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Prevalence of eating disorders and disordered eating in Western Asia: a systematic review and meta-Analysis

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ABSTRACT

This study aimed to systematically synthesize and appraise existing literature on the prevalence of eating disorders and disordered eating in Western Asia. A systematic literature search of major English and Arabic databases, i.e., PubMed/Medline, EMBASE, PsychInfo, Web of Science and Scopus (English), Al-Manhal (Arabic) and grey literature was done to obtain the prevalence of disordered eating and eating disorders in Western Asia. The literature search was conducted on June 12th, 2020, and included papers from 1990–2020. Out of the 249 unduplicated original studies reviewed, 27 were included in the final meta-analysis. Data were then categorized according to the tools used to identify the presence of disordered eating or eating disorders. The pooled prevalence of disordered eating as solicited by both the Eating Attitudes Scale 26 and the Eating Attitudes Scale 40 (N = 11841) was 22.07%, the Sick, Control, One stone, Fat, Food Questionnaire (n = 3160) was 22.28% and the Eating Disorder Examination–Questionnaire (n = 425) was 7.95%. The pooled prevalence obtained from those studies using semi-structured interviews for anorexia nervosa (n = 118190) was 1.59%, bulimia nervosa (n = 118513) was 2.41% and the estimated prevalence of Eating Disorder Not Otherwise Specified (EDNOS) (n = 118087) was 3.51%. Although the prevalence rate of eating disorders solicited using semi-structured interviews appeared to parallel the international range, the overall prevalence rate of disordered eating appeared to be slightly higher than the global rates of prevalence. A significant number of the suspected/detected cases of disordered eating appear to fulfill the criteria for EDNOS. This study is classified as evidence obtained from systematic reviews and meta-analyses (i.e. Level 1).

Clinical Implications

- Evaluated existing literature on the prevalence of disordered eating and eating disorders in Western Asia

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- Disordered eating attitudes are common in Western Asia. The overall prevalence rate of disordered eating appears to be slightly higher than the international rates
- A significant number of the suspected or detected cases of disordered eating appear to fulfill the criteria for EDNOS
- Various idiosyncratic socio-cultural factors play a major role in shaping disordered eating
- More studies should be directed towards exploring and understanding the outcomes of disordered eating and its covariates in Non-Western countries so that preventive measures could be contemplated

Introduction

Eating Disorders, as featured in psychiatric nomenclatures such as the *International Classification of Diseases* and *Diagnostic and Statistical Manual*, appear to be increasingly identified across different parts of the world (Erskine et al., 2016; Hoek, 2016; Kolar et al., 2016). This emerging trend has begun to challenge the previous assumption that eating disorders are a culture-bound syndrome of high-income countries of North America and Western Europe where idealization of thinness predominates the existing standards of beauty and health (Rikani et al., 2013). More recently, there has been an increasing recognition of eating disorders being more ‘culture-reactive’ than ‘culture-bound’ (Keel & Klump, 2003; Lee, 1996), a notion that is supported by a variety of studies emerging from non-Western societies, often categorized as “emerging economies”, “developing countries” or “societies in transition” (Pike et al., 2014).

Pathological preoccupation with food and body image, though different in frequency, expression, and severity as observed in North America, Western Asia and the Pacific Rim (Fairburn & Harrison, 2003; Kuboki et al., 1996), are now being reported in different corners of the world (Kolar et al., 2016; van Hoeken, Burns & Hoek, 2016). This includes those countries located in the geographical regions known as the Fertile Crescent, Iranian Plateau, the Arabian Peninsula and the Hind Kush region (Al-Adawi, Dorvlo, Burke, Moosa, Al-Bahlani, et al., 2002; Pike & Dunne, 2015). Studies from these particular regions revealed that younger people have increasingly been showing body image dissatisfaction, as is widely documented among their counterparts in North America and Western Europe (Mitrany et al., 1995). It is worthwhile to note that EDs have been ranked globally as the 12th leading cause of disability-adjusted life years (DALY) (Erskine et al., 2016). In Western countries, the rate of EDs such as anorexia nervosa (AN) and bulimia nervosa (BN) ranges from 0.1% to 5.7% and 0% to 7.3%, respectively (Makino et al., 2004). In a meta-analysis that pooled data from community surveys from around the world, Qian et al. (2013) reported that the

prevalence of EDs was approximately 1% and specific eating disorders such as AN was 0.21%, BN was 0.81%, and binge eating disorder (BED) was 2.22%. In this regard, the geographical and sub-cultural diversity in the magnitude of eating disorders must also be considered. Eating disorders seem to be most prevalent among Caucasian populations around the world when compared to Asian, African, and South American populations and ethnic minorities living in high-income countries in North America and Western Europe. This is especially true for AN as compared to the other subtypes of eating disorders (Goode et al., 2020; Kolar et al., 2016; Thomas et al., 2016; van Hoeken, Burns & Hoek, 2016; Perez et al., 2016; Makino et al., 2004).

The majority of the epidemiological meta-analyses, systematic reviews, and narrative reviews have focused on the Western/non-Western dichotomy. In this regard, there appears to be a dearth of studies synthesizing the prevalence of disordered eating and eating disorders among “societies in transition” or “developing”/“emerging” economies such as those in the region of Western Asia, despite the considerable volume of research surfacing from these regions. A search of the literature did not reveal the existence of many such syntheses of research on the epidemiology of eating disorders in non-westernized societies with a few exceptions of studies reviewed from South America and Africa and none from Asia (Kolar, Rodriguez, Chams & Hoek, 2016; van Hoeken, Burns & Hoek, 2016). In this regard, a meta-analysis is required to assess and evaluate the existing evidence and highlight cultural trends within eating disorders in such underrepresented regions. The present meta-analysis and systematic review focused on the region of Western Asia covering 16 countries and has been operationalized in the present context to constitute the Fertile Crescent region (Iraq, Israel, Jordan, Lebanon, Palestine, and Syria), Iranian Plateau and the Hind Kush region (Iran and Pakistan, Afghanistan), and the Arabian Peninsula (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen). It should be noted that multiple names do exist for the groups of countries constituting the present definitions: ‘Middle East’, ‘Eastern Mediterranean’, and the ‘Near East’, which also includes countries of Eastern and Southern Europe such as Armenia, Georgia, Cyprus and Turkey. However, the present operationalization of the geographical region defined as Western Asia is a pragmatic one as there are certain stringent and agreed-upon definitions of what constitutes this region. The commonality between the countries constituting the presently defined region of Western Asia is that they are known for being the birthplace of most ancient civilizations and the Abrahamic religion (Braithwaite et al., 2017). These countries have been collectively labeled as societies in transition (also known as ‘emerging economies’ or ‘developing countries’) (Lesthaeghe, 2020) and are characterized by a move away from traditional modes of living including diet, family structure,

and gender roles (Pike & Dunne, 2015). Such social and demographic trends have generally led to an increase in the spread of adjustment disorders including body image disturbances and pathological eating (Pate et al., 1992).

Two types of standardized diagnostic interviews are commonly used to solicit the presence of disordered eating and eating disorders: self-report questionnaires and semi-structured interviews (Al-Adawi, Dorvlo, Burke, Moosa, Al-Bahlani, et al., 2002; World Health Organization, 1992). Hence, the primary aim was to conduct a systematic review and meta-analysis of this accumulated data from Western Asia. Specifically, we aimed to synthesize empirical studies on the prevalence rate of disordered eating patterns and eating disorders using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines (Liberati et al., 2009). This review addressed the prevalence of disordered eating and eating disorders using data derived from articles that employed either self-report questionnaires or semi-structured interviews. Screening tools such as the Eating Attitudes Test 26 and the Eating Attitudes Test 40 (EAT-26/40) (Garner et al., 1982), Sick, Control, One, Fat, Food (SCOFF) questionnaire (Morgan et al., 1999), Eating Disorder Examination–Questionnaire (EDE-Q) (C.G. Fairburn & Beglin, 2008) and Eating Disorder Diagnostic Scale (EDDS) (Stice et al., 2000) were operationalized to constitute self-report questionnaires. Surveys conducted on Asian populations suggest that the prototypical conception of disordered eating might not apply to certain ethnic and linguistic groups (Lee, 1996; Lee et al., 1993; Ngai et al., 2000) and therefore ‘atypical’ eating behaviours, sometimes labeled Eating Disorder Not Otherwise Specified (EDNOS), are common (Lee & Kwok, 2005). Semi-structured interviews have been designed with the flexibility to accommodate these atypical features of eating disorders (Al-Adawi, Dorvlo, Burke, Moosa, Al-Bahlani, et al., 2002).

Methods

This systematic review was conducted via an established protocol, using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher, Liberati, Tetzlaff, Altman, the PRISMA Group, 2009) and included published articles up to the year 2020. Using search terms such as ‘eating disorders’, ‘prevalence’ and the individual country names (Iraq, Israel, Jordan, Lebanon, Palestine, Syria, Iran, Pakistan, Afghanistan, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen), the accrued articles were further screened to identify whether or not they met the eligibility criteria.

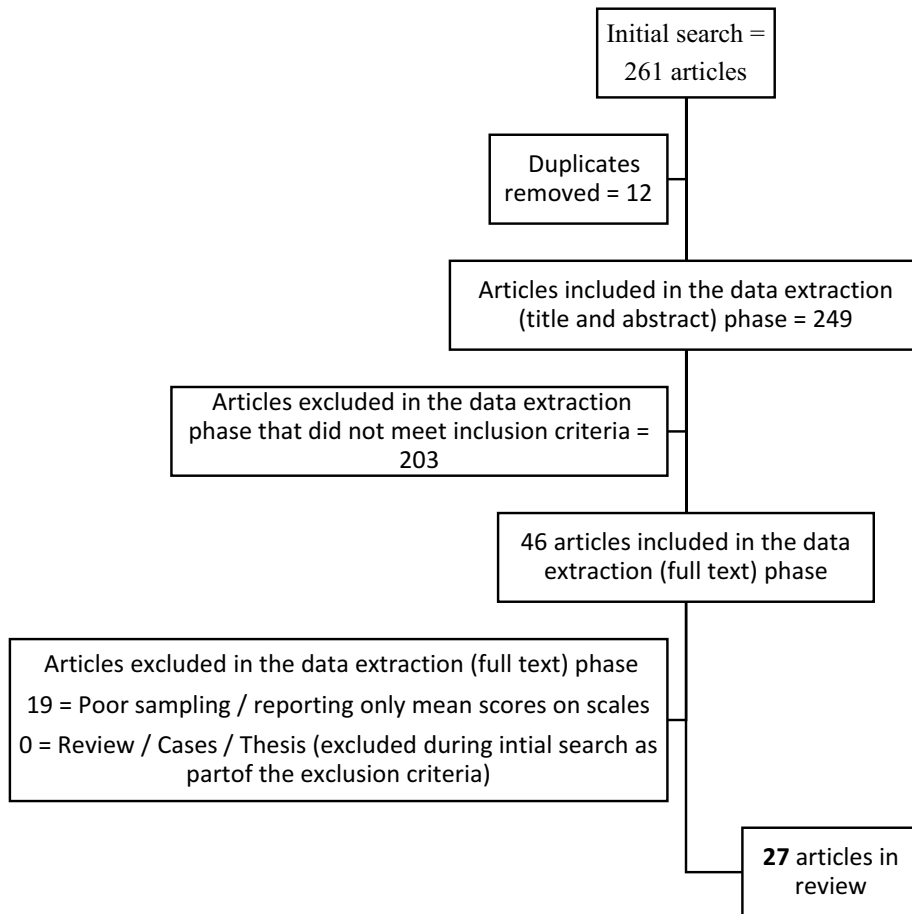


Figure 1. The PRISMA flow diagram describing the systematic review process.

Data retrieval strategies

The process of identifying articles began with a complete screening of the following major databases: PsycINFO, Web of Science, Scopus (1990–2020), PubMed/Medline (1990–2020) for English articles and Al-Manhal (2009–2020) for Arabic articles. A grey literature search was also done alongside this. The following were the specific search terms used: ‘eating disorders’ OR ‘Bulimia Nervosa OR ‘Anorexia Nervosa OR ‘binge-eating disorder’ AND ‘prevalence’, AND ‘[individual country name such as “Oman”, for example]’ for English articles and اضطرابات الأكل, نسبة, and البلد for articles in Arabic. This chosen strategy did not include a search based on any specific time stamp. This meant that all articles published before the 30th of June 2020 were included in the search.

As shown in [Figure 1](#), the search yielded a total of 261 usable articles which came down to 249 after manual removal of duplicates by three independent authors (MA, RA, and SM). Full documents were retrieved when a brief scan of the title/abstract indicated that the articles met the inclusion criteria of the present review. They screened all 249 articles according to the inclusion and exclusion criteria for quality using the Joanna Briggs Institute (JBI) appraisal checklist of scientific research articles (Joanna Briggs Institute (JBI) Systematic Review, [2020](#)). The authors also hand-checked references of these articles to ensure that all relevant articles were included. When available, Masters and Doctoral dissertations were also explored for further references. The third and fourth authors were consulted when a disagreement arose between the three reviewers.

The checklist consists of 8 questions: “Were the criteria for inclusion in the sample clearly defined?”, “Were the study subjects and the setting described in detail?”, “Was the exposure measured in a valid and reliable manner?”, “Were objective, standard criteria used for measurement of the condition?”, “Were confounding factors identified?”, “Were there strategies to deal with confounding factors?”, “Were the outcomes measured in a valid and reliable manner?” and “Was an appropriate statistical analysis used?”. All of these close-ended questions were answered with a choice of Yes/No/Unclear/Not applicable, enabling clear assessment of the quality of each article by the individual reviewer. To ensure the highest quality of research, only articles that scored either 7 or 8 “Yes” answers out of 8 (almost 90% and above) were included for final review.

None of the articles derived from the Arabic database fulfilled the requirements of the JBI guidelines. Hence 27 original studies (all in English only) were finally included in the meta-analysis. Results from the evaluation of articles using the JBI guidelines can be found in [Table 2](#).

Inclusion and exclusion criteria

This meta-analysis included all the studies fulfilling the following characteristics: the studies (1) examined the magnitude of disordered eating/eating disorders; (2) used validated assessment tools; (3) had proper numerical details about prevalence sample size; (4) were written in English or Arabic. Review studies or those that employed the idiographic approach, duplicated studies, non-human studies, or studies that did not elucidate the prevalence rate of eating disorders were all excluded. Additionally, studies were excluded when they scored below the 90% cut-off point of the JBI guidelines. Articles were also excluded if they did not provide a proper prevalence measure of disordered eating or any of the 9 individual eating disorders classified by international nomenclature, namely the *International Classification of Diseases* (World Health Organization, [1992](#)) and

Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013; Association, 2000), i.e., Anorexia Nervosa (AN), Bulimia Nervosa (BN), Binge Eating Disorder (BED), Other Specified Feeding and Eating Disorder (OSFED), Pica, Rumination Disorder, Avoidant/Restrictive Food Intake Disorder (ARFID), Unspecified Feeding or Eating Disorder (UFED) or “Other” disorders such as Eating Disorder Not Otherwise Specified (EDNOS) (American Psychiatric Association, 1994). The existing literature in Western Asia appears to have focused predominantly on AN, BN, BED and the spectrum of disordered eating. The present meta-analysis and systematic review did not include OSFED, Pica, Rumination Disorder, and ARFID.

Data extraction

Three authors (MA, RA and SM) worked independently on the extraction of the following information in tandem: name of the first author, the date of publication, country and population in which the study was conducted, study period (years), sampling methods, age-range, sample characteristic (university student, patient, etc.) total sample size, gender distribution of the sample, assessment tool, tool reliability, case diagnosis (AN, BN, BED) and the total number of diagnosed cases.

Evaluation of the quality of reports of the studies

According to the standard items listed in the JBI guidelines (Joanna Briggs Institute (JBI) Systematic Review, 2020), three authors scrutinized the title, abstract, methods, results, discussion, and other sections of each article. As part of the guidelines, the scores were tabulated from zero to 8. This exercise resulted in adequate inter-rater reliability of the three authors (intra-class correlation coefficient [ICC] = 0.92).

Statistical analysis

The acquired data were entered into a study proforma and analyzed using the MedCalc 12 Statistical Software. Prevalence was logit transformed to produce pooled estimates. I^2 and Q statistics were used to assess heterogeneity across studies (Higgins, 2003). The output data were considered homogeneous when I^2 was < 50% and the p -value of Q statistic was > 0.10, in which case a fixed effect model was used to produce pooled estimates; else, the random-effect model was utilized (i.e., when the data were not homogenous) (DerSimonian & Laird, 1986; Higgins, 2003).

Results

The study accrued 27 articles that fulfilled the inclusion criteria. The majority of studies were from Iran (10 studies), followed by Lebanon and Israel with 4 studies each. A total of 3 studies was accrued from Jordan. The United Arab Emirates and Pakistan collectively yielded 4 studies while both Saudi Arabia and Syria yielded 1 study each. Approximately 50% of the countries in Western Asia were represented, with a majority of the papers coming from Iran, Israel, and Lebanon. The prevalence rates detailed below were apportioned according to the tools used to solicit the presence of disordered eating and eating disorders.

Prevalence of disordered eating assessed by the EAT-26/40

The estimated prevalence of disordered eating using the EAT-26/40 for 17 studies are shown in Table 1 and Figure 2. The pooled prevalence of disordered eating in the total sample of 11841 was 22.07% (95% CI=15.09-29.95%) based on the random effects model ($I^2=98.92\%$, $Q=147.37$, $p<0.001$).

Prevalence of disordered eating assessed by the SCOFF questionnaire

The estimated prevalence of disordered eating assessed by the SCOFF for 5 studies are shown in Table 1 and Figure 3. The pooled prevalence of disordered eating in the total sample of 3160 was 22.28% (95% CI = 13.13–33.03%) based on the random effects model ($I^2 = 97.23\%$, $Q = 144.64$, $p < .001$).

Prevalence of disordered eating assessed by the EDE-Q

The estimated prevalence of disordered eating assessed by the EDE-Q for 2 studies are shown in Table 1 and Figure 4. The pooled prevalence of disordered eating in the total sample of 425 was 7.95% (95% CI = 5.57–10.94%) based on the fixed-effects model ($I^2 = 0.001\%$, $Q = 0.217$, $p = .641$).

Prevalence of eating disorder assessed by the EDDS

The estimated prevalence of AN assessed by the EDDS for 2 studies are shown in Table 1 and Figure 5. The pooled prevalence of AN in the total sample of 1379 was 18.91% (95% CI = 11.55–27.59%) based on the random-effects model ($I^2 = 92.4\%$, $Q = 13.20$, $p < .001$). The estimated prevalence of BN was 5.56% (95% CI = 2.71–9.34%) based on the random-effects model ($I^2 = 84.73\%$, $Q = 6.547$, $p = .011$).

Table 1. Characteristics of studies included for systematic review.

No.	Author (Year)	Country	Study Design	Gender distribution (F/M)	Mean age (SD)	Sample characteristics	Screening tool	Disorder screened	Positive cases (N or %)
#1	Pasternak et al. (2012)	Israel	Cross sectional, retrospective	1178/5/0	N/A	Women attending maternity ward	Semi-structured Interview (DSM-IV)	AN	AN = 03%
#2	Latzer et al. (2014)	Israel	Cross sectional prevalence	1142/824	Female- 15.23(1.37) Male—15.18 (1.37)	Israeli-Arab adolescents (Grades 7–12)	EAT-26	BN EDNOS Disordered eating	BN = 05% EDNOS = 02% Male positive cases = 39% Female positive cases = 61%
#3	Katz (2014)	Israel	Cross-sectional prevalence	181/142	14.4(1.25)	Israelistudents	EAT-40	Disordered eating	Male positive cases = 2.8% Female positive cases = 8.3%
#4	Latzer et al. (2014)	Israel	Cross-sectional	222/172	16.5(3.7)	Outpatients with medical conditions (T1DM and CD)	EAT-26	Disordered eating	Male positive cases = 4.1% Female positive cases = 14.9
#5	Nobakhti&Dezhkam (2000)	Iran	Cross-sectional	3100/0	16.11(2.02)	High school girls	EAT-26/EDDI	AN and BN	AN = 0.9% BN = 3.2%
#6	Sajadi et al. (2016)	Iran	Cross-sectional	946/0	24.64(4.30)	Women referred to wellness and fitness centers	EDDS	AN, BN, BED	AN = 6.02% BN = 4.01% BED = 13.0%
#7	Mohamadirizi et al. (2015)	Iran	Cross sectional	215/0	24.14(4.4)	Primigravida women	EDE-Q	Disordered eating	Female positive cases = 8%
#8	Garrusi et al. (2016)	Iran	Cross-sectional	0/433	15.99(0.86)	Males from high schools	EDDS	AN	AN = 0
#9	Rouzitab et al. (2019)	Iran	Cross sectional	105/105	21.08(1.69)	University students/physical education school	EAT-26	BN BED Disordered eating	BN = 7.4% BED = 6.5% Male positive cases = 15.2% Female positive cases = 4.8%
#10	Mohamadirizi et al. (2016)	Iran	Cross sectional correlational	89/0	33.96(9.5)	Hospital patients diagnosed with Multiple Sclerosis	EDE-Q	Disordered eating	Positive cases = 7.2%
#11	Sanaei et al. (2016)	Iran	Cross-sectional	619/0	15.8(1.02)	Public high school students	EAT-26	Disordered eating	Positive cases = 24.7%
#12	Naeimi et al. (2016)	Iran	Cross sectional	296/134	21.09(2.24)	University students of medical sciences	EAT-26	Disordered eating	Male positive cases = 7.5% Female positive cases = 10.5%

(Continued)

Table 1. (Continued).

No.	Author (Year)	Country	Study Design	Gender distribution (F/M)	Mean age (SD)	Sample characteristics	Screening tool	Disorder screened	Positive cases (N or %)
#13	Jahromi et al. (2013)	Iran	Cross-sectional	212/0	40–60	Patients attending weight management clinic	Semi-structured Interview (DSM-IV)	AN	AN = 0
#14	Jalali-Farahani et al. (2014)	Iran	Cross sectional	227/238	15.55(0.94)	High schools of Tehran	EAT-26	BN EDNOS Disordered eating	BN = 5.2 ED-NOS = 13% Male positive cases = 11.8% Female positive cases = 26.4%
#15	Aoun et al. (2013)	Lebanon	Cross sectional	224/79	19(1.2)	Undergraduate students in healthcare studies	SCOFF	Disordered eating	Male positive cases = 21.5% Female positive cases = 35%
#16	Kronfol et al. (2018)	Lebanon	Cross-sectional comparative	1841	N/A	University students	SCOFF	Disordered eating	Positive cases = 20.4%
#17	Doumit et al. (2017)	Lebanon	Cross sectional	949/0	N/A	University students	EAT-26	Disordered eating	Positive cases = 21%
#18	Bou Khalil et al. (2020)	Lebanon	Cross sectional	94/37	31.8(12.0)	Attendees to medical clinics ophthalmology, orthopedics clinics	SCOFF	Disordered eating	Positive cases = 45%
#19	Aoun et al. (2019)	Syria	Cross sectional	69/381	27.86(8.14)	Syrian refugees living in North Lebanon	SCOFF	Disordered eating	Positive cases = 6%
#20	Al Kloub et al. (2019)	Jordan	Cross sectional	503/460	16.01(0.72)	Adolescent girls and boys from 12 public secondary schools	EAT-26	Disordered eating	Male positive cases = 37% Female positive cases = 43%
#21	Ghraiyybah (2018)	Jordan	Cross sectional	408/330	15.06(0.8)	public and private schools/ grade 8–10/ both genders/ adolescent	EAT-26	Disordered eating	Positive cases = 24%
#22	Mousa et al. (2010)	Jordan	Cross sectional	432/0	12.9(1.8)	Public and private schools in Amman/ elementary adolescent girls	EAT-26	Disordered eating	Positive cases = 40.5%
#23	Memon et al. (2012)	Pakistan	Cross sectional	342/93	20.5(1.67)	Medical Students	EAT-26/ SCOFF	Disordered eating	Positive cases(EAT-26) = 23% Positive cases(SCOFF) = 17%

(Continued)

Table 1. (Continued).

No.	Author (Year)	Country	Study Design	Gender distribution (F/M)	Mean age (SD)	Sample characteristics	Screening tool	Disorder screened	Positive cases (N or %)
#24	Suhail (2002)	Pakistan	Cross-sectional	12/0	21(N/A)	Female College students	Semi-structured Interview	AN BN BED	BN = 17% EDNOS = 17
#25	Fatima et al. (2018)	Saudi Arabia	Cross-sectional	120/0	N/A	Female Health sciences students	EAT-26	Disordered eating	Positive cases (EAT-26) = 27%
#26	Al Sabbah and Muhsineh (2016)	United Arab	Cross sectional	242/0	12(1.3)	Female College students	EAT-26	Disordered eating	Positive cases (EAT-26) = 31%
#27	Kazim et al. (2017)	Emirates United Arab Emirates	Cross sectional	315/0	16.14(1.1)	Female High school students	Semi-structure Interview	AN BN BED	AN = 5.4% BN = 4.8% BED = 20.3%

AN: Anorexia nervosa; BED: Binge Eating Disorder; BN: Bulimia Nervosa; CD: Celiac disease; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders-IV; EDDI: Eating Disorder Diagnostic Inventory; EDDs: Eating Disorder Diagnostic Scale; EDE-Q: Eating Disorder Examination—Questionnaire; EDNOS: Eating Disorder-Not Otherwise Specified; N/A: Not available; T1DM: Type 1 diabetes.

Table 2. Evaluation of the qualifying papers using the JBI guidelines.

Authors	Q1 ¹	Q2 ²	Q3 ³	Q4 ⁴	Q5 ⁵	Q6 ⁶	Q7 ⁷	Q8 ⁸
Tzischinsky et al (2004)	U	Y	Y	Y	Y	Y	Y	Y
Pasternak et al. (2012)	Y	Y	Y	Y	Y	Y	Y	Y
Latzer et al. (2014)	Y	Y	Y	Y	Y	Y	Y	Y
Katz (2014)	Y	Y	Y	Y	Y	Y	Y	Y
Latzer et al (2018)	Y	Y	Y	Y	Y	N	Y	Y
Nobakht and Dezhkam (2000)	Y	Y	Y	Y	Y	Y	Y	Y
Sajadi et al. (2016)	Y	Y	Y	Y	Y	Y	Y	U
Mohamadirizi et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y
Garrusi et al. (2016), p. -	Y	Y	Y	Y	Y	Y	Y	Y
Al Kloub et al (2019)	U	Y	Y	Y	Y	Y	Y	Y
Kazim et al. (2017)	Y	Y	Y	Y	Y	Y	U	Y
Fatima et al. (2018)	Y	Y	Y	U	Y	Y	Y	Y
Suhail (2002)	N	Y	Y	Y	Y	Y	Y	Y
Memon et al. (2012)	N	Y	Y	Y	Y	Y	Y	Y
Rouzitalab et al. (2019)	Y	Y	Y	Y	Y	N	Y	Y
Mohamadirizi et al. (2016)	Y	Y	Y	Y	Y	N	Y	Y
Sanaei et al. (2016)	Y	Y	Y	Y	Y	N	Y	Y
Naeimi et al. (2016)	Y	Y	Y	Y	Y	N	Y	Y
Jahromi et al. (2013)	Y	Y	Y	Y	Y	N	Y	Y
Grover and Ghosh (2014)	Y	Y	Y	Y	Y	N	Y	Y
Aoun et al. (2013)	Y	Y	Y	Y	Y	N	Y	Y
Kronfol et al. (2018)	Y	Y	Y	Y	Y	N	Y	Y
Doumit et al. (2017)	Y	Y	Y	Y	Y	N	Y	Y
Bou Khalil et al. (2020)	Y	Y	Y	Y	Y	N	Y	Y
Ghraiyybah (2018)(JBI = 8/8)	Y	Y	Y	Y	Y	Y	Y	Y
Mousa et al. (2010)	Y	Y	Y	Y	Y	N	Y	Y
Al Sabbah&Muhsineh (2016)	Y	Y	Y	U	Y	Y	Y	Y

Y = Yes, N = No, U = Unclear, NA = Not Applicable

Were the criteria for inclusion in the sample clearly defined?

² Were the study subjects and the setting described in detail?

³ Was the exposure measured in a valid and reliable way?

⁴ Were objective, standard criteria used for measurement of the condition?

⁵ Were confounding factors identified?

⁶ Were strategies to deal with confounding factors stated?

⁷ Were the outcomes measured in a valid and reliable way?

⁸ Was appropriate statistical analysis used?

Prevalence of AN, BN and EDNOS assessed by the semi-structured interview

The estimated prevalence of AN assessed using a *semi-structured interview* based on the DSM-IV for 2 studies are shown in Table 1 and Figure 6. The pooled prevalence of AN in the total sample of 118190 was 1.59% (95% CI = 0.77–11.17%) based on the random effects model ($I^2 = 98.34\%$, $Q = 60.33$, $p < .001$). The estimated prevalence of BN for 4 studies in the total sample of 118513 was 2.41% (95% CI = 0.04–8.24%) based on the random effects model ($I^2 = 96.86\%$, $Q = 95.41$, $p = .011$). The estimated prevalence of EDNOS for 2 studies in the total sample of 118087 was 3.51% (95% CI = 2.51–26.09%) based on the random effects model ($I^2 = 99.07\%$, $Q = 106.975$, $p < .001$).

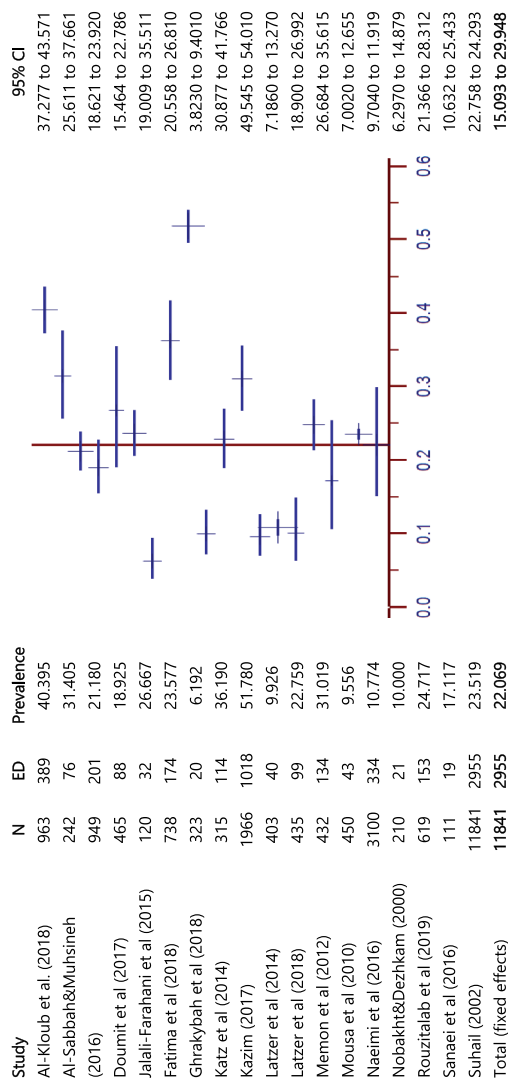


Figure 2. Forest plot of prevalence estimates of disordered eating as assessed by the eating attitudes test-26/40.

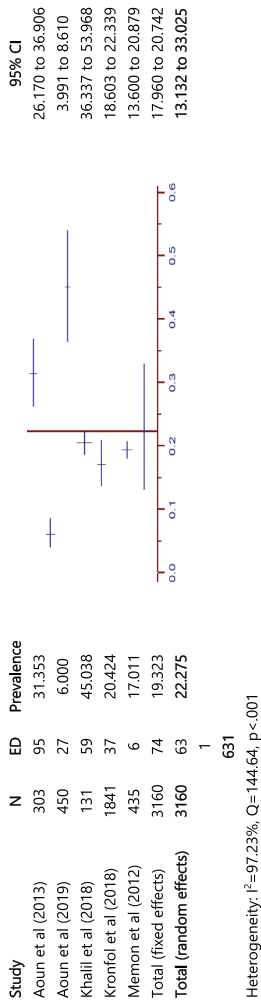


Figure 3. Forest plot of prevalence estimates of disordered eating using the SCOFF.

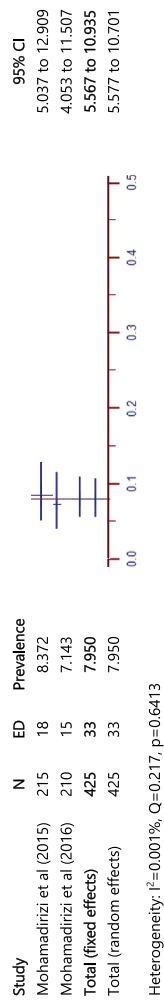


Figure 4. Forest plot of prevalence estimates of disordered eating using the EDE-Q.

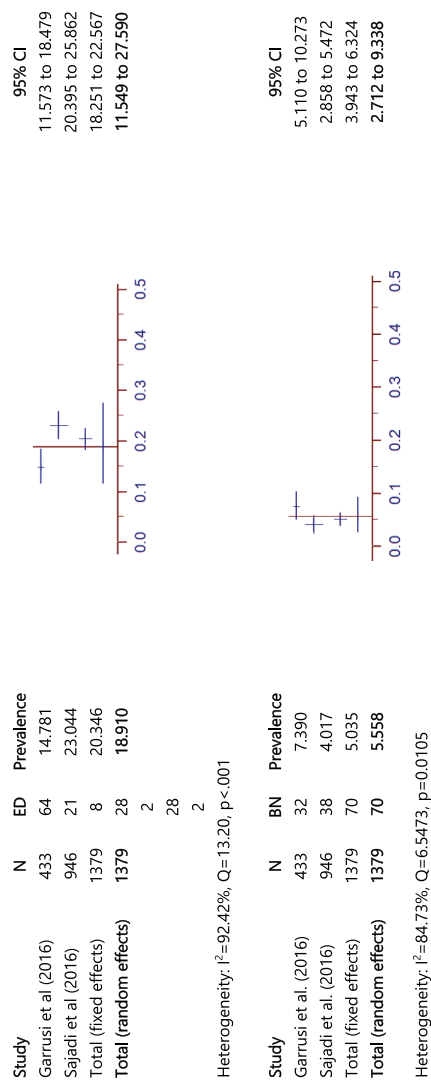


Figure 5. Forest plot of prevalence estimates of eating disorders (ED) and BN using the EDDS.

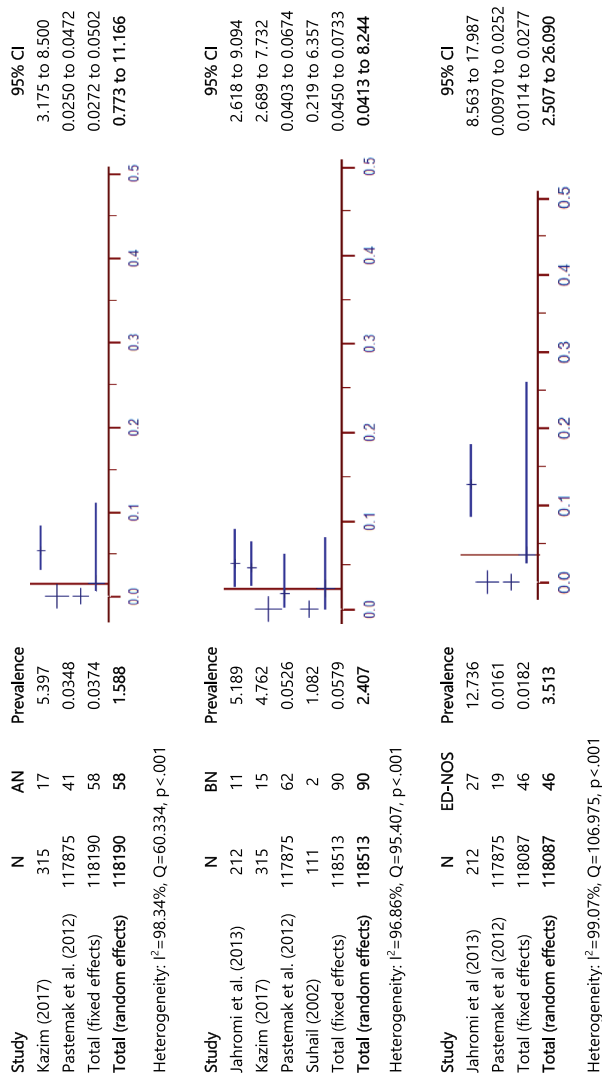


Figure 6. Forest plot of prevalence estimates of anorexia nervosa (AN), bulimia nervosa (BN), and EDNOS solicited using semi-structured interviews.

Discussion

To our knowledge, this is the first systematic review and meta-analysis on the prevalence of eating disorders and disordered eating in Western Asia, a region operationalized to consist of those countries lying in the Fertile Crescent region (Iraq, Israel, and Jordan. Lebanon, Palestine, and Syria), Iranian Plateau and the Hind Kush region (Iran, Pakistan, and Afghanistan) and the Arabian Peninsula (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen). Among the 16 countries, the 27 articles that met the inclusion criteria were from Israel, Iran, Lebanon, Syria, Jordan, Pakistan, Saudi Arabia and the United Arab Emirates. It is essential to note that out of the 16 countries initially chosen for this study, only 50% of the countries had articles that matched the inclusion criteria, with the majority of the articles coming from Iran, Israel and Lebanon. Although this may have had to do with the employment of stringent quality control measures, the present literature search did not reveal much research from Yemen, Afghanistan, Bahrain, and Iraq. In their meta-analysis, **Qian et al. (2013)** indicated that eating disorders appear to be more prevalent in Western rather than Asian countries. However, Qian et al. also mentioned that a potential reason for this difference could be due to the severe lack of high-quality data from Asian countries. Future studies must look into the possibilities of increasing available data from the aforementioned regions of Yemen, Afghanistan, Bahrain, and Iraq. International collaboration would be needed to prompt more research initiatives in these under-researched regions to add more empirical evidence to the global map of eating disorders.

Eating disorders, much like many other psychosomatic phenomena, are protean and without central features (Littlewood, 1995). The examination of eating disorders using instruments developed in the West is likely to be inadequate when testing non-Western populations (Viernes et al., 2007). The gold standard for the diagnosis of eating disorders derived from the *Diagnostic and Statistical Manual* and *International Classification of Diseases* tends to emphasize cognitive symptoms rather somatic complaints often observed among non-Western populations (Al-Adawi et al., 2011). Although previous attempts have been made to compare eating disorders between Western and non-Western populations (Makino et al., 2004; Nasser, 1986), less attention has been directed towards documenting prevalence among inter-ethnic cohorts within a non-Western sample. Relevant to this, several challenges are noted when quantifying the prevalence of eating disorders which include the use of different approaches to case ascertainment, sample size considerations and, most significantly, the use of diverse instruments to solicit the presence of disordered eating patterns. To accommodate these challenges, a systematic review and meta-analysis of the prevalence rate of eating disorders and disordered eating, categorized according to the standardized tools

used to solicit the presence of disordered eating tendencies (and the resulting vulnerability to developing eating disorders), was conducted. In the presently defined geographical region of Western Asia, 5 types of tools appeared to have heuristic value: 1) EAT 26/40; 2) SCOFF questionnaire; 3) EDE-Q; 4) EDDS and 5) a diagnosis of an eating disorder based on the style and format of the semi-structured interview using the *Diagnostic and Statistical Manual of Mental Disorders* or *International Classification of Diseases*. Simply put, the prevalence of eating disorders and disordered eating was therefore calculated in terms of these standardized tools: self-report questionnaires or semi-structured interviews.

In the present study, a common trend that was observed was that a majority of the studies (17 out of 27) utilized self-report questionnaires to solicit the presence of disordered eating. The estimated prevalence of disordered eating attitudes based on the most commonly utilized self-report questionnaire (EAT-26/40) stood at 22.07%, a percentage that is in comparison much higher than the global prevalence (1.01%) (Qian et al., 2013). The other standardized tools include the SCOFF (5 studies) and EDDS (2 studies), yielding prevalence rates of 22.8% and 18.91%, respectively. Yet another tool utilized by researchers in Western Asia was the EDE-Q (C.G. Fairburn & Beglin, 2008). The prevalence of disordered eating using EDE-Q appears to be 7.95%. This rate appears to be relatively closer to the aforementioned global prevalence of eating disorders (Qian et al., 2013). Based on the present prevalence rate in Western Asia and the data from other studies, it has been shown that the EDE-Q can detect disordered eating much more reliably than other screening tools (Beglin & Fairburn, 1992). Other than EDE-Q, the present systematic review suggests that self-report questionnaires often provide a higher prevalence rate. The literature suggests that the ‘symptom checklists’, ‘structured interview’, or ‘self-report questionnaires’ tend to be outperformed by semi-structured interviews (Wu et al., 2021). The present data also mirror a similar trend where the self-reported questionnaires showed higher figures compared to semi-structured interviews. In fact, in those studies that have used ‘two-phase surveys’ to examine the efficacy of self-report questionnaires vis-à-vis gold-standard interviews (Newman et al., 1990), it has been a common observation that self-report questionnaires tend to provide spurious results in the form of fault positives or negatives (Al-Adawi, Dorvlo, Burke, Moosa, Al-Bahlani, et al., 2002; Brehaut et al., 2020). Semi-structured interviews, on the other hand, are equipped to detect the presence of many atypical feature of eating disorders, i.e. Eating disorders not otherwise specified (EDNOS), in non-western populations too, as is the focus of the present study (Lee & Kwok, 2005).

As alluded to earlier, a meta-analysis conducted by Qian et al. (2013) on community surveys of eating disorders around the world revealed the prevalence of eating disorders (AN, BN and BED) to be 1.01% of the total

population (Qian et al., 2013). According to Erskine et al. (2016), the global prevalence of individuals affected by AN and BN stood at 0.4 million and 1.11 million, respectively. A region-wise search of available literature suggested the prevalence rate of AN and BN is 0.28% and 1.1%, respectively (Nielsen, 2001). In their meta-analysis of eating disorders in Africa, Hoek (2016) showed the prevalence rate of BN and EDNOS to be 0.87% and 4.45%, respectively, while no cases were found to manifest symptoms of anorexia nervosa. Only 2 studies out of the 27 that were in consideration utilized semi-structured interviews. According to these studies, the prevalence rate of AN was 1.59% and BN was 2.41%. Overall, whether utilizing self-report questionnaires or semi-structured interviews, the presently observed rate appears to be on the higher side of the global trend.

Pike and Dunne (2015), as part of their review of the existing trends in unhealthy eating behavior in Asia, mention that the issue could be intimately linked to a region having all the hallmarks of an emerging/developing economy or a “society or culture-in transition”. This is likely to manifest in an upward trend in adjustment disorders including unhealthy body image (Pike et al., 2014). In terms of demography, the current regions under scrutiny are mostly all in their second phase of demographic transition characterized by the preponderance of a “youth bulge” (Chaaban, 2009). A youth bulge is defined as the sudden increase in the population of individuals aged 15–24 years (LaGrafte, 2012). As seen in Table 1, multiple studies have clearly shown that being of adolescent age (15–19 years) is significantly associated with an increased prevalence of eating disorders (Erskine et al., 2016). Hence, this could be another potential explanation for the higher prevalence rate of disordered eating attitudes in Western Asia.

Body image dissatisfaction is increasingly becoming a global phenomenon and is concurrently associated with eating disorders (Garrusi et al., 2016; Nobakht & Dezhkam, 2000; Tahmouresi & Pashang, 2018). In addition to the socio-cultural factors that contribute to eating disorders, there are also certain biological factors that render some individuals vulnerable to developing eating disorders. Gray (1987) has suggested that human temperaments can be shaped by two biological systems. The first one known as the BIS (behavioral inhibition system) is characterized by inhibition or avoidance. The complementary system is known as BAS (behavioral activation system) which is characterized by a tendency for impulsiveness and sensation-seeking behavior. There is evidence to suggest that characteristics of BIS/BAS, sensitivity to reward and punishment or approach and avoidance motivation (e.g., high constraint, constriction of affect, emotional expressiveness, anhedonia, sensation-seeking or lack of it, perfectionism, obsessiveness) are common among individuals with eating disorders (Claes et al., 2006). There is also evidence to suggest that eating disorders are critically influenced by variations in catecholamine and indoleamine neurotransmission (Kaye, 1997).

A hypothesis exists that acculturation has triggered an increase in the number of individuals vulnerable to body image dissatisfaction. However, this also tends to be molded by socio-cultural factors and the phenotypical presentation of eating disorders which seem to vary across cultures (Al-Adawi et al., 2011). With regard to AN, there is an indication that the presence of fat-phobia is less endorsed in non-Western cultures as being a ‘cardinal’ symptom of AN (Lee & Kwok, 2005; Pike & Dunne, 2015). This culture-specific manifestation of eating disorders also bore support in the present review with the predominance of ‘atypical disordered’ eating tendencies at 3.51%. Atypical disordered eating was defined as those who appeared to fulfill the criteria of EDNOS.

Methodological limitations of the current literature

Some of the most obvious limitations of this review are highlighted here. Firstly, this review employed stringent inclusion criteria. The general agreement is that only studies scoring above 60% on the given criteria of the Joanna Briggs Institute (JBI) guidelines for appraisal of scientific research, should be included (Joanna Briggs Institute (JBI) Systematic Review, 2020). However, given that some of the major criticisms of data coming from Asian countries include the lack of required methodological sophistication and normative data for the self-reported questionnaires on amorphous conditions such as disordered eating and the considerable number of studies (of varying quality) from western Asia, for this review, the bar was raised to 90% to ensure the highest quality of included articles. This implies that the meta-analysis excluded a significant number of articles. Although the threshold of 60% could have been used, most of the articles that scored below 90% reported prevalence data using continuous variables (only mean scores), utilized assessment measures that lacked psychometric properties for the local population, and that were derived from observational studies. Incongruent with the established practice, the scoring system and the cut-off for the inclusion of a study in the review were made before commencement of critical appraisal. For this reason, a 90% threshold was used to exclude articles. However, it must be noted that this decision was made as it does not contravene the established best practice as the threshold of 60% on the JBI is an arbitrary one (Aromataris et al., 2015). For example, in meta-analyses of randomized control studies, it is recommended to raise the bar to 100% (Joanna Briggs Institute, 2014).

Relevant to this, a majority of the articles that we have included employed self-report questionnaires which are known not to be the ideal method for detecting the prevalence of diagnosable eating disorders. Though useful in understanding the general predisposition of a sample to develop an eating disorder, handy self-report questionnaires are no match for the “gold standard” diagnostic interview. Secondly, a majority of the studies were conducted

among females or selective populations (e.g., hospitals, schools). The generalization of these studies would have been strengthened if community surveys and the inclusion of both genders were considered (Qian et al., 2013). In this regard, the comparison of prevalence rates of eating disorders obtained from this study to global prevalence measures obtained from the study conducted by Qian et al. (2013) is not ideal. This is mainly due to the fact that while the presently obtained pooled prevalence rates are based on both self-reported questionnaires and semi-structured interviews, Qian et al. (2013) only included results from those studies that used semi-structured interviews. However, one of the major gaps in the existing literature is the lack of studies that provide a categorical assessment of the prevalence of eating disorders based on both self-reported measures and semi-structured interviews. Besides, though there are some largescale studies addressing the global burden of eating disorders (the GBD 2013 and 2019), that usually include a wide array of studies (utilizing various tools), these studies provide us measures based on Disability Adjusted Life Years—DALYs (Erskine et al., 2016). These would not be comparable to the prevalence-based measures we wished to report in this study (Santomauro et al., 2021). Given these reasons, we believe that we are in the circumstance of having to make the comparison to the results from the study by Qian et al. (2013). Third, most of the studies were cross-sectional. A concerted effort to conduct cohort-based as well as interventional studies to mitigate the observed high prevalence of unhealthy body image would be necessary. Fourth, it is interesting to note that the tools utilized to capture the prevalence of disordered eating in Western Asia appear not to have undergone the required local validation and establishment of local psychometric properties. In most cases, the screening tools were simply translated into the local language using a back-translation protocol (Al-Adawi, Dorvlo, Burke, Moosa, Al-Bahlani, et al., 2002). On one hand, this might have helped to establish the identification of disordered eating via unified tools with one established cut-off. On the other hand, the problem remains that such screening tools may overlook culture-specific idioms of distress relevant to disordered eating, known to exist in Asia (Lee, 1996; Lee et al., 1993; Ngai et al., 2000; Pike & Dunne, 2015; Pike et al., 2014). This proposition is supported by the present observation that the prevalence of EDNOS appears to be higher compared to other types of eating disorders. Within such constraints, a concerted effort is needed in Asia to develop and employ screening tools that are culturally sensitive. Deliberate food restriction in Asia has been reported to be expressed as somatic symptoms or somatic idioms of distress. It appears that there is no predominance of ‘fat aversion’ in Asian populations. (Melisse et al., 2020; Viernes et al., 2007). However, fatphobia is the central diagnostic criteria for eating disorders in the existing psychiatric nomenclatures and the psychological or cognitive symptoms commonly featured in existing screening tools for disordered eating (Grover & Ghosh, 2014;

Kayano et al., 2008). Therefore, such somatic idioms of distress should be integrated into the screening tools that tap into disordered eating tendencies in Western Asia. Finally, it is worthwhile to note that the regions presently defined as Western Asia constitute diverse societies with a myriad of sub-cultures, languages, and dialects including Arabic, Hebrew, Kurdish, Farsi, and Urdu. However, for logistic reasons, this review only included articles in Arabic and English. Despite the rigorous efforts to identify suitable Arabic-language articles, no studies managed to fulfil the criteria of the present review. In this regard, it remains unclear whether suitable articles do exist in other Western Asian languages. Collaborations with a multi-lingual research team are therefore warranted in the future.

What is already known on this subject?

It is well-known that disordered eating and disturbed body image are increasingly being recognized across the globe (Erskine et al., 2016; Hoek, 2016; Kolar et al., 2016). Although disordered eating and disturbed body image have been critically appraised in North American and European populations with an average prevalence of around 1% being reported, there is a lack of such an undertaking in non-westernized societies with a few exceptions (Qian et al., 2013). Hence, a primary aim of this systematic review and meta-analysis was to synthesize the prevalence rate of disordered eating and disturbed body image emerging from Western Asia (Iraq, Israel, Jordan, Lebanon, Palestine, Syria, Iran, Pakistan, Afghanistan, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen.)

What does this study add?

The present appraisal indicates that the overall prevalence rate of disordered eating appears to be slightly higher than the global rates. This likely stems from the fact that most of the studies utilized self-report questionnaires rather than the gold-standard semi-structured interview. However, the prevalence rate appears to be less spurious, and hence lower, when examined using semi-structured interviews. Given these observed limitations of existing literature from Western Asia, more studies using robust methodologies are needed. Similarly, the culture-specific idioms of distress for disordered eating and disturbed body image among non-Western populations must be addressed.

Conclusions

This systematic review and meta-analysis sought to synthesize existing literature on the prevalence of eating disorders and disordered eating from the region of Western Asia comprising of Iraq, Israel, Jordan, Lebanon, Palestine,

Syria, Iran, Pakistan, Afghanistan, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen. The overall prevalence rate of disordered eating appeared to be slightly higher than the global rates when scrutinized with self-report questionnaires. However, the prevalence appeared to be less spurious, and hence lower, when examined using semi-structured interviews.

However, the overall idea is that both disordered eating attitudes and eating disorders are common in Western Asia (Melisse et al., 2020). More studies should be directed towards exploring and understanding the outcomes of disordered eating and its covariates so that preventive measures could be contemplated. As this review suggests, the idea that tendencies of disordered eating are predominantly characteristic of young females from high-income countries of the West, such as those in North America and Western Europe, is no longer valid. A significant portion of the global burden of disordered eating is shouldered by multiple countries outside of these aforementioned regions.

Clinical Significance

- Evaluated existing literature on the prevalence of disordered eating and eating disorders in Western Asia
- Disordered eating attitudes are common in Western Asia. The overall prevalence rate of disordered eating appears to be slightly higher than the international rates
- A significant number of the suspected or detected cases of disordered eating appear to fulfill the criteria for EDNOS
- Various idiosyncratic socio-cultural factors play a major role in shaping disordered eating
- More studies should be directed towards exploring and understanding the outcomes of disordered eating and its covariates in Non-Western countries so that preventive measures could be contemplated

AUTHORS' CONTRIBUTIONS

MA, SM, and RB performed literature research, gathered and analyzed information, and generated short preliminary write-ups. MFC and MS provided research insight, content examination and supported wide-ranging aspects of the manuscript development process. Corresponding authors SA and WQ were involved in the conceptual work, framework, final draft write-up, critical reading, and editing of this manuscript. All authors read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

COMPETING/CONFLICTS OF INTEREST

None. The authors declare that there are no conflicts of/or competing interests.

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