

An Umbrella Review and a Meta-analysis of Meta-analyses of Disordered Eating Among Medical Students

ABSTRACT

Objective: To prevent eating disorders in future physicians, this umbrella review and meta-analysis of previous meta-analyses estimates the prevalence of disordered eating (DE) among medical students worldwide and identifies key risk factors.

Methods: Four databases were searched electronically between their inception and February 1, 2023. The search was later updated to December 31, 2023.

Results: The search yielded prevalence rates for medical students who scored above established cutoffs on validated assessment measures for DE. These were computed to provide an overall pooled estimate. The data was taken from 2 previous reviews. Both these systematic reviews found a 15.1% (95% confidence interval [CI]: 14.7%-15.6%) prevalence rate of DE among medical students. The equivalent Hedges' $G = 0.30$ (95% CI: 0.29-0.31), the equivalent odds ratio = 1.74 (95% CI: 1.71-1.77), $I^2 = 97.6\%$, and the excess of statistical significance is $P = .001$. The trim and fill adjusted effect size was 16.0% (95% CI: 14.0%-20.0%).

Conclusion: Because eating disorders put students' safety and well-being at risk and because the health of early-stage physicians is vital to the welfare of a country, early signs of disordered eating must become a priority of medical schools and a signal for effective prevention and intervention. The recommendation is to ensure supportive environments, provide easy access to effective care, and hold clear expectations for student eating behavior.

Keywords: Adolescence, body image, BMI, feeding and eating disorders, umbrella review

Introduction

The term disordered eating (DE) refers to food/eating symptoms and behaviors that are intermittent, of relatively low severity, and that do not unduly interfere with daily life.^{1,2} Disordered eating exists on a spectrum between normal eating patterns and clinically diagnosed eating disorders (EDs).³ Thus, DE involves irregular eating behaviors that may resemble symptoms of EDs but do not meet full diagnostic criteria in terms of frequency or severity. From a clinical perspective, DE refers to the category of Other Specified Feeding or Eating Disorders (OSFED) or Unspecified Feeding or Eating Disorder (UFED) in diagnostic manuals such as the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5).⁴ The OSFED designation includes atypical presentations of anorexia nervosa, subthreshold bulimia nervosa, and binge ED falling below clinical thresholds.⁴ In contrast, UFED is used when criteria for a specific ED are not met or there is insufficient information for a diagnosis.^{4,5}

Disordered eating can be precursors or early warning signs of full-blown EDs. The symptoms include food restriction, compulsive eating, and irregular or inflexible eating patterns—usually beginning in adolescence.^{1,3,6} Disordered eating is a sign of potential trouble ahead and is, because of age, academic stress, and new surroundings, not uncommon among medical students in many parts of the world.² According to a 2019 meta-analysis (19 prevalence studies conducted between 2000 and 2018), the rate of DE is approximately 10.4% in medical students.⁷ Another meta-analysis put the prevalence of DE in high school students at around

Haitham Jahrami^{1,2} 

Zahra Saif¹ 

Khaled Trabelsi^{3,4} 

Hadeel Ghazzawi⁵ 

Seithikurippu R. Pandi-Perumal^{6,7} 

Mary V. Seeman⁸ 

¹Department of Psychiatry, Governmental Hospitals, Manama, Bahrain

²Department of Psychiatry, College of Medicine and Medical Sciences, Arabian Gulf University, Manama, Bahrain

³High Institute of Sport and Physical Education of Sfax, University of Sfax, Sfax, Tunisia

⁴Research Laboratory: Education, Motricity, Sport and Health, University of Sfax, Sfax, Tunisia

⁵Department of Nutrition and Food Science, The University of Jordan, Agriculture School, Amman, Jordan

⁶Division of Research and Development, Lovely Professional University, Phagwara, Punjab, India

⁷Saveetha Medical College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

⁸Department of Psychiatry, University of Toronto, Canada, Toronto, ON, Canada

Corresponding author:

Haitham Jahrami
✉ haitham.jahrami@outlook.com

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13% globally.³ Yet another found the rate of DE in non-medical university students to be approximately 14%.⁸

This area of research is currently being much pursued. The number of relevant studies has nearly doubled between the years 2019 and 2022.⁹ In 2022, an updated meta-analysis of 35 relevant papers yielded a pooled prevalence rate of 17.35%,⁹ a marked increase from 2019.

Understanding the prevalence of DE among medical students is critical for several reasons. High prevalence rates powerfully demonstrate that DE behaviors and attitudes are a widespread issue affecting a substantial proportion of this population. Quantifying prevalence conveys the scale and urgency of this health problem. Prevalence rates across multiple studies also reveal trends over time.

Medical training is notoriously rigorous, with heavy course loads and long study hours being the norm.¹⁰ Students must master significant amounts of information in a short period of time.^{9,11} Pressures to earn top grades and succeed academically are coupled with few opportunities for adequate sleep and self-care.¹² In addition, medical students confront high expectations to demonstrate competence and perfectionism, traits valued in physicians.¹² However, this promotes unrealistic standards that foster DE tendencies such as restrictive eating and compulsive overexercise.¹² The highly competitive nature of medical school can encourage interpersonal comparisons and negatively impact body image.^{9,10,12} The belief that one's appearance conveys professionalism and competence can catalyze DE patterns.^{9,10} For example, uniforms (medical scrubs and white coats) and routine weight checks can direct attention to body image.^{8,9} Learning about nutrition, weight management, and the health impacts of EDs may inadvertently emphasize food choice and dieting strategies.⁸ Busy medical school schedules often lead to disrupted sleep, irregular meal times, and reliance on quick processed foods, which are ED risk factors.^{2,7,10} In some cases, interacting with patients with EDs may normalize pathological eating behaviors.^{2,7,10} Medical students also experience dramatic lifestyle changes upon entering school, such as moving away from home, losing former social connections, incurring financial burdens, and experiencing isolation.¹³ These disruptions in support systems and daily structure can trigger DE behaviors, as has been shown for bingeing and purging.¹³

Without proper coping outlets to help manage myriad demands, medical students are susceptible to developing, instead, maladaptive coping mechanisms such as DE.¹⁴ Early intervention is critical

MAIN POINTS

- *The prevalence of disordered eating in medical students is approximately 15%.*
- *Disordered eating puts medical students at risk for developing full-blown eating disorders, which can result in severe health consequences.*
- *Key risk factors for disordered eating include anxiety, stress, burn-out, lack of coping skills, and lack of social support.*
- *Recommended preventive strategies include counseling services offered at medical faculties plus nutrition education, resilience training, and policies promoting healthy eating.*

to prevent progression to full EDs, which are associated with severe health consequences.^{13,14}

To better understand the potential reasons for the increased rate of DE among medical students, an umbrella review approach was used to evaluate, contrast, and critically examine the results of past studies.¹⁵ An umbrella review considers only the highest level of evidence, namely, previous systematic reviews and meta-analyses.¹⁵ Umbrella reviews of prevalence have several short- and long-term advantages. These methods not only arrive at standard prevalence rates but also provide a precise and comprehensive description of the status of research in a field and illustrate the breadth and depth of evidence that is currently accessible.¹⁵ This approach can enable both researchers and policymakers to make informed decisions. Umbrella reviews also save researchers and policymakers time by omitting scientifically unconvincing literature.^{15,16} Third, because an umbrella review synthesizes data from several sources, the research process is transparent, enabling readers to understand how the data were gathered and interpreted.^{15,17} Finally, a comprehensive review can assist in identifying gaps in the literature, which can guide future research and help the field reach appropriate conclusions that lead to effective action.^{15,18} Umbrella reviews offer advantages over traditional isolated reviews or primary studies.^{16,18} By combining multiple datasets, they provide precision and increased certainty in their conclusions.^{17,18} Gaps in the research base are also thereby identified and are able to guide future studies.¹⁶⁻¹⁸ Finally, the transparent synthesis of high-quality evidence aids development of practice guidelines and health policies.¹⁶⁻¹⁸

Methods

Registration and Protocol

The review was designed and reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 guidelines.¹⁹ The study protocol and associated data are openly accessible at the Center for Open Science Framework (Identifier: DOI 10.17605/OSF.IO/VFUE9).

Search Strategy and Selection Criteria

A systematic search was conducted in a range of databases, including MEDLINE, EMBASE, PsycINFO, and Scopus, to identify relevant systematic reviews and meta-analyses. The search was initially carried out electronically, and all terms related to the topic were included in the search strategy. The search was limited to reviews published from 1950 to initially February 1, 2023, later expanded to December 31, 2023. The search terms were as follows: ("feeding and eating disorders" (MeSH Terms) OR ("feeding" (All Fields) AND "eating" (All Fields) AND "disorders" (All Fields)) OR "feeding and eating disorders" (All Fields) OR "eating" (All Fields) AND "disorders"(All Fields)) OR "eating disorders" (All Fields) OR ("disordered" (All Fields) OR "disordering" (All Fields) AND ("eating" (MeSH Terms) OR "eating" (All Fields) AND ("students, medical" (MeSH Terms) OR ("students" (All Fields) AND "medical" (All Fields)) OR "medical students" (All Fields) OR ("medical" (All Fields) AND "students" (All Fields))). Filters applied: meta-analysis, review, systematic review.

Papers were included if they met the following criteria: (1) were identified as reviews (including systematic reviews) or meta-analyses; (2) were published in peer-reviewed journals; and (3) reported on the topic of the prevalence of DE symptoms and behaviors in

medical students. Papers were excluded if they (1) were not in English, (2) were reviews or meta-analyses of interventions, or (3) were reporting on the same data set already included in another review.

Data Extraction, Data Coding, and Quality Assessment

When 2 systematic reviews/meta-analyses presented overlapping data from the same study, only the data from the first dataset were retained. The primary study-level exclusion criteria were as follows: 1) studies investigating psychiatric symptoms in general and not specific to DE; 2) studies that reported scores of self-reported DE without presenting a prevalence rate (the proportion of students affected at a given time); 3) studies using unvalidated tools (e.g., scales without established cutoff points); and 4) studies that involved students with a clinical/formal diagnosis of an ED.

Two researchers (experts in meta-analyses H.J., Z.S.) independently extracted the data, and a third (K.T.Z.) checked their decisions. After discussion, disagreements were resolved by consensus. The data were extracted using a standardized form and included the following information: study design, sample size, study population, results, and conclusions. Quality assessment of the included studies was conducted according to the criteria outlined in the Newcastle–Ottawa scale tool used to assess the quality of nonrandomized studies in systematic reviews and meta-analyses.²⁰ For each primary study, the data extraction team presented the list of possible risk factors discussed in each study.

The results of the umbrella review were presented in narrative form and organized according to the research questions posed. The strength of the evidence was evaluated using the grading of recommendations assessment, development and evaluation (GRADE) approach.²¹

The GRADE approach arose in response to the existence of multiple evidence classification systems and provides a transparent and structured process for developing and presenting evidence summaries while taking into account the certainty of the evidence and, in a subsequent step, the strength of the recommendations that they inform.²¹ The GRADE process starts with an explicit inquiry that expressly contains all significant and critical outcomes.²¹ The risk of bias, inconsistency, indirectness of evidence, imprecision, and publication bias are the key areas utilized to assess the reliability of the evidence.²¹

Statistical Analysis

We used the restricted maximum likelihood variance estimator for random effects models.^{18,22} Using the I^2 statistic and 95% prediction intervals, we were able to estimate the plausible range within which the effect sizes of future studies are expected to fall, based on inconsistency ($I^2 > 50\%$).^{18,22} A regression asymmetry test was carried out to determine the existence of small-study effects ($P = .06$).^{18,22} To adjust for potential publication bias, the trim and fill procedure was utilized.²³ The trim and fill method trims the asymmetric studies/reviews from the right-hand side to locate the unbiased effect and then fills the plot by re-inserting the trimmed studies on the right as well as their imputed counterparts to the left of the mean effect.¹⁸ This allows for an adjustment of the effect size estimate by incorporating the hypothetical missing studies/review.¹⁸

Data analysis was performed using the package “metaumbrella: Umbrella Review Package for R”¹⁸ Statistical Software version 4.2.2 (R Core Team 2023, R Foundation for Statistical Computing, Vienna, Austria; Available <https://www.R-project.org>) for Windows statistical computing software.²⁴ A P -value $< .05$ was considered to indicate statistical significance. The acquired lists of possible risk factors in the primary study were analyzed using the Text Statistics Analyzer, version 3.2, by Vovsoft using word frequency, 2-word phrases, 3-word phrases, and 4-word phrases to construct a model of the common risk factors examined in previous research.

Results

The identification of new studies via databases, registries, and other methods is shown in Figure 1. A total of 129 review papers were identified via electronic means. After removing duplicates, 40 full-text records were screened, and 28 were selected for comprehensive review. After exclusions, 2 systematic reviews and meta-analyses were included in the present umbrella review. Table 1 provides a summary of the primary studies’ systematic reviews and meta-analyses included in the present umbrella review.

The first systematic review and meta-analysis included 19 studies²⁵⁻⁴¹ ($k = 19$, $n = 5722$) and was published in 2019. Findings from the first review showed that there was statistically significant between-study heterogeneity in DE prevalence (295/5722 students, $I^2 = 94.0\%$, $P = 0.001$), indicating that the ED prevalence rate was 10.4% (497/5722 students, 95% CI: 7.8-13.0%). Prevalence estimates of DE between studies ranged from 2.2% to 29.1%. This review was rated as being of medium quality according to GRADE criteria.

The second systematic review and meta-analysis was updated and included 35 studies (16 additional new studies)⁴²⁻⁵² ($k = 35$, $n = 15661$). Using a random-effects meta-analysis, a pooled prevalence rate of 17.35% (95% CI: 14.15-21.10%) was generated for medical students ($k = 35$, $n = 21,383$). Heterogeneity was found ($Q = 1528$ (34), $P = .001$); $\tau^2 = 0.51$ (95% CI: 0.3-1.05); $\tau = 0.71$ (95% CI: 0.59-1.02); $I^2 = 97.8\%$; $H = 6.70$ (95% CI: 6.19-7.26)). Neither age nor sex was a significant predictor. The confounders included body mass index, culture, and research tools. This review was rated as high quality according to the GRADE criteria.

The combined results of both systematic reviews showed that the overall prevalence of DE in medical students was 15.1% (95% CI: 14.7%-15.6%). Figure 2 provides a visual summary of the point prevalence estimates of the primary studies, the previous systematic reviews and meta-analyses and the findings of this umbrella review. The equivalent Hedges’ $G = 0.30$ (95% CI: 0.29-0.31), the equivalent odds ratio (OR) = 1.74 (95% CI: 1.71-1.77), $I^2 = 97.6\%$, Egger’s test < 0.001 , and excess statistical significance < 0.001 . The grade of evidence was class II (good) for the estimates. The details are presented in Table 2.

The trim and fill analysis indicated that two additional studies/reviews were needed to remove the effect of publication bias. The adjusted effect size estimate accounting for these hypothetical missing studies was 16.0% (95% CI: 14.0% – 20.0%). The trim and fill procedure provided a close estimate of effect size but a more conservative estimate of the confidence level of the effect size after considering and adjusting for potential publication bias in the meta-analysis.

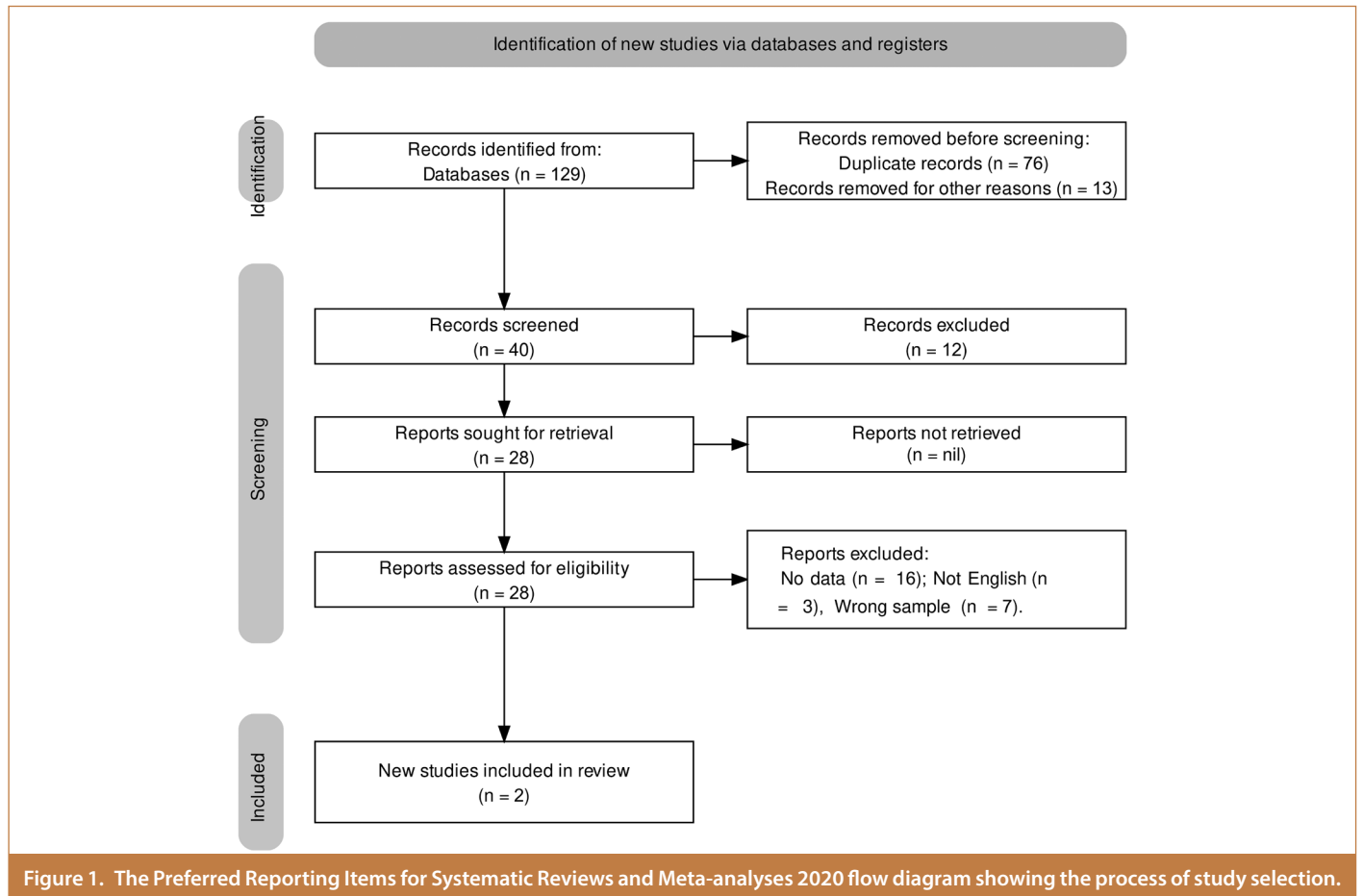


Table 2 provides a comprehensive description of the projected or discussed possible risk factors in each of the primary studies. Word frequency analysis revealed that “lack”, “self”, “burnout”, “poor”, “stigma”, “stress”, “anxiety”, “coping”, “family”, and “support” were the most commonly described factors. The 2-word phrase analysis revealed that “lack of; of balance; of support; poor coping; and poor self” were the most commonly described phrases in the literature. The keywords and their full meanings are available in Figure 3, which presents a comprehensive literature overview of the increasing risk of DE in medical students.

Discussion

This umbrella review systematically summarized and evaluated multiple systematic reviews on DE among medical students. This type of review allowed for a comprehensive overview of the evidence landscape on the topic. Our results presented data from each primary study about the prevalence rate and the possible risk factors discussed in each of the papers. This umbrella review provided an effect size adjustment for the prevalence rate and corresponding 95% CIs. Previous systematic reviews and meta-analyses showed an effect size of 10.4% (95% CI: 7.8%-13.0%)⁷ and 17.3% (95% CI: 14.1-21.1%),⁹ while this umbrella review revealed an overall effect size of 15.1% (95% CI: 14.7%-15.6%). With our umbrella review approach, a narrower confidence interval indicates greater precision, as it suggests a more precise estimate of the population parameter. Meta-analyses are well known for their propensity to inflate effect sizes due to publication bias, selection criteria,

heterogeneous data, repeated analyses of the same samples, and multiplicity issues.^{53,54}

The present umbrella review offers an important and unique analysis not present in previous reviews, which is the focus on possible risk factors discussed in the primary studies. Our results show that anxiety, stress, and burnout are the most important precursors and comorbidities that co-occur in association with DE in medical students. Previous research has shown that individuals with DE frequently experience underlying psychological symptoms such as despair, anxiety, or low self-esteem.^{40,55-57} Given the demanding expectations of medical school and the limited availability of treatment resources such as counseling and nutritional support, medical students are more vulnerable to these expressions of distress than their age peers.¹¹ Failure to address this issue puts them at risk of developing significant mental and physical health complications.⁷ Neglecting the risks can lead to the development of severe and potentially chronic mental and physical health conditions in adulthood.^{7,8} One recommendation is to recognize and deliberately set out to reduce stressors in medical school. An important research gap identified by the present review is that the relationships between DE and anxiety, stress, and burnout require attention from future researchers.

Our analyses showed that “lack of support” and “lack of coping skills” or “poor coping” are the most important risk factors for DE in medical students. To effectively mitigate the occurrence of DE among medical students, proactive measures that address the underlying causes

Table 1. Summary of the Primary Studies and Systematic Reviews and Meta-analyses Included in this Umbrella Review

SN	Primary Study		Discussed Possible Risk Factors in the Primary Study	Sample Size	Prevalence Rate (95% CI)	Risk of Bias, NOS Score
	Review Author	Author, (Ref.)				
SRMA 1, Study 1	Jahrami	Herzog ²⁵	Perfectionism; pressure; stress; anxiety	121	15% (95% LL = 8%–95% UL = 21%)	Moderate, 5
SRMA 1, Study 2	Jahrami	Rathner (1) ²⁶	Competition; achievement; unrealistic goals; burnout	379	5% (95% LL = 3%–95% UL = 7%)	Low, 7
SRMA 1, Study 3	Jahrami	Rathner (2) ²⁶	S/A	379	10% (95% LL = 7%–95% UL = 13%)	Low, 7
SRMA 1, Study 4	Jahrami	Sepulveda ²⁷	Poor self-care; lack of balance; overload; isolation; stress	2551	19% (95% LL = 17%–95% UL = 20%)	Low, 8
SRMA 1, Study 5	Jahrami	Joja ²⁸	Aggression; hostile environments; discrimination; stigma	110	15% (95% LL = 9%–95% UL = 22%)	Low, 8
SRMA 1, Study 6	Jahrami	Lee ²⁹	Trauma; abuse; harassment; inadequate support; poor coping	199	16% (95% LL = 10%–95% UL = 21%)	Low, 7
SRMA 1, Study 7	Jahrami	Ramaiah ³⁰	Financial strain; debt; poverty; pressure; stress; anxiety	172	17% (95% LL = 11%–95% UL = 23%)	Low, 7
SRMA 1, Study 8	Jahrami	Weigel ³¹	Poor body image; weight stigma; pressure; stress; anxiety	304	11% (95% LL = 7%–95% UL = 14%)	Low, 7
SRMA 1, Study 9	Jahrami	Chaudhari ³²	Loneliness; homesickness; burnout	193	14% (95% LL = 9%–95% UL = 19%)	Low, 7
SRMA 1, Study 10	Jahrami	Pitanupong ³³	Self-criticism; guilt	885	16% (95% LL = 13%–95% UL = 18%)	Low, 7
SRMA 1, Study 11	Jahrami	Barayan ³⁴	Lack of support; independence struggles; depression	319	14% (95% LL = 10%–95% UL = 18%)	Moderate, 5
SRMA 1, Study 12	Jahrami	Brumboiu ³⁵	Obsessiveness; compulsiveness; rigidity; perfectionism	222	26% (95% LL = 20%–95% UL = 32%)	Low, 7
SRMA 1, Study 13	Jahrami	Rasman ³⁶	Substance abuse; addiction; unhealthy coping; escape	279	43% (95% LL = 37%–95% UL = 49%)	Low, 8
SRMA 1, Study 14	Jahrami	Taha ³⁷	Transition from school to university; lack of coping skills; emotion regulation issues	1200	11% (95% LL = 9%–95% UL = 13%)	Low, 7
SRMA 1, Study 15	Jahrami	Tavolacci ³⁸	Genetics; predisposition; vulnerability factors	1225	19% (95% LL = 17%–95% UL = 21%)	Low, 7
SRMA 1, Study 16	Jahrami	Azzouzi ³⁹	Mental health issues; family dysfunction; trauma; anxiety	710	33% (95% LL = 29%–95% UL = 36%)	Low, 7
SRMA 1, Study 17	Jahrami	Farchakh (1) ⁴⁰	Thin ideal; diet culture; burnout; competitiveness; self-criticism	627	74% (95% LL = 71%–95% UL = 78%)	Low, 8
SRMA 1, Study 18	Jahrami	Farchakh (2) ⁴⁰	S/A	627	30% (95% LL = 26%–95% UL = 34%)	Low, 8
SRMA 1, Study 19	Jahrami	Plichta ⁴¹	Misconceptions; false beliefs; burnout	1120	28% (95% LL = 26%–95% UL = 31%)	Low, 7
SRMA 2, Study 20	Fekih-Romdhane	Sharma ⁴²	Barriers to care; stigma; lack of support; family issues	370	21% (95% LL = 17%–95% UL = 25%)	Low, 8
SRMA 2, Study 21	Fekih-Romdhane	Spillebout ⁴³	Food rules; dieting; behaviors via society	731	17% (95% LL = 14%–95% UL = 19%)	Low, 7
SRMA 2, Study 22	Fekih-Romdhane	Abo Alj ⁴⁴	Peer influence; media impact; social media	615	33% (95% LL = 29%–95% UL = 37%)	Low, 8
SRMA 2, Study 23	Fekih-Romdhane	Bizri (1) ⁴⁵	Disordered eating patterns; restriction; poor self-care; self-neglect; inadequate sleep; skipping meals	124	19% (95% LL = 12%–95% UL = 26%)	Low, 7
SRMA 2, Study 24	Fekih-Romdhane	Bizri (2) ⁴⁵	S/A	131	17% (95% LL = 10%–95% UL = 23%)	Low, 7
SRMA 2, Study 25	Fekih-Romdhane	Chan ⁴⁶	Low self-worth; lack of confidence; insecurity	1017	14% (95% LL = 12%–95% UL = 16%)	Low, 8
SRMA 2, Study 26	Fekih-Romdhane	Polanco ⁴⁷	Difficulty asking for help; independence; isolation; stress	90	8% (95% LL = 2%–95% UL = 13%)	Moderate, 6
SRMA 2, Study 27	Fekih-Romdhane	Thangaraju ⁴⁸	High demands; workload; fast pace; lack of balance	199	14% (95% LL = 9%–95% UL = 18%)	Low, 7
SRMA 2, Study 28	Fekih-Romdhane	Tury (1) ⁴⁹	Lack of healthy supports; burnout; childhood trauma; harassment; assault; lack of safety; stigma; shame; media	538	8% (95% LL = 5%–95% UL = 10%)	Low, 7
SRMA 2, Study 29	Fekih-Romdhane	Tury (2) ⁴⁹	S/A	538	4% (95% LL = 3%–95% UL = 6%)	Low, 7
SRMA 2, Study 30	Fekih-Romdhane	Tury (3) ⁴⁹	S/A	969	14% (95% LL = 12%–95% UL = 16%)	Low, 7
SRMA 2, Study 31	Fekih-Romdhane	Tury (4) ⁴⁹	S/A	969	7% (95% LL = 5%–95% UL = 9%)	Low, 7
SRMA 2, Study 32	Fekih-Romdhane	Damiri (1) ⁵⁰	Lack of support; worsening; identity struggles; lack of belonging	1047	31% (95% LL = 29%–95% UL = 34%)	Low, 8
SRMA 2, Study 33	Fekih-Romdhane	Damiri (2) ⁵⁰	S/A	1047	21% (95% LL = 19%–95% UL = 24%)	Low, 8
SRMA 2, Study 34	Fekih-Romdhane	Iyer ⁵¹	Long hours; lack of sleep; exhaustion; poor coping	332	15% (95% LL = 11%–95% UL = 19%)	Low, 7
SRMA 2, Study 35	Fekih-Romdhane	Rostad ⁵²	Body dissatisfaction; dysmorphia; internalized stigma	1044	18% (95% LL = 16%–95% UL = 21%)	Low, 8

LL, lower limit; UL, upper limit; S/A, same as above; SRMA, systematic review and meta-analysis.

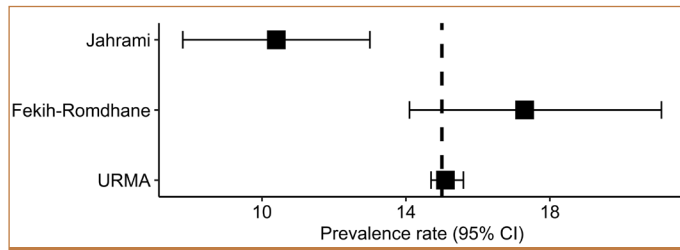


Figure 2. An overview of meta-analyses pertaining to disordered eating among medical students.

of such behaviors and provide effective early intervention are recommended.⁵⁸ Examples include supportive environments within medical schools, accessible counseling services, and the establishment of well-defined guidelines regarding expected eating behaviors.^{55,59}

Early intervention is vital. Counseling assumes a pivotal role in assisting students in managing and navigating the complexities of stress that can lead to an ED.⁶⁰ Experienced counselors collaborate with students, helping them dismantle detrimental behavioral patterns and foster sustainable, healthy eating habits.⁶⁰ Within counseling sessions, students acquire valuable skills and techniques to identify

Table 2. Umbrella Review and Meta-analysis of Meta-analyses

SRMA/URMA	Prevalence (95% CI)	P-value Random Effects	k	n	eOR (95% CI)	I ²	Egger's Test	ESB	GRADE
Umbrella review (present results, URMA)	15.1% (95%CI: 14.7%-15.6%)	<.001	35	21383	(1.71- 1.77)	97.6%	<0.001	<0.001	-
Fekih-Romdhane (SRMA 2) ⁹	17.3% (95%CI: 14.1-21.1%)	<.001	Jahrami (i.e., 18) +17	Jahrami (i.e., 5722)+ 15661	NA	97.8%	<0.001	NA	High quality
Jahrami (SRMA 1) ⁶⁸	10.4% (95%CI: 7.8%-13.0%)	<.001	18	5722	NA	94.0%	<0.001	NA	Medium quality

eOR, equivalent odds ratio; ESB, excess statistical significance; k, number of studies; n, number of the sample (sample size); NA, Not applicable; SRMA, systematic review and meta-analysis; URMA, umbrella review and meta-analysis; GRADE, Grading of Recommendations Assessment, Development and Evaluation.



Figure 3. An illustrative representation elucidating the potential risk factors contributing to disordered eating among medical students.

and address negative thought patterns that contribute to DE.^{47,56} The incorporation of cognitive behavioral therapy (CBT) further augments the efficacy of this approach, empowering students to lessen their stress levels and to transform negative attitudes toward their bodies and toward food into positive perceptions.

A systematic review and meta-analysis or meta-analyses published in 2022 compiled data from 55 meta-analyses and 4 network meta-analyses, representing 1154 effect sizes from randomized controlled trials, showed that there were treatment differences across ED diagnoses.⁶¹ The results support family-based therapy for adolescents with anorexia nervosa and individual CBT for adults with bulimia nervosa. Cognitive behavioral therapy and antidepressants have the strongest evidence for binge ED.⁶¹ Thus, the results provide insights into optimal evidence-based interventions that can inform clinicians' selection of tailored treatments based on diagnosis, age of the patient, and care setting.⁶¹ The review also revealed areas where the evidence remains limited, such as treatments for OSFED/UFED, combination approaches, and long-term outcomes.⁶¹ These evidence gaps highlight fruitful directions for future research to advance the field.

There are other interventions available. Educational institutions can implement nutrition classes to educate students about the significance of wholesome eating practices.⁶² Additionally, establishing support groups and organizing activities that foster resilience and celebrate body diversity have been shown to increase student well-being.⁶² Moreover, schools can formulate strategies to cultivate an inclusive and supportive environment that encourages positive body image and acceptance. Because many medical students encounter personal, financial, family, academic, and relationship stressors that result in a variety of physical/psychological symptoms, a wide array of therapeutic interventions need to be made available.

This is an important area of prevention. A DE pattern may develop into a formal ED if it is not immediately addressed.⁷⁻⁹ Eating disorders can give rise to various physical complications, including nutrient deficiencies, electrolyte imbalances, cardiac issues, and digestive problems.⁹ Furthermore, they are tied to mental and emotional health challenges, encompassing anxiety, depression, self-harm, and thoughts of suicide.^{7,9} Additionally, individuals grappling with EDs often encounter social difficulties, experiencing strain in maintaining relationships with loved ones and facing obstacles in meeting academic or professional aspirations.^{7,9} Finally, it is essential to recognize the financial burden associated with EDs, as well as the long-term economic implications that can stem from missed work or educational failures.^{7,9}

Research into DE in medical students emerged in the 1980s, with seminal studies by Herzog and colleagues,²⁵ Rathner and Rumpold²⁶ examining prevalence and associated traits like perfectionism and need for achievement.¹² Since then, the research base on these phenomena has grown steadily.^{25,26} Initial studies exploring DE in medical students were concentrated in Western nations like the United States, Austria, and Germany.^{25,26,31} More recent research has expanded to include regions such as Asia, the Middle East, Eastern Europe, and South America.^{28,30,33,39} This wider scope enables analysis of the ways cultural factors are able to influence the manifestations of DE.^{25,31} For instance, research conducted in individualistic cultures such as the US and Germany links DE to internal pressures, e.g., perfectionism and self-criticism.^{25,31} In contrast, studies from collectivist cultures

such as Malaysia and Lebanon relate DE to external forces, e.g., family expectations and social comparisons.^{2,39,40} However, certain risk factors e.g., academic stress, poor coping, and lack of support appear consistent across cultures.^{27,36,47} While cultural influences on DE do exist, medical students worldwide share core experiences that confer risk. The competitive pressures, academic rigors, lack of self-care, and isolation from support systems are near-universal facets of medical education across global regions.^{7,9,10} Thus, DE remains elevated in this population irrespective of cultural norms. Recent research demonstrates that DE among medical students is increasing over time, now estimated at 15%-17% globally.^{7,9,10} While total explanations are unclear, hypothesized contributors include rising academic demands, changing lifestyle factors, and greater willingness to report DE symptoms.^{49,52} More research analyzing temporal and cultural nuances is warranted. Nevertheless, the consistency of heightened DE risk in medical students' underscores needed prevention efforts.

The high prevalence of DE among medical students has significant implications for medical education and student wellness initiatives. This umbrella review highlights the need for proactive measures to promote healthy eating attitudes and behaviors in medical school. The 15% prevalence signals an urgent need for multifaceted prevention strategies. Counseling services, peer support groups, resilience training, and wellness programming focused on nutrition, coping skills, and stress management could help foster healthy coping mechanisms during this demanding training period. Confidential avenues to help seeking without academic penalty will encourage students to come forward. At the institutional level, schools can formulate policies on positive body image, model appropriate work-life balance for students, and provide flexible leave options. Reducing stigma around mental health through open dialogue will further normalize help-seeking.

Several theoretical models help explain the development and maintenance of DE among medical students. These frameworks identify contributing factors and mechanisms underlying the emergence of DE. The psychosocial model posits that psychological traits and social/environmental influences intersect to produce DE.⁶³ For example, medical students with perfectionistic tendencies are at special risk in a high-pressure academic climate.⁶³ The model emphasizes how vulnerability factors and stressors combine to increase susceptibility.⁶³ The stress-adaptation model highlights the body's maladaptive physiological response to chronic stress.⁶⁴ Prolonged activation of stress systems due to medical school demands can dysregulate appetite hormones, altering eating behaviors.¹⁰ Disordered eating symptoms often emerge as a form of coping with distress.⁶⁵ The cognitive-behavioral model focuses on dysfunctional thought patterns such as excessive self-criticism, cognitive distortions about food or weight, and poor coping skills.⁶⁶ These cognitive factors perpetuate DE symptoms; correcting distortions and building coping abilities is key to overcoming DE according to this model.⁶⁶ Finally, the sociocultural model examines societal pressures that promulgate unrealistic appearance ideals and excessive focus on weight/shape.⁶⁷ Internalization of these standards of attractiveness generates body dissatisfaction, which then leads to DE symptoms.⁴

Strengths and Limitations

The major strengths of this review are i) the umbrella format, which provides an overview of the most reliable existing evidence; ii) the

identification of gaps in the existing evidence, i.e., a focus on prevalence rates rather than on risk factors; and iii) the discussion of the variety of interventions that could prevent progression to full-blown EDs. Our review has 2 major limitations. The quality of the available studies was limited. It is also possible that there were other relevant studies in databases we did not search. Prioritizing interventions requires a comprehensive understanding of the factors that contribute most significantly to the development and maintenance of DE behaviors. While our study was unable to quantify the specific effects of each stressor identified in Figure 3, future research should aim to investigate these associations in greater depth.

This umbrella review moved our current knowledge about DE among medical students to a more advanced level by synthesizing vast evidence, appraising its quality, identifying consistency and gaps, resolving discrepancies, and providing high-level evidence that can inform practice and policy. This represents an important advancement over individual primary studies or isolated systematic reviews. Approximately, 1 out of 7 medical students suffer from DE, a rate which needs to be addressed by medical schools in order to prevent full-blown EDs and, thus, ensure the safety and well-being of fledgling physicians. Preventive measures in medical schools include supportive environments, easy access to care, and clearly stated expectations for healthy behavior concerning eating. DE is a precursor to EDs, which often entail grave physical and psychological health ramifications as well as economic and social sequelae. Timely identification and intervention are crucial for curtailing further harm.

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