



Review article

Emerging Evidence: A Systematic Literature Review of Disordered Eating Among Transgender and Nonbinary Youth


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 A B S T R A C T

Purpose: This systematic literature review explores the evidence base related to the diagnosis and clinical management of eating disorders among transgender and gender nonbinary (TGNB) youth. Through an exploration of the literature, this review highlights key considerations for providers working with this population, including the complex relationship between body image and gender, the assessment of subthreshold eating disorder symptoms, the impact of gender-affirming care on eating disorder treatment outcomes, and available evidence-based metrics, with attention to factors impacting treatment, including family support, psychiatric comorbidities, and community safety.

Methods: We conducted a search of the databases PubMed and Ovid MEDLINE for articles pertaining to eating disorders and TGNB youth, with forward citation chaining conducted via Google Scholar to provide a review of recent publications. Twenty-six articles published from 2017 to 2022 met the criteria for full-text review.

Results: The selected articles primarily explored data from the United States and varied widely in methodology, including a systematic literature review ($n = 1$), narrative literature reviews ($n = 3$), case series ($n = 4$), case studies ($n = 2$), cross-sectional population surveys ($n = 7$), cross-sectional patient surveys ($n = 3$), other cross-sectional studies ($n = 3$), retrospective chart reviews ($n = 2$), and a retrospective longitudinal cohort study ($n = 1$). Most commonly, researchers sampled patients within the setting of gender clinics. Researchers used a range of validated measures in clinical settings, with the Eating Disorder Examination Questionnaire most frequently reported. The literature highlights several considerations unique to transgender populations, including the complex relationship between gender dysphoria, body dissatisfaction, disordered eating behavior, and gender-affirming care.

Discussion: In clinical settings with TGNB youth, providers may consider implementing validated screening measures to assess for eating disorders. Future research should emphasize a nuanced understanding of the heterogeneity among TGNB patient populations and the impact of gender identity on treatment of eating disorders.

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IMPLICATIONS AND CONTRIBUTION

 This systematic literature review describes unique considerations for treating eating disorders among transgender youth populations and outlines emerging themes in the evidence base.

Conflicts of interest: The authors have no conflicts of interest to disclose.

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There is a rapidly expanding body of literature exploring the intersection of transgender care and treatment of eating disorders, in alignment with a broader expansion of the research base on transgender health. Throughout this review, we will use the term transgender and gender nonbinary (TGNB) to encompass individuals whose gender identity differs from their natal sex and/or falls outside of a male/female gender binary, with an acknowledgment of the evolving terminology within this field.

Within the United States, transgender rights have become increasingly central to the national cultural and political discourse, especially in the years since 2014, deemed the “Transgender Tipping Point” of visibility by Time Magazine [1]. Heightened public awareness has been accompanied by both a generational shift in discussions on gender identity (with an estimated 1.4% of United States youth ages 13–17 identifying as transgender, compared to an estimated 0.5% of United States adults) [2] and a reactionary wave of discriminatory legislation [3–5]. This legislation includes efforts to restrict access to school sports and public restrooms as well as attempts to criminalize provision of gender-affirming medical care for transgender youth. Given the swift evolution of the research and social climate, we focused the scope of this review on the past 5 years.

Access to care

Access to all forms of gender-affirming medical care is a significant challenge. National and international medical organizations including the American Academy of Pediatrics, the Pediatric Endocrine Society, the American Academy of Child & Adolescent Psychiatry, and the World Professional Association for Transgender Health have issued clinical guidelines firmly in support of developmentally appropriate gender-affirming medical care for youth [6–9]. Despite these guidelines, physicians and legislators are increasingly in conflict as lawmakers continue to restrict access to gender-affirming medical care. Compounding this issue, eating disorder treatment is *also* a limited resource nationally. With the onset of the COVID-19 pandemic in 2020 and the accompanying surge in eating disorder diagnoses among adolescents, both cisgender and transgender youth have struggled to access eating disorder treatment [10,11]. As a minority population, TGNB adolescents and their families face particularly extensive barriers when seeking evidence-based treatment for eating disorders [12].

Consent for treatment of a minor

Even in regions where patients have access to specialized gender clinics or other gender-affirming clinical settings, for TGNB minors, gender-affirming medical care is contingent on parents or guardians consenting to treatment. Several recent studies on the diagnosis and treatment of eating disorders among transgender patients have focused on college students and transitional age youth, rather than minors; for this older population, parental consent is not a central consideration [13–17]. However, family involvement and consent are uniquely challenging for TGNB patients under age 18. In some families, parents may support treatment of an eating disorder, but do not accept their child’s gender identity and will not consent to gender-affirming care; in these circumstances, clinical management of an eating disorder can be fraught for both patients and providers. The current eating disorder treatment literature

strongly supports family-based treatment for eating disorders [18–21]. Patients with eating disorders often do not have insight into the severity of their illness and may not seek treatment without the insistence of parents and caregivers. Consequently, treatment goals often do not align for patients, parents, and providers when addressing eating disorders among TGNB youth. In this review, we therefore focused on articles reporting data for TGNB youth under age 18.

Eating disorder prevalence among transgender youth

Among TGNB youth, screening for eating disorders is particularly important. Previous research has documented a higher prevalence of eating disorders among transgender youth in comparison to cisgender peers, with estimates of formal eating disorder diagnoses varying from 2%–18% [22–27]. In one large population survey, disordered eating behaviors were endorsed by 42% of participating TGNB youth [28]. Researchers have examined these high rates of eating disorders through the framework of the minority stress model, which correlates experiences of systemic discrimination with adverse mental health outcomes, [29–36] and the tripartite influence model of body image and eating, which emphasizes the impact of parents, peers, and media [35,37,38]. These factors may be particularly relevant as political tension increases, threats of violence toward TGNB youth continue, and the influence of social media expands.

When examining health-promoting behaviors, TGNB youth also endorse poorer-quality nutrition and less engagement in regular exercise [39,40], which can be associated with numerous societal factors ranging from restrictions on engagement in school sports, to increased rates of bullying and peer victimization, to high rates of homelessness among LGBTQ+ youth. Importantly, the underlying motivations for disordered eating behavior may differ from the motivations of cisgender youth [41–43]. TGNB youth have described caloric restriction and other disordered eating behaviors as specifically relating to the experience of gender dysphoria and body dissatisfaction.

Unique treatment considerations for transgender youth

It is therefore essential for clinicians to consider unique aspects of eating disorder treatment specific to the care of TGNB youth. Historically, sample populations have been small, and researchers consequently studied TGNB youth as a homogenous population. Scholarly research has only more recently started to elucidate considerations exclusive to transmasculine, transfeminine, and nonbinary patient populations [44,45]. For example, transmasculine youth may weight restrict with a goal of suppressing secondary sex characteristics (breast tissue, menses) or engage in compensatory exercise behavior to increase muscularity [46]. Transfeminine youth may weight restrict to avoid pubertal changes (facial hair, vocal deepening) or to conform to an idealized thin female esthetic. Nonbinary youth may be seeking an androgynous appearance [47], although the literature is least robust for this population. Across gender identities, increased congruence between gender identity and physical appearance (the ability to “pass”) may be associated with increased physical safety [48]. Additionally, all adolescents are impacted by cisnormative beauty ideals portrayed in the media [49–51].

Literature review objectives

In reviewing the current literature base, our goal is to (1) outline emerging themes from the current body of evidence; (2) discuss unique treatment considerations among specific transgender patient populations with attention to differences in presentation between transmasculine, transfeminine, and nonbinary youth; and (3) explore practical recommendations for clinical providers. Treatment recommendations from the literature may be applied when screening for eating disorders in gender clinics, when adapting clinical approaches in eating disorder programs for TGNB patients, or when providing routine primary care for TGNB adolescents. Within the results, we outline the study characteristics, research methodology, treatment settings, gender categories, and standardized assessments included in the available body of research. Although data cannot be directly compared among the highly heterogeneous sample of articles, we highlight key themes which emerged across publications.

Methodology

Literature searches were conducted in two primary scholarly databases, PubMed and Ovid MEDLINE, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 systematic literature review guidelines [52]. Search terms were mapped to Medical Subject Headings when

available. Search criteria focused on three core aspects of the literature: (1) transgender populations, (2) patients under age 18, and (3) the continuum of eating disorder behavior (see Figure 1 for complete search strategy). To meet inclusion criteria, the final selected articles needed to be published journal articles which included all three components. The search was limited to English language publications within a 5-year interval (2017–2022). Search criteria were kept broad to capture the wide variety of scholarly work on this subject. The initial search generated 33 unique articles. Two reviewers (K.V., L.C.) completed independent reviews of the resultant abstracts; discrepancies were resolved by consensus. Articles were excluded due to the following criteria: (1) editorial publications ($n = 2$) [53,54], (2) articles not focused on eating disorders ($n = 3$) [26,55,56], and (3) articles not focused on pediatric populations ($n = 9$) [13–17,29,34,42,57].

From the abstract review, 19 articles met criteria for full-text review. A forward citation chain analysis of the resultant articles was conducted via Google Scholar and identified seven additional articles for review. A reference review was also completed to ensure all relevant results were captured. The 26 final included articles were assessed for study design, study location, population size, clinical setting, and key findings. Key themes were selected from a full-text review of the selected articles, a process which could not be automated due to the heterogeneity of reported findings. Each theme was agreed upon by both reviewers (K.V., L.C.). Key themes included the following:

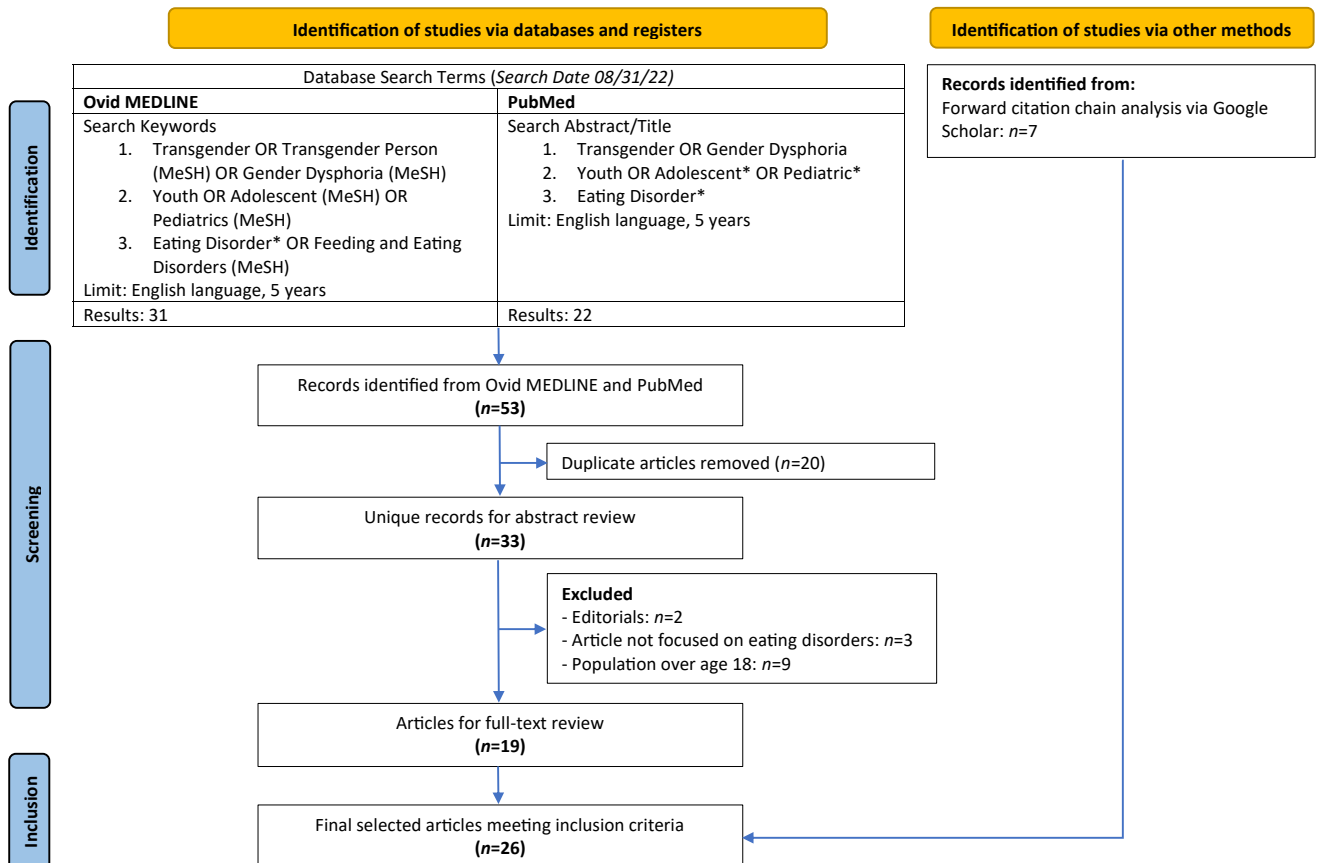


Figure 1. Literature search methodology.

weight control behavior with a goal of gender affirmation, exploration of subthreshold eating disorder behaviors, family support of gender identity, psychiatric comorbidities, the impact of gender-affirming care on treatment of eating disorders, and recommendations for clinical care and screening. Additionally, any standardized measures employed in clinical practice were highlighted.

Results

Article characteristics

Article characteristics are outlined in [Table 1](#). The reviewed research varies widely with respect to study methodology, sample size, and study objectives. This review includes one prior systematic literature review [22]; notably, 16 of the 26 articles included in this review were published in the three years following the review by Coelho et al. The current review builds upon the foundational work of the Coelho review and also includes a synthesis of key themes from three additional narrative reviews published from 2019 to 2021 [35,58,59]. This body of research is rapidly evolving. Five countries are represented (United States, Canada, Australia, New Zealand, and Italy); the majority of the data are reported from urban academic medical centers within the United States.

Article study design included one systematic literature review ($n = 1$), narrative literature reviews ($n = 3$), case series ($n = 4$), case studies ($n = 2$), cross-sectional population surveys ($n = 7$), cross-sectional patient surveys ($n = 3$), other cross-sectional studies ($n = 3$), retrospective chart reviews ($n = 2$), and a retrospective longitudinal cohort study ($n = 1$). Population surveys included data collected from large-scale population surveys of adolescents [25,32,44,60], surveys targeting LGBTQ+ youth [61,62], and one survey tailored specifically for TGNB youth [28].

Treatment settings

Most study data were collected from patients presenting for gender-affirming care. All three cross-sectional patient surveys were collected from gender clinics [63–65], as were both retrospective chart reviews [66,67]. Two studies reported cross-sectional data from the same gender clinic [68,69], and one collected qualitative data from patients within a gender clinic [45]. Among the case studies and case series, there was greater heterogeneity in treatment settings. Articles included a case series of patients presenting across a hospital system in both eating disorder and gender clinic settings [70], two case series highlighting patients presenting to gender clinics [71,72], one case series examining a community sample of participants [37], and two case studies featuring patients presenting to mental health settings [73,74]. One retrospective longitudinal cohort study collected data from an eating disorder treatment setting [75].

Gender identities

Within the transgender community in the United States, language related to gender identity continues to evolve; for example, scholars and community advocates differ on whether nonbinary gender identities fall under a broader umbrella of transgender identities or if nonbinary gender identities are best understood as a distinct category. For the specific purpose of researching eating disorders, many articles position transgender

communities in relation to cisgender women (historically, the most researched eating disorder population). One article, for example, exclusively categorizes the transgender patient population studied as "assigned female at birth" [61]. Several articles do not distinguish between transgender identities, commonly grouping patients within the category of "gender minority" or transgender [25,28,32,60,67,75]. Four of the case studies or case series focus exclusively on individuals with a binary transgender identity (e.g., transmasculine or transfeminine) [71–74]. One patient survey excluded nonbinary participants due to small sample size and concern for heterogeneity [65].

When exploring nuances within the transgender community, however, researchers most commonly attempted to differentiate between transmasculine, transfeminine, and nonbinary patient populations [45,63,64,68,69], occasionally including other categories for gender expansive identities (e.g., gender queer, gender fluid, agender, nonbinary assigned female at birth, and nonbinary assigned male at birth). One case series recognized that patient self-identification may evolve throughout adolescence [37].

Screening and assessment

At present, there is no standardized approach to the diagnosis and treatment of TGNB youth presenting with disordered eating. Within the included articles, clinicians employed a range of validated measures, including the Eating Disorder Examination Questionnaire (EDE-Q), the Sick, Control, One Stone, Fat, Food Questionnaire, the Adolescent Binge Eating Disorder Questionnaire, the Nine-Item Avoidant/Restrictive Food Intake Disorder Screen, the Hunger Vital Sign, the Body Uneasiness Test, the Eating Pathology Symptoms Inventory, the Transgender Congruence Scale, the Motivations to Eat Scale, and validated items from a longitudinal study called Project Eating and Activity over Time. One article focused specifically on determining the effectiveness of the EDE-Q as a screening measure in a gender clinic [63]. The EDE-Q was the most frequently reported measure, which is a validated measure to assess the range and severity of eating disorder symptoms in patients aged 14 and older [60,63–65,73,75]. See [Table 2](#) for an outline of the validated measures discussed in each article.

Themes from article key findings

All case series, both case studies, all literature reviews, and six empirical studies explored weight control behavior with a patient-reported goal of increasing alignment between their body and their gender identity (see [Table 2](#), theme A) [22,25,28,35,37,44,45,58,59,63,67,70–74]. These 16 articles explored the relationship between body dissatisfaction, gender dysphoria, and patients' efforts to transform their own bodies. Patient-stated goals commonly included pubertal suppression, minimization of natal secondary sex characteristics, desire to "pass" as a cisgender individual, and/or desire to conform to a specific idealized body type. Researchers also noted that TGNB youth endorse a wide range of eating disorder behaviors (including "cheat meals," caloric restriction, compensatory exercise, use of laxatives or diuretics, and binge eating) but may not meet diagnostic criteria for a specific eating disorder (see [Table 2](#), theme B) [22,25,28,32,35,44,59–62,65–69]. These "subthreshold" symptoms were particularly highlighted in all seven large-scale population surveys. For example, in one large-scale survey of transgender youth, 48% of TGNB adolescents

Table 1
Article characteristics

Author	Year	Study Design	Location	Sample Size	Sample Age	Sample Gender
Donaldson	2018	Case Series	USA (Hasbro Children's Hospital)	5 patients	13-22	3 Transmasculine patient 1 Transfeminine patient 1 Gender queer patient
Pham	2021	Case Series	USA (Seattle Children's Hospital)	3 patients	14-17	Transmasculine (1) Transfeminine (2)
Ristori	2019	Case Series	Italy	2 patients	14-16	Transmasculine (1) Transfeminine (1)
Romito	2021	Case Series	USA (Pittsburgh)	9 patients	16-20	Transfeminine (2) Transmasculine (4) Agender (1) Gender queer (2)
Cibic	2019	Case Study	Australia	1 patient	16	Transmasculine individual
Protos	2021	Case Study	USA (Private Practice)	1 patient	16 (followed through age 18)	Transmasculine individual
Linsenmeyer	2021	Cross-sectional study	USA (St. Louis Children's Hospital)	164 patients (shared sample with Zickgraf)	12-23	Transmasculine (78%) Transfeminine (17.1%) Non-binary (4.9%)
Pham	2022	Cross-sectional study (qualitative)	USA (Seattle Children's Hospital)	23 participants	13-19	Transfeminine - 9 (44%) Transmasculine - 10 (39%) Non-binary/gender-fluid - 4 (17%)
Zickgraf	2021	Cross-sectional study	USA (St. Louis Children's Hospital)	164 patients (shared sample with Linsenmeyer)	12-23	Transmasculine (78%) Transfeminine (17.1%) Non-binary (4.9%)
Avila	2019	Patient Survey (cross-sectional)	USA (Stanford)	106 patients	13-22	Transmasculine (61%) Transfeminine (28%) Nonbinary (11%)
Peterson	2020	Patient Survey (cross-sectional)	USA (Cincinnati Children's Hospital)	86 patients	10-26	Transgender male (60) Transgender female (20) Non-binary (6)
Peterson	2020	Patient Survey (cross-sectional)	USA (Cincinnati Children's Hospital)	249 patients	11-24	Transfeminine (69) Transmasculine (180) Excluded 4 nonbinary patients
Ganson	2022	Population Survey (cross-sectional)	Canada	52.5% transgender respondents 2,717 total respondents	16-30	Not Provided
Guss	2017	Population Survey (cross-sectional)	USA (Massachusetts)	67 transgender respondents (2,473 total respondents)	14-18	Not Provided
Lessard	2021	Population Survey (cross-sectional)	USA	33% transgender respondents (17,112 total respondents)	13-17	AFAB 72% (No additional gender differentiation provided)
Lucassen	2019	Population Survey (cross-sectional)	New Zealand	266 + 434 transgender respondents (7,769 total respondents)	Not Provided	Not Provided
Roberts	2021	Population Survey (cross-sectional)	USA	1,191 gender minority respondents (2,110 total respondents)	14-18	Transfeminine - 64 (3.0%) Transmasculine - 635 (30.1%) Non-binary/Questioning AFAB - 441 (20.9%) Non-binary/Questioning AMAB - 51 (0.02%)
Roberts	2022	Population Survey (cross-sectional)	USA	3,103 gender minority respondents (8,814 total respondents)	13-17	Transfeminine - 101 (3.25 %) Transmasculine - 767 (24.72%) Non-binary AFAB - 2034 (65.55%) Non-binary AMAB - 201 (6.45%)
Watson	2017	Population Survey (cross-sectional)	Canada	923 respondents	14-25 (35% under 18)	Not Provided
Feder	2017	Retrospective chart review	Canada	97 patients	12-18	Transfeminine (37) Transmasculine (58) Gender fluid (2)
Ferrucci	2022	Retrospective chart review	USA (Massachusetts)	10,415 patients	11-18 <11 (256) 12-15 (11125) 16-18 (1883)	Not Provided
Mensingher	2019	Retrospective longitudinal cohort study	USA (Pennsylvania)	471 sexual and gender minority patients (2,818 total patients)	Not Provided (250 under 18)	Not Provided
Coelho	2019	Review: Systematic Lit Review	Not Applicable	20 articles (2014-2019)	8-25	Not Applicable
Geilhufe	2021	Review: General review of guidelines & recommendations	USA (California)	Not Provided	Not Applicable	Not Applicable
Kamody	2020	Review: General review	Not Applicable	Not Provided	Not Applicable	Not Applicable
Parker	2020	Review: Literature Review	Not Applicable	Not Provided	Not Applicable	Not Applicable

AFAB = assigned female at birth; AMAB = assigned male at birth; SCOFF = Sick, Control, One Stone, Fat, Food Questionnaire.

aged 14–18 reported fasting within the past year, 42% reported binge eating, 18% reported purging, 7% endorsed the use of diet pills, and 5% used laxatives [28]. The rates of eating disorder behaviors were universally found to be higher among TGNB

youth than cisgender male peers; however, some studies indicate that the prevalence of subthreshold eating disorder symptoms may be similar to the prevalence among cisgender female peers [25,65]. One study reported further nuance [44].

Table 2
Key findings

Author	Year	Study Design	Research Population	Study Objective	Validated Measures	Highlighted Populations	Common Themes in Key Findings									
							A. Weight control behavior with a goal of gender affirmation	B. Exploration of sub-threshold disordered eating behaviors	C. Importance of family support of gender identity	D. Psychiatric comorbidities (including depression, self-harm, suicidality)	E. Safety concerns (bullying, victimization in the community)	F. Initiation of gender-affirming care demonstrated an impact on disordered eating	G. Initiation of gender-affirming care demonstrated an unclear impact on disordered eating	H. Recommendations for clinical care & screening		
Donaldson	2018	Case Series	Patients from Gender Clinic OR Eating Disorder Clinic/Weight Management Clinic	Describing common themes in a case series of transgender patients with eating disorders			X		X	X	X	X	X	X	X	X
Pham	2021	Case Series	Gender Clinic Patients	Describing features specific to the intersection of transgender identity, autism spectrum disorder, and eating disorders		Transgender patients with eating disorder and autism spectrum disorder	X		X	X		X	X	X	X	X
Ristori	2019	Case Series	Gender Clinic Patients	Describing longitudinal changes in eating disorder symptoms for two transgender patients with anorexia	BUT		X		X	X	X	X				
Romito	2021	Case Series	Community Sample	Exploring body image concerns among transgender patients			X		X	X	X	X				X
Cibic	2019	Case Study	Mental Health Patients	Describing outcomes of brief course of CBT for one individual	EDE-Q		X		X							
Protos	2021	Case Study	Mental Health Patients	Describing longitudinal mental health treatment course for one transgender patient with anorexia			X		X	X						
Linsenmeyer	2021	Cross-sectional study	Gender Clinic Patients	Describing the interaction between disordered eating, food insecurity, and weight status among transgender patients	SCOFF, ADO-BED, NIAS, Hunger Vital Sign		X						X	X	X	X
Pham	2022	Cross-sectional study (qualitative)	Gender Clinic Patients	Describing aspects of gender identity and gender affirming care impacting eating behavior and health among transgender patients		Non-binary patients with eating disorders	X		X	X	X					
Zickgraf	2021	Cross-sectional study	Gender Clinic Patients	Validating an ARFID screening measure in a gender clinic	NIAS, SCOFF, GAD-7, PHQ-9	Transgender patients with ARFID		X								
Avila	2019	Patient Survey (cross-sectional)	Gender Clinic Patients	Determining effectiveness of EDE-Q in a gender clinic	EDE-Q		X									X
Peterson	2020	Patient Survey (cross-sectional)	Gender Clinic Patients	Examining a specific model of behavior in relationship to transgender patients with bulimia	EDE-Q				X							
Peterson	2020	Patient Survey (cross-sectional)	Gender Clinic Patients	Examining the utility of the EDE-Q as a screening tool in a gender clinic	EDE-Q		X									X
Ganson	2022	Population Survey (cross-sectional)	Adolescents and Young Adults	Characterizing subclinical disordered eating behavior in a large population sample	EDE-Q		X									
Guss	2017	Population Survey (cross-sectional)	High School Students	Estimating prevalence of disordered weight management behavior among cisgender and transgender adolescents			X	X								
Lessard	2021	Population Survey (cross-sectional)	LGBTQ+ Adolescents	Exploring the relationship between school safety and disordered eating among LGBT adolescents	Project Eating and Activity over Time, Motivations to Eat Scale, British Columbia Adolescent Health Survey			X		X						
Lucassen	2019	Population Survey (cross-sectional)	High School Students	Describing body size, weight, nutrition, and activity behaviors among SGM youth			X									
Roberts	2021	Population Survey (cross-sectional)	Adolescents	Comparing disordered eating behavior between transgender and cisgender adolescents, and exploring the relationship between disordered eating and gender identity congruence among transgender teens	EPSS, Transgender Congruence Scale	Non-binary patients with eating disorders	X	X								
Roberts	2022	Population Survey (cross-sectional)	LGBTQ+ Adolescents	Identifying unique factors in disordered eating behavior for sexual and gender minority youth			X		X	X						
Watson	2017	Population Survey (cross-sectional)	Transgender Youth	Identifying risk factors and protective factors for disordered eating behavior among transgender youth			X	X	X		X					X
Feder	2017	Retrospective chart review	Gender Clinic Patients	Describing eating disorder presentation among transgender patients			X	X				X				X
Ferrucci	2022	Retrospective chart review	Gender Clinic Patients	Estimating prevalence of disordered eating among transgender patients			X	X								
Mensinger	2019	Retrospective longitudinal cohort study	Eating Disorder Patients	Comparing abuse history and eating disorder severity between transgender and cisgender eating disorder patients	EDE-Q					X						
Coelho	2019	Review: Systematic Lit Review	Not Applicable	Identifying literature themes			X	X		X		X				X
Gelhufe	2021	Review: General review of guidelines & recommendations	Not Applicable	Recommending clinic approaches to inclusive care			X		X	X	X					X
Kamody	2020	Review: General review	Not Applicable	Identifying unique treatment considerations for transmasculine patients			X	X				X				X
Parker	2020	Review: Literature Review	Not Applicable	Identifying literature themes			X	X		X	X	X				

ADO-BED = Adolescent Binge Eating Disorder Questionnaire; ARFID = Avoidant Restrictive Food Intake Disorder; BUT = Body Uneasiness Test; CBT = Cognitive Behavioral Therapy; EDE-Q = Eating Disorder Examination Questionnaire; EPSS = Eating Pathology Symptoms Inventory; GAD-7 = Generalized Anxiety Disorder-7; NIAS = Nine-Item Avoidant/Restrictive Food Intake Disorder Screen; PHQ-9 = Patient Health Questionnaire-9; SCOFF = Sick, Control, One Stone, Fat, Food Questionnaire.

Roberts et al. found that transmasculine adolescents engaged in significantly greater purging behavior than cisgender male peers, greater caloric restriction than cisgender female peers,

and greater muscle-building behaviors than all comparison groups, though with less excessive exercise than cisgender female peers. Transfeminine adolescents were found to engage in

greater caloric restriction than cisgender male peers but with less excessive exercise or muscle-building than cisgender male or female peers. Nonbinary assigned female at birth adolescents were noted to have significantly greater caloric restriction and muscle-building than cisgender female peers, though with less excessive exercise. Nonbinary assigned male at birth adolescents were found to have significantly greater rates of purging than their cisgender male peers, along with less excessive exercise.

Many articles highlighted key factors affecting access to care, engagement in treatment, and the degree of clinical improvement. These considerations include the impact of psychiatric comorbidities (most commonly depression, nonsuicidal self-injurious behavior, and suicidal behavior) [22,35,37,45,58,62,64,70–73], the importance of family support of patient gender identity [28,37,58,70–72,74], and the significance of safety concerns at school or in the community (see Table 2, themes C, D, and E) [28,35,37,45,58,61,62,70,72,74,75]. Notably, seven articles, including three literature reviews, described improvement or remission of eating disorder symptoms when TGNB youth were given access to appropriate gender-affirming care, including pubertal blockers (gonadotropin-releasing hormone analogs) or hormone therapy (e.g., estrogen or testosterone) [22,35,37,45,59,66,72]. Surgical interventions were not commonly reported among youth populations. One cross-sectional study reported that initiation of gender-affirming care did not correlate with a clear improvement in eating disorder symptoms [68]. Two of the case series included both clinical cases in which gender-affirming care demonstrated clear positive benefits on eating disorder symptoms and cases in which disordered eating persisted despite access to gender-affirming care [70,71]. The literature indicates that resolution of gender dysphoria is not always sufficient to resolve body dissatisfaction or restore normative eating behaviors (see Table 2, theme F).

Eleven articles provided recommendations for clinical providers (see Table 2, theme G), primarily screening and treatment guidelines for transgender patients with eating disorders [22,28,37,58,59,63,65,66,68,70,71]. Recommendations also included structural modifications (e.g., gender inclusive bathrooms, pronouns displayed on staff badges, signs, brochures welcoming TGNB patients) and trainings on gender-affirming medical practices for all providers, from front desk staff to physicians, in addition to family support resources. Articles broadly recommend trauma-informed care, given the high rates of trauma exposure among TGNB populations. The reviewed articles also emphasize the importance of screening metrics, with a recommendation to routinely screen all gender clinic patients for eating disorder behaviors (especially binge eating, as it was the most commonly reported behavior), screening for psychiatric comorbidities which may impact response to treatment (e.g., anxiety, depression, autism spectrum disorder), and screening for food insecurity.

Within these clinical recommendations, researchers also note the limitations of current metrics for physical health and clinical improvement. For example, the body mass index was developed as an assessment of the nutritional status of White, cisgender men, and current Centers for Disease Control and Prevention growth charts are based on binary male/female growth curves among cisgender populations; the utility of these metrics for TGNB populations is in dispute [58,76–78]. Additionally, restoration of menses, historically an indicator of appropriate weight restoration among underweight cisgender

female patients, may exacerbate distress among transmasculine patients. Researchers recommend clear anticipatory guidance for TGNB youth and consideration of strategies to mitigate gender dysphoria associated with resumed menses (e.g., hormonal birth control, long-acting reversible contraception, pubertal blockers). Researchers also note that TGNB youth benefit from appropriate anticipatory guidance regarding the impact of gender-affirming hormone therapy on weight and appetite. These review articles advocate for both a nuanced assessment of motivations for weight restriction and expanding metrics for nutritional recovery.

Discussion

The current body of research clearly indicates that TGNB youth are at high risk of developing eating disorders. Eating disorder behaviors, most commonly binge eating, were frequently endorsed even when research participants were not formally diagnosed with an eating disorder. It is difficult to discern to what extent these weight management behaviors represent early indications of an emerging eating disorder, maladaptive coping responses to numerous psychosocial stressors, or attempts to minimize gender dysphoria in the absence of access to gender-affirming medical care.

For providers working with TGNB youth in clinical settings, an important first step is screening for patterns of disordered eating. The EDE-Q emerged from the reviewed literature as the most frequently studied screening tool. If parents are not supportive of a patient's gender identity, an important next step is assessing for safety in the community, followed by a careful assessment of the motivations for weight management behaviors. If providers refer to eating disorder treatment without addressing gender dysphoria, disordered eating behaviors are likely to persist. The reviewed case studies and case series highlighted several adverse outcomes for TGNB patients with eating disorders when family members opposed access to gender-affirming care, including one completed suicide [70]. In these circumstances, beyond providing psychoeducation and support groups for family members, providers can work closely with youth to explore body dissatisfaction. When parents do not consent to hormone therapy (e.g., pubertal blockers, masculinizing hormone therapy, or feminizing hormone therapy), providers can explore adjunctive approaches to affirming gender with the patient (including chest binders, packers, or menstrual suppression), which may be helpful temporizing measures until a patient turns 18 and is able to consent to their own medical care.

In addition, TGNB adolescents have endorsed high rates of food insecurity, poorer quality of nutrition, and lower rates of exercise than their cisgender peers [32]. Barriers to accessing exercise may include local legislation, school policies regarding participation in gendered team sports, access to appropriate locker rooms, and/or funding for participation in community athletic activities [79–82]. When available, referrals to inclusive LGBTQ+ community athletic programs and knowledgeable dietitians may be an important component of care. Emerging research has also emphasized the importance of a nuanced understanding of patient's gender identity. Although research in this domain is still limited, transmasculine, transfeminine, and nonbinary adolescents appear to present with different patterns of body dissatisfaction and eating disorder behavior [44–47]. A drive for muscularity is likely to present with different high-risk behaviors than a drive for thinness, and clinicians should be aware that body mass index is an

unreliable indicator of TGNB adolescents' overall health or nutritional status. Additionally, clinical providers should be cognizant of the limitations of gender-affirming care in mitigating symptoms of body dissatisfaction. While providing appropriate gender-affirming hormone therapy has been reported to decrease eating disorder symptoms for many patients, it is not always sufficient to resolve disordered eating behavior, as reported in several studies [68,70,71]. Patients should be referred to appropriate mental health resources for treatment of comorbid depression, anxiety, post-traumatic stress disorder, autism spectrum disorder, or other primary psychiatric comorbidities. Patients must also be provided with clear anticipatory guidance for the initiation of masculinizing or feminizing hormone therapy, as unexpected changes in appetite or fat distribution may cause distress, as reported in a case series of transgender adolescents with autism [71]. Providers should also be aware that adolescent patients have access to a wide array of videos on social media platforms in which TGNB youth document their medical transition, often with a time-lapse feature. It is important to assess each individual patient's expectations and provide realistic guidance on each individual patient's anticipated treatment course.

Limitations

The articles included in the current review are notably heterogeneous in methodology, study populations, and sample sizes, limiting the comparison of data across articles. The discrepancies in categorization of gender, for example, render meta-analyses impossible. To maximize the scope of the current review, no specific exclusion criteria were applied related to the rigor of the academic research reported or the magnitude of any findings. This limits our ability to comment on the overall caliber of the research. There was also striking variability in the use of metrics and reported outcomes, presenting a significant challenge when attempting to highlight similarities and differences in key findings.

It is also challenging to generalize from the populations sampled by researchers. Cross-sectional patient data were primarily collected in the setting of gender clinics. This patient population is treatment-seeking and particularly interested in medicalized gender-affirming treatment, which may not be representative of a broader TGNB youth population. A wider community sample of TGNB adolescents may demonstrate lower desire for medical interventions, lower intensity of gender dysphoria symptoms, and/or lower rates of body dissatisfaction. Conversely, while large-scale population surveys of adolescents were notable for high rates of subthreshold eating disorder behaviors, the majority of respondents were not receiving formal psychiatric or medical treatment for an eating disorder. Surveys reporting subthreshold findings may overemphasize the significance of normative variation in eating behavior among adolescents.

With regards to the literature review process, while efforts were made to ensure the inclusion of all relevant articles (including forward citation chain analysis and reference review), it is possible that the additional relevant scholarly work was not captured by the current search terms, which focused on the "Title/Abstract" search field in the PubMed database and the "Keywords" search field in the Ovid MEDLINE database. Additionally, due to the heterogeneity of the data reported, there is no automated or standardized approach to generating key findings for comparisons; while authors reached a consensus regarding central

themes, this represents a potential source of bias. Also, as noted, this is a quickly evolving field of research, with an accelerated rate of publication across a wide range of disciplines, including pediatrics, adolescent medicine, LGBT health, nutrition, psychology, and psychiatry, and as such, the current review represents a snapshot of the body of research at this moment in time.

Conclusion

Overall, the literature included in this review highlights several important considerations for treatment providers as well as directions for future research. Although clinical care is often siloed into gender clinics, eating disorder treatment, or other mental health treatment settings, providers must take a holistic approach to assessing the health of TGNB adolescents. Providers in gender clinics should consider incorporating routine, standardized screening and psychoeducation on eating disorders, with referrals to available supportive resources. Providers in eating disorder treatment programs should consider a nuanced assessment of gender identity when evaluating body dissatisfaction, as transgender and nonbinary patients may require additional referrals or family support to achieve remission of eating disorder symptoms. There is a clear need for further research exploring the constellation of gender identity, disordered eating, and adolescent health.

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