N* = 827)

	Males (*n* = 362) Mean (*SD*)	**Females (*n* = 397) Mean (*SD*)**	**Significance (*p*-value)**
BMI	24.49 (3.74)[a]	22.71 (4.06)[b]	<.001
Age	45.86 (14.13)	43.97 (14.05)	.05
	***n* (%)**	***n* (%)**	
Marital status			<.001
Married	255 (64.9)[a]	217 (50.0)[b]	
Living with partner	11 (2.8)	7 (1.6)	
In relationship, but not living with partner	22 (5.6)[a]	48 (11.1)[b]	
Widowed	2 (0.5)	8 (1.8)	
Divorced	8 (1.8)[a]	24 (5.2)[b]	
Separated	2 (0.5)	5 (1.2)	
Single	93 (23.7)	126 (29.0)	
Ethnicity			.35
Chinese	287 (73.0)	332 (76.5)	
Malay	48 (12.2)	55 (12.7)	
Indian	40 (10.2)	35 (8.1)	
Other	18 (4.65)	12 (1.5)	
Income group			.05
Low income (<SGD4000)	111 (30.1)	148 (37.9)	
Middle income (SGD4001–SGD14999)	124 (33.6)	126 (32.2)	
High income (>SGD14999)	134 (36.3)	117 (29.9)	
Missing			
Education			.04
Primary school	9 (2.3)	11 (2.6)	
Secondary school	71 (18.1)[a]	110 (25.5)[b]	
Diploma/University	254 (64.8)	263 (61.0)	
Post graduate	58 (14.8)	47 (10.9)	
Other			
Employment status			.10
Full time work	268 (68.2)	271 (62.4)	
Part time work	49 (12.5)	52 (12.0)	
Full time student	17 (4.3)	16 (3.7)	
Retired/unemployed/not working	53 (13.5)	90 (20.7)	
Other	6 (1.5)	5 (1.2)	

Note: p-value was based on the test of difference in means for continuous variables and proportions for binary/categorical variables between males and females.

Differences in ED status groups on weight/shape concerns were examined using ANOVAs, controlling for BMI, age and gender. The Bonferroni correction was used to adjust for multiple statistical tests.

3 | RESULTS

In total, 1,104 individuals were invited to participate in the online survey, of which, 866 individuals ages 21–77 years (78% response rate; 51% females) agreed to participate. After removing outliers, the sample size was n = 827. Demographic information is reported in Table 1. Males had significantly higher mean BMI (24.49 kg/m^2) than females (22.71 kg/m^2) and were more likely to be in a relationship than females. The mean BMI of our sample is comparable with Singapore's national mean BMI of 24.3 kg/m^2 for males and 23.2 kg/m^2 for females (World Health Organisation [WHO], 2014). There were no other demographic differences between genders. Females had higher scores on the WCS compared to males, but there were no gender differences in frequency of disordered weight control behaviors over the past 3 months (Table 2).

TABLE 2 Weight-shape concerns, frequency of disordered weight control behaviors in the past 3 months, eating disorder diagnostic and risk categories and eating disorder treatment status by gender (n = 797)

	Total (N = 797) Mean (*SD*)	Males (n = 392) Mean (*SD*)	Females (n = 405) Mean (*SD*)	Significance
WCS	38.21 (22.93)	35.16 (21.97)	41.21 (23.48)	$F(1, 768) = 13.62$, $p < .001$
DWCB				
Binge eating	3.15 (10.58)	2.84 (8.64)	3.46 (12.18)	$F(1, 731) = 6.15$, $p = .43$
Vomiting	0.22 (1.38)	0.28 (1.17)	0.16 (1.55)	$F(1, 774) = 1.45$, $p = .23$
Diuretics/laxatives	0.34 (1.84)	0.28 (1.37)	0.40 (2.21)	$F(1, 775) = 0.85$, $p = .36$
Excessive exercise	2.56 (9.20)	2.99 (10.16)	2.14 (8.17)	$F(1, 779) = 1.65$, $p = .20$
Fasting	1.40 (6.01)	1.49 (5.55)	1.32 (6.43)	$F(1, 780) = 0.16$, $p = .70$
	n (%)	*n* (%)	*n* (%)	
Eating disorder diagnostic and risk categories				
Low risk	296 (37.2)	147 (37.5)	149 (36.9)	$\chi^2(3, 796) = 3.74$, $p = .15$
High risk	156 (19.5)	66 (16.9)	89 (22.1)	
ED				
pAN	7 (0.9)	1 (0.3)	6 (1.5)	
BN	7 (0.9)	3 (0.7)	4 (1.0)	
BED	2 (0.2)	0	2 (0.4)	
OSFED-BN	46 (5.7)	22 (5.7)	24 (5.8)	
OSFED-BED	3 (0.4)	0	3 (0.8)	
OSFED-PD	1 (0.1)	0	1 (0.2)	
OSFED-OTHER	246 (30.9)	137 (34.9)	109 (27.0)	
ARFID	33 (4.1)	16 (4.1)	17 (4.2)	
Treatment status of participants who screened positive for an ED (n = 345)				
Yes	5 (1.6)	4 (2.5)	1 (0.7)	$\chi^2(2, 344) = 0.77$, $p = .45$
Not currently but in the past	10 (2.9)	5 (2.9)	5 (3.0)	
No	328 (95.1)	168 (94.0)	160 (96.3)	
Prefer not to say	1 (0.3)	1 (0.6)	0	

Note: Within the ARFID group, 10 (30.3%) endorsed more than one ARFID symptom (eating or feeding disturbance due to sensory properties of food, poor appetite or concern of aversive consequences from eating). Among those who endorsed only one ARFID symptom, 7 (30.4%) had poor appetite; 9 (39.1%) avoided food due to sensory properties of food; and 7 (30.4%) had concerns about the aversive consequences of eating.
Gender difference for WCS and DWCB were tested using ANOVA tests controlling for BMI and age. Gender difference between eating disorder status groups and treatment status were conducted using chi-square tests. Groups with different superscripts are significantly different from each other ($p < .05$). Chi-square tests for treatment status examined gender differences between no treatment receipt and treatment receipt (currently receiving treatment and treatment in the past).
Abbreviations: ARFID, avoidant/restrictive food intake disorder; BN, bulimia nervosa; BED, binge-eating disorder; DWCB, disordered weight control behaviors in the past 3 months; ED, all possible DSM-5 clinical/subclinical diagnosis groups; OSFED-BN, other specified feeding or eating disorder bulimia nervosa (of low frequency and/or limited duration); OSFED-BED, other specified feeding or eating disorder binge-eating disorder (of low frequency and/or limited duration); OSFED-PD, other specified feeding and eating disorder-purging disorder; OSFED-other, other feeding or eating disorder-other; pAN, possible anorexia nervosa; WCS, weight concerns scale.

TABLE 3 Means and *SD*s of BMI (kg/m^2), weight-shape concerns and frequency of disordered weight control behaviors in the past 3 months across eating disorder status groups (n = 794)

	LR (n = 296)	HR (n = 156)	pAN (n = 7)	BN/OSFED-BN (n = 53)	BED/OSFED-BED (n = 5)	OSFED-other (n = 247)	ARFID (n = 33)	Significance
BMI (kg/m^2)	22.35 (3.47)	24.25 (4.11)	17.60 (1.09)	25.47 (3.71)	23.77 (1.56)	24.56 (4.04)	21.64 (2.97)	$F(6, 758) = 16.18$, $p < .001$, LR, HR, BN, BED, OSFED-OTHER>pAN HR, BN, OSFED-OTHER > LR, ARFID
WCS	20.71 (14.94)	51.52 (16.96)	59.15 (16.87)	68.32 (14.65)	62.63 (18.89)	44.67 (20.18)	24.17 (10.53)	$F(6, 736) = 91.53$ $p < .001$ pAN, BN, BED, OSFED-OTHER, HR > LR, ARFID pAN > OSFED-OTHER BN > HR > OSFED-OTHER
DWCB								
Binge eating	0.43 (1.48)	0.39 (0.68)	2.34 (3.82)	11.07 (16.64)	32.34 (43.65)	5.90 (14.21)	0.64 (0.83)	$F(6, 731) = 22.17$, $p < .001$ BED > BN > OSFED-OTHER > LR, HR, ARFID BED > pAN
Vomiting	0.04 (0.37)	0.02 (0.13)	0	0.78 (1.76)	0.13 (3.72)	0.47 (2.25)	0.04 (0.19)	$F(6, 774) = 4.36$, $p < .001$ BN, OSFED-OTHER > LR, HR
Diuretics/ laxatives	0.03 (0.23)	0.05 (0.26)	0	2.35 (4.51)	0	0.52 (2.32)	0.07 (0.27)	$F(6, 775) = 14.38$, $p < .001$ BN > LR, HR, pAN, OSFED-OTHER, ARFID OSFED-OTHER > LR
Excessive exercise	0.19 (1.09)	0.18 (0.51)	5.84 (10.33)	10.20 (16.83)	0.15 (0.41)	5.43 (13.19)	0.06 (0.38)	$F(6, 779) = 17.43$, $p < .001$ BN > OSFED-OTHER > LR, HR, ARFID
Fasting	0.22 (1.77)	0.06 (0.26)	1.47 (3.51)	4.52 (7.86)	0	3.16 (9.51)	0.04 (0.19)	$F(6, 780) = 9.90$, $p < .001$ BN, OSFED-OTHER > LR, HR BN > ARFID

Note: Eating disorder status group differences were tested using ANOVA tests. Group differences for BMI (kg/m^2) controlled for gender and age; group differences for WCS and DWCB controlled for gender, BMI and age.

Abbreviations: ARFID, avoidant/restrictive food intake disorder; BN, bulimia nervosa + other specified feeding or eating disorder bulimia nervosa (of low frequency and/or limited duration; BED, binge-eating disorder + other specified feeding or eating disorder binge-eating disorder (of low frequency and/or limited duration; DWCB, disordered weight control behaviors over the past 3 months; pAN, possible anorexia nervosa; OSFED-other, other specified feeding or eating disorder-other + other specified feeding and eating disorder- purging disorder; WCS, weight concerns scale.

The point prevalence of individuals who screened positive for a current clinical/subclinical ED diagnosis is reported in Table 2. ED risk/diagnostic category was assigned to 797 participants (50.8% females) as 30 individuals had missing height/weight information. The point prevalence are as follows: 0.9% for AN (0.3% males; 1.5% females), 0.9% for BN (0.7% males; 1.0% females), 5.7% for OSFED-BN (5.7% males; 5.8% females), 30.9% for OSFED-other (34.9% males; 27.0% females) and 4.1% for ARFID (4.1% males; 4.2% females). Only females screened positive for BED (0.2%), OSFED-BED (0.4%) and OSFED-PD (0.1%). Among those who screened positive for a current ED, only 1.6% were currently receiving treatment for an ED. In analyses examining gender differences in the presence of any ED (Table 2), we found the ratio of males to females in the low risk, high risk, and EDs categories to be comparable. Likewise, there was no gender difference in ED treatment status.

The clinical profiles of ED status groups are reported in Table 3. Individuals who screened positive for BN/OSFED-BN were in the overweight BMI range for Asians (25.47 kg/m^2; WHO, 2004). There were elevated weight and shape concerns for all groups who screened positive for an ED except for those in the ARFID and OSFED-other groups. Binge-eating episodes were most frequent among those in the BED/OSFED-BED and BN/OSFED-BN groups. Individuals in the BN/OSFED-BN group reported the highest frequencies of disordered weight control behaviors.

As there was a high prevalence of OSFED-other in this study, we looked at the proportion of participants who engaged in binge eating

TABLE 4 Characteristics of OSFED-other binge eating and compensatory behaviors subgroups and associated features of binge-eating episodes in the past 3 months (n = 246)

	Total (n = 246) n (%)	Binge-eating subgroup (n = 101) n (%)	Compensatory behaviors subgroup (n = 145) n (%)	Significance
Females %	109 (44.4)	53 (52.2)[a]	57 (39.0)[b]	χ^2 (1, 247) = 0.04, p = .04
Binge eating				χ^2 (3, 246) = 67.48, p < .001
0	47 (19.2)	0[a]	47 (32.5)[b]	
1–10	162 (66.0)	85 (83.9)[a]	78 (53.5)[b]	
11 or more	19 (7.8)	16 (16.1)[a]	3 (2.0)[b]	
Missing	17 (7.1)	0[a]	17 (12.0)[b]	
Vomiting				χ^2 (3, 247) = 22.69, p < .001
0	209 (84.7)	98 (97.1)[a]	111 (76.1)[b]	
1–10	31 (12.8)	1 (0.9)[a]	31 (21.0)[b]	
11 or more	1 (0.4)	0	1 (0.7)	
Missing	5 (2.2)	2 (2.0)	3 (2.3)	
Diuretics/ laxatives				χ^2 (2,246) = 18.50, p < .001
0	209 (84.9)	97 (96.0)[a]	112 (77.2)[b]	
1–10	32 (12.9)	2 (2.0)[a]	30 (20.7)[b]	
11 or more	0	0	0	
Missing	5 (2.2)	2 (2.0)	3 (2.1)	
Excessive exercise				χ^2 (3, 247) = 116.80, p < .001
0	112 (45.3)	86 (85.1)[a]	26 (17.8)[b]	
1–10	113 (45.9)	13 (11.5)[a]	100 (68.5)[b]	
11 or more	20 (8.0)	0 [a]	20 (13.7)[b]	
Missing	2 (0.8)	2 (2.0)	0	
Fasting				χ^2 (3, 246) = 51.07, p < .001
0	155 (62.9)	89 (88.1)[a]	66 (45.5)[b]	
1–10	72 (29.2)	10 (9.9)[a]	62 (42.8)[b]	
11 or more	16 (6.6)	0 [a]	16(11.0)[b]	
Missing	3 (1.3)	2 (2.0)	1 (0.7)	

Note: OSFED-other = Other specified feeding or eating disorder-other. Binge-eating subgroup = total episodes of binge eating in the past 3 months ≥3 in the past 3 months; compensatory behaviors subgroup = total frequency of vomiting, use of diuretics/laxatives, excessive exercise and fasting to control weight/shape ≥3 in the past 3 months. Groups with different superscripts are significantly different from each other (p < .05).

≥3 times in the past 3 months (41.1%) versus compensatory behaviors ≥3 times in the past 3 months (58.9%; Table 4). There were more females in binge-eating group (females = 52.2%) than in the compensatory behaviors group (females = 38.9%). A majority (85.1–97.1%) of people in the OSFED-other binge-eating group did not engage in any compensatory behaviors. In comparison, a majority of participants in the OSFED-other compensatory behaviors group said that they excessively exercised (82.2%) or fasted (53.8%) in the past 3 months. Misuse of diuretics/laxatives (20.7%) and vomiting (21.7%) to control weight or shape were less common behaviors.

4 | DISCUSSION

This is the first national ED screening study to be conducted in Singapore and paints an alarming picture with the majority of participants screening positive for a DSM-5 clinical ED/OSFED-ED diagnosis (42.7%) or at high risk of developing an ED (19.5%). The point prevalence of pAN (0.9%) and BN (0.9%) is comparable or higher than the national one-year prevalence of AN and BN in the United Kingdom (AN: 0.6%, BN: 1.0%; National Institute for Health and Care Excellence [NICE], 2017) and the United States (AN: 0.12%, BN: 0.19%; Deloitte Access Economics, 2020). Consistent with data from United States (Fitzsimmons-Craft, Balantekin, et al., 2019; Fitzsimmons-Craft, Firebaugh, et al., 2019), individuals who screened positive for pAN, BN/OSFED-BN and BED/OSFED-BED had elevated WCS scores (≥47). In addition, we also found cross-cultural similarities with the current understanding of ARFID as a nonweight/shape concern disorder (Fisher et al., 2014), such that, individuals who screened positive for ARFID had similar WCS scores as those in the low risk group.

Nonetheless, some of our findings suggest that a closer examination into the less studied EDs groups is warranted. The point prevalence of BED (0.2%) was considerably lower than the national one-year prevalence reported in the United Kingdom (3.2%; NICE, 2017) and the United States (0.62%; Deloitte Access Economics, 2020), while the point prevalence of OSFED-other (30.9%) was high. In this study, OSFED-other was defined by (a) three or more binge-eating episodes in the past 3 months or (b) three or more disordered weight control behaviors in the past 3 months. It should be noted that individuals in the OSFED-other group do not qualify for a BN/OSFED-BN, BED/OSFED-BED, or OSFED-PD diagnosis due to the hierarchical categorization of the SWED. It is possible that the Singapore population has a different interpretation of what consists a large amount of food than Western populations. The collectivistic culture of Singapore might also facilitate binge eating in social groups, which reduces marked distress and feelings of embarrassment or disgust toward oneself. It may also be due to over-eating due to politeness and to not be seen as wasteful (He et al., 2020). This may explain why individuals in the OSFED-other binge-eating group did not meet the DSM-5 diagnostic criteria for BED/OSFED-BED and seldom engaged in compensatory behaviors.

In the OSFED-other compensatory behaviors group, fasting and exercise were the most common behaviors used to control weight and shape. This may be due to the concerted effort of the Singapore government to reduce the prevalence of obesity through national obesity prevention campaigns by encouraging dieting and exercise (Mond et al., 2010). There may be certain individuals who are particularly vulnerable to developing EDs through public reminders to eat healthy, count calories and exercise frequently. Specifically, obsessive compulsive disorder (OCD) often co-occur with EDs and appears to have a shared etiological relationship through perfectionistic and impulsive traits (Altman & Shankman, 2009). The 2010 national mental health survey found that underweight Singaporeans (BMI ≤18.49 kg/m^2) were more likely to have OCD in the past 12 months (Subramaniam et al., 2013). As Singapore has one of the highest rates of OCD in the world (3.6% lifetime prevalence; 2.9% 12-month prevalence; Subramaniam et al., 2019), more research is urgently needed to understand the risk factors for EDs and their co-occurring disorders.

We found a relatively high percentage of participants who screened positive for ARFID (4.1%; Bourne, Bryant-Waugh, Cook, & Mandy, 2020). Common parenting practices around feeding may be a contributing factor to the development of ARFID in Singapore. A longitudinal cohort study of mother-infant dyads (n = 842) found that 32.7% of 12-month old infants were still being fed blended food, although 91.7% of infants in the cohort could self-feed finger food (Toh et al., 2016). Late introduction (after 9 months) to "lumpy food" has been shown to be associated with later feeding difficulties (Coulthard, Harris, & Emmett, 2009; Northstone et al., 2001).

Mothers of young children in Singapore also tend to show a high level of involvement in their children's eating behaviors (Fries et al., 2019). Past studies have found that controlling parenting practices related to food and maternal feeding restriction is associated with persistent problematic eating (Ellis, Galloway, Webb, Martz, & Farrow, 2016; Fernandez et al., 2020). As children get older and develop their own eating preferences, restrictive eating habits may be socially maintained as Singaporean mothers often defer to their children's food preferences, possibly to minimize family conflict (Ferzacca, Naidoo, Wang, Reddy, & van Dam, 2013).

Given the difficulty in differential diagnosis between nonfat phobic AN (NFP-AN) and ARFID (Izquierdo et al., 2019), it is also possible that the ARFID category captured some individuals with NFP-AN. Past research suggests that individuals with ARFID and NFP-AN both report a lack of interest in food or eating or physical discomfort from eating (Thomas, Hartmann, & Killgore, 2013). Of the 35 individuals who screened positive for ARFID in our sample, eight individuals had a BMI of ≤18.49 kg/m^2 but did not engage in any disordered weight control behaviors. More research is needed to examine the clinical features of such individuals to distinguish between ARFID and NFP-AN.

Our study found there were no gender differences in the frequency of disordered weight control behaviors or the overall prevalence of EDs. This suggests that gender disparity in EDs in Asia cannot be assumed and further research is required to understand culture and gender specific factors contributing to increased prevalence of EDs. Even in syndicated men's magazines, male readers are encouraged to count calories and slim down to appeal to women

(Pugsley, 2010). Future research is needed to understand the consequences of soft masculinity and whether males who strive for such an ideal are at greater risk for developing an ED.

Our study also found that only 1.6% of individuals who screened positive for an ED are currently in treatment for the ED. This is similar to recent data from a national study in the United States (3.0%; Fitzsimmons-Craft, Balantekin, et al., 2019, Fitzsimmons-Craft, Firebaugh, et al., 2019), and highlights a large treatment gap for EDs across cultures. The low percentage of treatment receipt is surprising considering that Singapore has a dedicated public EDs treatment program, the only one of its kind in Southeast Asia (Lian, 2019). The treatment gap may be due to the lack of awareness of EDs, with one study reporting that only 14.0% of university women could correctly identify symptoms of BN in a vignette compared to 38.0% who attributed the symptoms to low self-esteem (Chen, Mond, & Kumar, 2010). People may also be reluctant to seek treatment due to the stigma associated with EDs in Singapore. Even among healthcare professionals, clinicians perceived patients with EDs as "deceitful and manipulative" (Seah, Tham, Kamaruzaman, & Yobas, 2018).

Despite our finding of gender parity in the overall prevalence of EDs, the ratio of male to female patients at the public ED program is 1:12.5 (Tan, Lin, Kuek, Lee, & Boon, 2014). This further points to the urgent need to shift away from viewing EDs as a female issue and for the development of ED prevention and intervention programs that are effective with each gender. One possible solution to reduce the treatment gap is to implement online EDs preventive and treatment interventions, which have been shown to be affordable (Kass et al., 2017), effective in reducing eating-related psychopathology among community samples across genders (Beintner, Jacobi, & Taylor, 2012; Fitzsimmons-Craft et al., 2020; Saekow et al., 2015) and in a clinical sample (Haderlein, 2019).

One of the limitations of this study is the assumption of the cross-cultural validity of the SWED and the DSM-5 ED diagnostic criteria. The SWED was validated against the EDE diagnostic interview for female college students in the United States (Graham et al., 2019), but its psychometric properties have not been examined with an Asian population or with a male population. Further research on the psychometrics of the SWED in Asian males and females would be of value. Another limitation is that we did not assess for other EDs such as night eating syndrome. We also collected self-reported anthropometric measurements of weight and height, which may differ from actual weight and height. Past research have found that self-reported weight and height provides a reasonably accurate estimation of actual anthropometrics (Olfert et al., 2018; Stommel & Schoenborn, 2009).

This article challenges the common assumption that EDs are a Western female phenomenon. Based on our results, we estimate that the majority of both female and male Singaporeans are either at risk for developing an ED or do already have an ED. With only a small number of people receiving treatment, there is a great need for more research on EDs in Asia and the development of culturally sensitive prevention and intervention programs for all genders. Nonetheless, even though EDs research and prevention and treatment programs in Asia lag behind Western nations, this is an opportunity to learn from prior mistakes and adopt best practices. It is time to acknowledge EDs as a public health issue in Singapore and take a broader approach to health beyond obesity.

ACKNOWLEDGMENTS

This work was supported by Ministry of Education AcRF Tier 1 grant no.: RP 3/18 CSN; National Institute of Mental Health grant K08 MH120341.

CONFLICT OF INTEREST

The authors have no conflict to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Chua SN, Fitzsimmons-Craft EE, Austin SB, Wilfley DE, Taylor CB. Estimated prevalence of eating disorders in Singapore. *Int J Eat Disord*. 2020;1–12. https://doi.org/10.1002/eat.23440