

Binge Eating Disorder in Patients with Type 2 Diabetes: Diagnostic and Management Challenges

This article was published in the following Dove Press journal:
Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy

Jonathan D Chevinsky¹
Thomas A Wadden²
Ariana M Chao^{2,3}

¹SUNY Downstate Health Sciences University, Brooklyn, NY, USA; ²Perelman School of Medicine at the University of Pennsylvania, Department of Psychiatry, Philadelphia, PA, USA; ³University of Pennsylvania School of Nursing, Department of Biobehavioral Health Sciences, Philadelphia, PA, USA

Abstract: Type 2 diabetes mellitus (T2DM) is associated with an increased risk of disordered eating behaviors including binge eating disorder (BED). Comorbid BED in patients with T2DM has been associated with adverse clinical outcomes such as higher body mass index (BMI) and depressive symptoms. Identifying and addressing this disorder in patients with T2DM is a significant challenge for health-care providers. The purpose of this narrative review is to discuss current perspectives on BED in the context of T2DM with implications for screening and management of these highly comorbid conditions. BED continues to be underrecognized and underdiagnosed. However, there are established tools that providers can use to screen for BED such as the SCOFF Questionnaire and Questionnaire on Eating and Weight Patterns-5. There are several effective treatments for BED including cognitive behavioral therapy, interpersonal therapy, and lisdexamfetamine dimesylate. However, few studies have examined the effects of these treatments in patients with co-morbid T2DM and BED.

Keywords: binge eating disorder, eating disorders, diabetes, obesity

Background

Over 30 million Americans suffer from type 2 diabetes mellitus (T2DM), comprising the seventh leading cause of death in the United States.¹ Some of the most common comorbid medical conditions with T2DM include overweight and obesity, sleep apnea, cardiovascular disease, kidney disease, hypertension and hyperlipidemia.²⁻⁵ T2DM is also associated with increased risks of psychiatric conditions such as depression and binge eating disorder (BED).⁶⁻⁸

BED was first added to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) in 1994 as a feature of eating disorder not otherwise specified (EDNOS), and did not gain formal recognition as its own psychiatric condition until 2013 in the DSM-5. To meet criteria for BED, patients must display recurrent episodes of binge eating, defined as the consumption of an objectively large amount of food, with a sense of loss of control over eating. Such eating must occur on average once per week for the previous 3 months. The episodes must cause marked distress and occur in the absence of compensatory behaviors (e.g., self-induced vomiting, laxative misuse). In addition, patients must have three of five associated features; i.e., eating more rapidly than normal; eating until uncomfortably full; eating large amounts of food when not physically hungry; eating alone because of embarrassment; or feeling disgusted with oneself, depressed, or very guilty after overeating. Based on the frequency of binge eating episodes, the

Correspondence: Ariana M Chao
University of Pennsylvania School of Nursing, 418 Curie Blvd, Philadelphia, PA 19104, USA
Tel +1215-746-7183
Fax +1215-898-2878
Email arichao@upenn.edu

severity of the disorder can be classified as mild (1–3 episodes/week), moderate (4–7 episodes/week), severe (8–13 episodes/week) and extreme (>14 episodes/week). These criteria largely accord with the World Health Organization's ICD-11 classification of BED, with the ICD-11 defining binge eating as when an individual feels a loss of control and the individual eats notably more or differently than usual and feels unable to stop eating or limit the type or amount of food eaten.⁹

BED is the most common eating disorder in the world, with a lifetime prevalence of 1.4%.¹⁰ One recent systematic literature review found the point prevalence average (and range) to be 2.3% (0–9.8%) in women and 0.3% (0–0.5%) in men.¹¹ There is wide variability in prevalence across countries. For example, a meta-analysis of studies from Latin American showed a mean point-prevalence of 3.5% for BED.¹² In addition to T2DM, BED is also associated with a number of psychiatric and metabolic conditions including mood disorders, substance use disorders, overweight and obesity, and dyslipidemia^{13–16} as well as impaired health-related quality of life and increased health-care costs.¹⁷ BED and T2DM each present a number of diagnostic and management obstacles that complicate care of patients with both of these conditions.

Prevalence

Many,^{7,8,18–20} but not all,^{21,22} studies have reported a greater prevalence of BED in patients with T2DM than those without T2DM. Prevalence rates in patients with T2DM have ranged widely from a point prevalence of 1.4 to 25%.^{7,8,19,23,24} Some studies however, like that by Kenardy et al,²² noted an association between T2DM and some degree of binge eating, but not BED itself. These conflicting results may be due to differences in exclusionary criteria, sample characteristics, and the setting in which participants were recruited. For example, patients may have been excluded if they were on anti-depressants or anti-psychotics or if they had substance or alcohol dependence. Rates of comorbidity may also vary in clinical vs community settings. In addition, conflicting results may be related to the threshold shifts for BED that occurred during different revisions of the DSM. Most notably, the DSM-IV-TR requires binge eating to occur at least 2 days a week for 6 months, whereas the DSM-5 requires binge eating only 1 day a week for 3 months.²⁵ This lower threshold for diagnosis has resulted in modestly higher BED lifetime prevalence estimates in the US population (1.52% for DSM-IV-TR and 2.03% for DSM-5).²⁶

Conversely, BED has also been shown to be a risk factor in the development of T2DM. In a meta-analysis of cross-sectional studies, Nieto-Martínez et al²⁷ found that relative to those without BED, those with BED had an increased risk of T2DM (OR=3.7, 95% CI=1.1, 12.1). However, cohort studies have shown a non-significant relationship (OR=3.3, 95% CI=0.9, 13.1). It is likely that the varying methods used for diagnosing BED, as well as the inclusion of patients with insulin dependent diabetes mellitus, may have resulted in this discrepancy. Moreover, lifetime prevalence of T2DM in BED patients has been shown to be as high as one in three, with one study showing that the eating disorder predates T2DM in 90% of patients with these two comorbid conditions.^{28,29}

Dietary Considerations

One important complicating factor in BED that presents a challenge to T2DM management is the dietary choices that are frequently made by patients with BED. During binge eating episodes, some studies have shown that patients with BED consume a disproportionately high percentage of their calories from fat,^{30–32} as well as carbohydrates.³³ Others have suggested similar macronutrient compositions despite increased caloric intake.^{34,35} Studies evaluating the specific types of food most common in binges have generally shown high rates of high-carbohydrate foods like sweets, breads and pasta.^{34,36} Newer research by Goodman et al³⁷ has validated this idea by showing that individuals with a greater preference for sweeter foods had an increased binge eating frequency. This suggests that dietary interventions may need to be more extensive in patients with T2DM and BED.

Medical Concerns

BED complicates the care of people with T2DM in a number of physical and psychological ways that make screening and treatment of BED of the utmost importance. Perhaps the most concerning issue in this regard is the effect that binge eating has on glycemic control. While this likely plays a role in BED leading to T2DM, it certainly complicates its care as well. Perhaps the most foundational study in this regard is that of Parry et al³⁸ which studied the effect of a single day of a high-fat, high-calorie diet on insulin sensitivity. This study of 15 healthy adults found that overall insulin sensitivity decreased by 28% in these individuals, compared to their non-overeating baseline level. This study suggests that each individual binge may contribute to loss of insulin sensitivity.

While the prior study was largely focused on establishing a link between bingeing and insulin insensitivity, Kenardy et al³⁹ studied 215 patients with T2DM to determine the extent of binge eating prevalent in the group, as well as the impact that binge eating had on glycemic control. This study found that binge eating frequency was positively correlated with poor blood glucose control (assessed by HbA1c) after adjusting for other variables (BMI, exercise level). Moreover, studies have found that compared to patients without binge eating episodes, those who experience binge eating episodes were significantly younger at age of T2DM diagnosis.^{32,39} Younger age of T2DM diagnosis increases the risk for negative cardiovascular and mortality outcomes;⁴⁰ thus younger age of T2DM diagnosis among those with BED warrants urgent screening in the BED population for T2DM and early intervention in BED treatment.

The literature suggests that patients with T2DM and BED do not have a significant difference in HbA1c levels compared to T2DM patients without BED.^{24,41} Çelik et al⁴² found in a study of 152 patients with T2DM that while rates of depression (assessed by the Beck Depression Scale) and disordered eating attitudes (assessed by the EAT) were significantly higher in T2DM patients with comorbid BED, HbA1c levels were similar. The aforementioned Kenardy et al study, which found a correlation between binge frequency and HbA1c levels in T2DM patients, did not find any correlation between HbA1c and categorical BED diagnosis—possibly due to the small number of participants who met thresholds for BED (n=45). Abraham et al¹⁵ screened 3551 subjects from the Framingham Heart Study for objective binge eating (OBE) and found that among those with OBE, the fasting blood glucose was 7.2 mg/dl higher than those without OBE, and rates of insulin resistance and metabolic syndrome were higher as well. Papelbaum et al⁴³ found that while eating disorders (mostly BED) predicted glycemic control outcomes in patients with T2DM—both in terms of fasting blood glucose and HbA1c—this impact was lost once BMI was controlled for. This evidence suggests that while BED as an isolated variable does not have a direct impact on HbA1c levels, the earlier age of T2DM diagnosis and possible effects of BED on weight status have the potential for worse outcomes. However, further studies are needed to clarify these relationships.

Metabolic Considerations

The effect of BED on components of metabolic syndrome has been extensively demonstrated in the literature. Hudson

et al¹³ conducted a longitudinal study comparing 134 individuals with BED to 134 age-, sex-, and BMI-matched controls without BED. This study found BED to be independently associated with dyslipidemia, any component of the metabolic syndrome, and \geq any 2 components of the metabolic syndrome. Nagata et al⁴⁴ conducted a 7-year follow-up study on longitudinal cohort data from over 5000 young adults with baseline obesity/overweight. Of this sample, 23% reported disordered eating behaviors (including binge eating); when controlled for BMI, among other demographic characteristics, this study found disordered eating behaviors were associated with elevated rates of incident hyperlipidemia in male patients and greater increase in BMI in all patients. Further studies have served to reinforce this relationship between obesity and BED as a factor affecting potential treatment of T2DM in these patients.^{24,41,45} Finally, a recent study of cytokines and growth factors, and their interaction with obesity and BED, suggests that there are a group of immune mediators that vary between individuals with obesity with or without BED.⁴⁶ This suggests that there is likely an immune component to the metabolic implications of BED that is still not well understood.

Screening and Diagnosis

There are a number of challenges that affect the screening and diagnosis of BED and its ultimate treatment. While research into the treatment of BED has advanced in recent years, fewer than half of persons with lifetime BED receive treatment.¹⁰ One factor that contributes to this gap is a lack of familiarity with BED among health-care providers.⁴⁷ Fewer than half of health-care providers report using DSM criteria to diagnose BED, 27% do not recognize BED as a discrete eating disorder, and over 40% never assess binge eating at all.^{48,49} Some health-care providers fail to address mental health at all despite one study finding that individuals with BED who are asked about their mental health by their general practitioner are much more likely to see a mental health specialist.⁵⁰ In addition, patients are often reluctant to disclose binge eating symptoms because of feelings of guilt and concerns of provider judgment.^{51–53} This may be related to some patients' lack of readiness to endorse a "loss of control" out of concern of being deemed to lack willpower.^{54,55} Even in circumstances in which patients are comfortable disclosing such information, determining whether a binge quantity is sufficiently large to meet DSM criteria can be challenging, even for clinicians with extensive experience treating BED. Moreover, one systematic review found that individuals

suffering from eating disorders are much more likely to seek treatment for their weight than they are for their eating disorder, with this phenomenon being most pronounced in BED.⁵⁶ The body of literature surrounding the specific screening tools for BED in patients with T2DM is quite limited. However, there are effective screening and diagnostic tools, which can be used to identify patients with BED, that have been tested in other patient populations. While this review focuses exclusively on studies conducted in English, it is of note that the following tools have been translated into numerous languages including: Arabic,^{57,58} Chinese,^{59–61} Fijian,⁶² Finnish,^{63,64} French,^{65,66} German,⁶⁷ Greek,⁶⁸ Italian,⁶⁹ Lithuanian,⁷⁰ Malay,⁷¹ Portuguese,⁷² Spanish,^{73–76} and Turkish.^{77,78}

Brief Screening SCOFF

Researchers have created BED screening tools that are brief, with the aim of increasing rates of use. The SCOFF questionnaire, named as an acronym for the 5 questions that comprise it (Table 1), is a simple, intuitive screening tool created in 1999 by Morgan et al⁷⁹ to screen primarily for AN and BN in young women. The SCOFF questionnaire has been widely validated for AN and BN using a cutoff value of ≥ 2 positive responses,^{65,80–82} though the data regarding its use in BED is still largely nascent.

Eating Disorder Screen for Primary Care

Cotton et al⁸³ created a five question survey (amended to a four question survey shortly thereafter) in 2003 called the Eating Disorder Screen for Primary Care (ESP) (Table 1). The foundational study that supported the survey tracked BED diagnosis, as well as AN and BN, among 233 total screened patients. This study found that using a cutoff of 2, the SCOFF had a sensitivity and specificity of 78% and 88%, compared to 100% and 71% for the ESP, for all eating disorders tracked.

Screen for Disordered Eating

Recently, Maguen et al⁸⁴ created the Screen for Disordered Eating (SDE) and compared the validity of this screening tool to the SCOFF and ESP in a sample of 407 female veterans, with the Eating Disorder Examination-Questionnaire (EDE-Q) used as the gold standard measurement (Table 1). For BED in particular, this study found that while the ESP was the most sensitive of these screeners (100%) and the SCOFF was the most specific (78.2%), the SDE represented a reasonable balance

between these two factors (sensitivity of 87.2%, specificity of 54.9%) when all used a cutoff value of two positive responses. While there is no gold standard for brief screening tools for BED, benefits of the three listed surveys are that they are simple to remember and easy to administer and score. Several options are available for longer screening measures, which can be more cumbersome for the patient and clinician, but may be considered if patients are high risk.

Extensive Screening Binge Eating Scale

The Binge Eating Scale (BES) is one of the most widely used and tested questionnaires for binge eating behaviors. However, this questionnaire does not map onto the DSM criteria for binge eating disorder. First created in the early 1980s by Gormally et al⁸⁵ this sixteen question survey has been extensively validated in numerous patient populations, ranging from those with obesity and overweight⁸⁶ to adolescents⁸⁷ to bariatric surgery candidates.^{88–90} Duarte et al⁹¹ used the BES in a sample of 1008 female college students and found the sensitivity and specificity to be 81.8% and 97.8% respectively, with 96.7% of patients correctly classified when using a cutoff score of ≥ 17 . While this also helps validate this questionnaire, the importance of extremely high sensitivities in screening tests means that this perhaps still leaves something to be desired.

Eating Disorder Examination Questionnaire

The Eating Disorder Examination Questionnaire (EDE-Q) is a survey adapted from the Eating Disorder Examination (EDE), a structured interview that has been studied in BED and several other eating disorders. The EDE was created by Cooper and Fairburn⁹² in 1987, adapted into questionnaire form for screening purposes in 1994,⁹³ and is currently in its seventeenth edition.⁹⁴ The interview and questionnaire both assess the frequency of eating disorder behaviors (e.g., binge eating, self-induced vomiting), as well as the severity of eating disorder psychopathology (i.e., dietary restraint, eating concern, shape concern, and weight concern). The 28-item questionnaire has been shown to have a very high discriminant validity^{95,96} and has been found to be reliable.⁹⁷ Other even shorter versions of the EDE-Q have also been proposed and have proven to be valid alternatives.^{98,99} Furthermore, the majority of studies which have evaluated the concordance of EDE-Q and the much more widely accepted EDE have

Table I Screening and Diagnostic Tests for BED

Questionnaire	Screening Questions	Considerations for Use	Citation
Brief Screens			
SCOFF questionnaire	Do you make yourself Sick because you feel uncomfortably full? Do you worry you have lost Control over how much you eat? Have you recently lost more than One stone in a 3 month period? Do you believe yourself to be Fat when others say you are too thin? Would you say that Food dominates your life?	Validated using a cutoff value of ≥ 2 positive responses	Morgan et al ⁷⁹
Eating Disorder Screen for Primary Care (ESP)	Are you satisfied with your eating patterns? Do you ever eat in secret? Does your weight affect the way you feel about yourself? Do you currently suffer with or have you ever suffered in the past with an eating disorder?	Validated using a cutoff value of ≥ 2 positive responses	Cotton et al ⁸³
Screen for Disordered Eating (SDE)	Do you often feel the desire to eat when you are emotionally upset or stressed? Do you often feel that you cannot control what or how much you eat? Do you sometimes make yourself throw up (vomit) to control your weight? Are you often preoccupied with a desire to be thinner? Do you believe yourself to be fat when others say you are thin?	Validated using a cutoff value of ≥ 2 positive responses	Maguen et al ⁸⁴
Extensive Screening			
Binge Eating Scale (BES)	16 questions, assessing behavioral manifestations and emotional impacts of binge eating	Created for use with obesity or overweight, ⁸⁶ but validated in adolescents ⁸⁷ and bariatric surgery candidates ⁸⁸⁻⁹⁰	Gormally et al ⁸⁵
Eating Disorder Examination Questionnaire (EDE-Q)	28 questions, assessing: restraint, eating concern, shape concern, and weight concern	Adapted from the frequently used Eating Disorder Examination (EDE), structured clinical interview	Fairburn et al ⁹³
Questionnaire on Eating and Weight Patterns-5 (QEWP-5)	26 questions, assessing demographic information and disordered eating behaviors over the last 3 months	Most studies testing its validity utilized previously revised version (QEWP-R)	Spitzer et al ¹⁰⁵ Yanovski et al ¹⁰⁷
Diagnostic Tests			
Eating Disorder Examination (EDE)	Clinician administered version of EDE-Q assessing the primary domains of: restraint, eating concern, shape concern, and weight concern	Specific to eating disorder diagnosis, assessing severity and frequency of disordered eating behaviors over the last month	Cooper and Fairburn ⁹²
Structured Clinical Interview for DSM-5 (SCID-5)	Clinician administered, systematic evaluation which closely adheres to DSM-5 diagnostic criteria	General to a wide array of DSM-5 disorders, with one specific domain applicable to eating disorder pathology	Spitzer et al ¹¹⁶

shown that binge eating frequency was well-correlated between these two measures.¹⁰⁰⁻¹⁰³

A challenge with self-reported questionnaires is difficulty discriminating an objectively large from a subjectively large amount of food. One approach that has been used to address this challenge is to include more detailed instructions in the EDE-Q.¹⁰⁵ The instructions include example scenarios to differentiate different types of eating episodes including:

objective binge eating episodes (i.e., consumption of an objectively large amount of food and sense of having lost control while eating); objective overeating episodes (i.e., consumption of an objectively large amount of food without a sense of loss of control); subjective binge eating episode (i.e., a sense of loss of control over eating but the amount is not necessarily large). Inclusion of these brief, detailed examples help to improve the performance of the assessment.

Questionnaire on Eating and Weight Patterns-5

The Questionnaire on Eating and Weight Patterns (QEWP) was developed in 1992 by Spitzer et al¹⁰⁵ as part of a larger field trial with the goal of defining BED and determining its prevalence and associated patterns of overeating. In 1993 it was first expanded¹⁰⁶ and then updated to the revised QEWP-R to align more closely with BED diagnostic criteria. It has been further updated in accordance with the newest DSM-5 diagnostic criteria (QEWP-5).¹⁰⁷ The QEWP-R has been validated as a reasonable screening option by Borges et al¹⁰⁹ in a Brazilian sample of 89 overweight women, with a sensitivity of 55% and specificity of 80% in screening for BED and a sensitivity of 88% and specificity of 63% in screening for any binge eating. Nangle et al¹⁰⁹ used the QEWP in a sample of 52 self-referred binge eaters compared to 52 controls who did not report binge eating and found the QEWP to have a 71.4% sensitivity and 69.2% specificity in screening for patients who are high probability bingers (>25% intakes rated as binges).

The above questionnaires have been compared in two studies. Celio et al¹¹⁰ used the formal, clinician administered EDE as the standard for diagnosis and compared these questionnaires in a sample of 157 adults, 129 of whom had been diagnosed with BED based on the EDE. The QEWP-R and the BES were fairly sensitive (74% vs 85%) but highly non-specific (35% vs 20%). The modified, two-item version of the EDE-Q correlated highly with the EDE regarding number of total binge eating days as well as total number of binges. Gladis et al¹¹¹ compared the QEWP and BES in a sample of 128 women with obesity specifically attempting to track binge eating diagnostic concordance among these two screening tools. The BES and QEWP only had a modest overlap ($\kappa = 0.45$), though each study identified a similar number of participants with BED, and subgroup analysis suggested that it was impossible to attribute this discrepancy to errors in either one of these tools. What these studies suggest is that there is no single, uniformly accepted gold standard screening tool for BED. Thus, if BED is suspected in a patient with T2DM, the EDE-Q and QEWP-5 are valid options.

Diagnosis

The gold standard method for diagnosing BED is to conduct a structured interview for the DSM-5 criteria performed by a qualified clinician. There are two clinician-administered diagnostic tests which have been used for this purpose, after a patient has screened positive using one of the aforementioned screening tools (Table 1).

Eating Disorder Examination

The first of these is the Eating Disorder Examination (EDE). This semi-structured clinical interview has been widely validated, including in a study by Wilfley et al¹¹² which found that not only did BED patients score higher than overweight controls on every subscale except restraint, they also had similar scores overall to AN and BN patients, for whom this test has been extensively validated.^{113,114} Grilo et al¹¹⁵ demonstrated the reliability of the EDE with BED in identifying the frequency of binges, test-retest reliability, and determining associated eating disorder features.

Structured Clinical Interview for DSM-5

The Structured Clinical Interview for DSM-5 Disorders (SCID-5) is the most recent in a series of semi-structured clinical interviews for psychiatric disorders beginning in the early 1990s with the Structured Clinical Interview for DSM-III-R.¹¹⁶ Since then, it has become widely accepted as a clinician-administered diagnostic test for BED. Published by the American Psychiatric Association (APA), there are four separate versions that can be purchased depending on the specific need—ranging from a version intended for clinicians, to one intended for researchers. The APA estimates that this clinical version should take no longer than 75 minutes to administer. It adheres to the DSM-5 criteria and has a modular format and systematic approach.¹¹⁷ While the SCID-5 has not been specifically validated for BED, there is vast evidence supporting the SCID in a wide array of psychiatric conditions.^{118–121}

BED Treatment

Few studies have investigated the treatment of comorbid BED and T2DM. However, several treatments for BED have established efficacy in other populations. Below we review common treatment interventions that have been studied in people with BED including: cognitive behavioral therapy (CBT); interpersonal psychotherapy (IPT); behavioral weight loss (BWL); and pharmacologic treatments (Table 2).

CBT

CBT is the current treatment of choice for BED given its extensive evaluation and strong empirical support.^{122,123} Therapist-led CBT typically consists of individual or group sessions that occur weekly for 12 to 16 weeks. The goals of CBT for BED are to interrupt binge-eating behavior, learn self-management strategies to establish a more normal eating schedule, change erroneous beliefs

Table 2 Results from Select Randomized Controlled Trials Comparing BED Treatments

Treatment	Brief Description	Citation	Comparison	Remission of BED	Binge Eating Frequency
Psychological Treatments					
Behavioral weight loss (BWL)	12 month study of 80 men and women with BED	Munsch et al ¹⁵⁰	CBT	58% remission on intention to treat analysis	Decreased from 14.17 to 7.54 weekly binges on intention to treat analysis
Cognitive behavioral therapy (CBT)	20 week group treatment of 259 patients	Peterson et al ¹⁷¹	Therapist-led CBT, therapist-assisted CBT, self-help and waiting list	Therapist-led = 51.7%; therapist-assisted = 33.3%; self-help = 17.9%	Decreased in binge days in therapist-led (16.0 to 4.4) therapist-assisted (16.4 to 7.6) self-help (16.4 to 9.6)
Interpersonal Psychotherapy (IPT)	2 year study of 205 women with BED	Wilson et al ¹⁵¹	CBT, BWL	67% remission on intention to treat analysis	Decreased from a mean of 16.1 to 3.7 days binge eating per month on intention to treat analysis
Pharmacologic Treatments					
Lisdexamfetamine	Two multicenter, double-blind, 12 week trials of 383 and 390 adults with BED	McElroy et al ¹⁷²	Placebo	38.2% 4 week binge cessation at week 12	Decreased in least squares mean of binge eating days/week by 3.87
Fluoxetine	16 week trial of fluoxetine (60mg/day) compared with CBT alone and combined with CBT	Grilo et al ¹⁶⁷	CBT	22% remission on intention to treat	Decreased from a mean of 16.5 to 11.0 binge episodes per month

about weight and shape, and develop healthier attitudes towards one's body. Participants are taught a variety of skills including identifying triggers of binge eating episodes, correcting beliefs or thought patterns related to binge eating, and altering attitudes regarding food and eating. Skill builders are assigned at each session so participants can practice what they have learned in session. With CBT, 68–90% of participants will have a reduction in the number of binge eating episodes, and more than 50% of participants generally achieve total remission, along with broad improvement in specific eating disorder psychopathology.^{124,125} However, this treatment does not tend to reduce weight.¹²⁶ CBT is also labor intensive and requires specialist training.

A growing body of research supports the use of guided-self-help (CBTgsh) for mild to moderate severity BED.^{127,128} CBTgsh combines self-help manuals, such as *Overcoming Binge Eating* by Christopher Fairburn,¹²⁹ with a limited number of brief treatment sessions administered by health-care providers. In one study, CBTgsh had significantly higher remission rates (46%) compared to BWLgsh (18%) or a control condition (13%).¹²⁸ An advantage of this treatment is that it may be easier to

disseminate while also being cost effective.¹³⁰ However, internet based guided-self-help, while cheaper than in person CBT, has been shown to be less efficacious.¹³¹

While CBT is not recommended as the primary treatment of T2DM itself, some evidence suggests that it may have a positive short-term effect on glycemic control, though results are inconclusive.¹³² Both therapist-led and guided self-help versions of CBT are well-founded treatments for BED, with fairly strong evidence from meta-analyses and systematic reviews supporting their use.^{122,126,133} Therefore, this treatment should be an early consideration in any treatment plan for BED. However, future studies are needed to test these interventions in patients with co-morbid BED and T2DM.

Interpersonal Psychotherapy

Other psychological treatments have also been tested for BED including interpersonal psychotherapy (IPT). IPT helps patients identify¹³⁴ and change interpersonal problems that are hypothesized to be maintaining BED. While not as widely utilized as CBT, studies comparing these two options have showed similar short-term and long-term efficacy with BED.^{135,136} However, the largest

concern with IPT in general is its relative cost-effectiveness; while this has not been studied at length in BED specifically, past studies suggest the possibility of increased costs compared to treatment as usual.¹³⁷ Moreover, as a specialty treatment modality it is much less likely to be available as widely as CBT, BWL or any of the pharmacological treatments listed.

Behavioral Weight Loss

Approximately 15-20% of participants seeking weight loss have BED.¹³⁸ Behavioral weight loss (BWL) may be an attractive treatment for these individuals since it does not require specialized psychological treatment and may help people manage both their binge eating and weight. In patients with diabetes, BWL can also help improve glyce-mic control.¹³⁹⁻¹⁴⁴

Concerns have been raised about BED and binge eating being negative prognostic indicators for BWL treatment. While some studies have shown that people with binge eating tend to lose less weight compared to those without binge eating,^{145,146} others have indicated no difference.^{147,148} The Look AHEAD trial compared an intensive lifestyle intervention (ILI) to Diabetes Support and Education (DSE) in patients with T2DM and obesity/overweight, with a primary goal of evaluating cardiovascular outcomes, while also tracking a number of other biological and behavioral endpoints.¹⁴⁹ While this study did not find any differences in cardiovascular outcomes, it did observe numerous health benefits of ILI, including reduced need for T2DM medications, greater weight loss, and significantly greater proportion of patients lowering their HbA1c to <7% in accordance with ADA glycemic control goals (among numerous other positive metabolic outcomes). Chao et al¹⁴⁵ conducted a secondary analysis from the Look AHEAD trial and found that while persistent binge eating attenuated weight loss in patients receiving ILI, those with pre-existing binge eating who stopped binge eating lost a similar amount of weight as those without binge eating at any time. Therefore, ILI is a reasonable recommendation as having efficacy in comorbid BED and T2DM patients in terms of weight loss and improved glycemic control. However, binge eating should be monitored, and those who continue to binge eat may need additional intervention such as CBT.

Another question regarding the treatment of BED has been whether CBT is needed beyond the standard BWL treatment. Relative to BWL, CBT appears to be more effective in reducing binge-eating related psychopathology, but only in the

short-term. Munsch et al¹⁵⁰ compared CBT and BWL in a sample of patients with BED and found that while short-term results suggested a faster improvement in binges in the CBT group and a faster BMI reduction in the BWL group, at a 12 month follow up no significant differences remained. In a comparison of 16 weekly sessions of CBT with BWL for patients with BED and obesity, CBT was significantly more effective than BWL in producing remission from binge eating at posttreatment but not at the 12-month follow-up.⁹ In another study, Grilo and colleagues¹⁰ randomly assigned 125 obese patients with BED to 16 sessions of either group CBT, BWL, or a sequential condition in which CBT was administered first, followed by BWL (CBT + BWL). No significant differences in binge eating remission rates emerged, although CBT produced significantly greater reductions in frequency of binge eating at the 6- and 12-month follow-ups. BWL resulted in a statistically greater percentage reduction in body mass. Wilson et al¹⁵¹ found BWL to be associated with greater 6 month reduction in BMI than CBT, although there were no difference in weight change at 2 year follow-up. There have been efforts to combine BWL and CBT into a single treatment modality called the Healthy Approach to weight management and Food in Eating Disorders (HAPIFED).^{152,153} However, results are preliminary for this treatment modality, with an early case series of 11 individuals showing high subjective patient-reported suitability and sustainability though inconsistent weight loss or decreased binge frequency.¹⁵⁴

Pharmacological Treatments for BED

Lisdexamfetamine

Research into effective pharmacologic options for treating BED is limited, though some efforts have been made, in the form of a recent meta-analysis, to compile what little research exists.¹⁵⁵ The only current Food and Drug Administration (FDA) approved medication for the treatment of BED is the stimulant lisdexamfetamine. While this medication is a mainstay of treatment for attention-deficit hyperactivity disorder (ADHD), its logical underpinnings as an appetite suppressant and a treatment for a similarly impulsive disorder justified its extensive testing in this population.¹⁵⁶ Safety and efficacy trials conducted by McElroy et al¹⁵⁷ and Hudson et al¹⁵⁸ have shown that not only is the safety profile consistent with prior ADHD trials, but that the medication decreased binge eating days, binge-eating related obsessions and compulsions, and more frequently resulted in binge cessation than placebo. While this medication has no specific contraindications for

use in patients with T2DM, it has known cardiovascular contraindications and must be used with caution in patients with hypertension. Insofar as cardiovascular disease and hypertension may be comorbid in T2DM, this further limits potential treatment options.

Antidepressants

Second-generation antidepressants are generally superior to placebo in patients with BED. Bupropion—when used in combination with naltrexone—is an FDA-approved weight loss medication which has been shown to have efficacy in inducing weight loss in patients with both T2DM and obesity.¹⁵⁹ Bupropion on its own, however, has limited effects on reducing binge eating.¹⁶⁰ A small body of data also supports the use of other second generation antidepressants in BED such as fluoxetine,¹⁶¹ fluvoxamine,¹⁶² citalopram,¹⁶³ and sertraline;¹⁶⁴ however, as Brownley et al¹⁶⁵ adeptly point out in their systematic review and meta-analysis, the body of evidence for these medications, while promising, is not sufficient to make clear recommendations. In addition, CBT has been^{166,167} found to be significantly more effective than fluoxetine in producing binge eating remission.

Glucagon-Like Peptide Receptor Agonists

One final consideration in the realm of anti-obesity or diabetes pharmacotherapy is glucagon-like peptide (GLP)-1 receptor agonists. While these medications are approved for T2DM treatment, liraglutide 3.0 mg/day is also FDA approved for chronic weight loss in patients with a BMI \geq 30 kg/m² or BMI \geq 27 kg/m² with a weight-related comorbidity such as T2DM. More than 50% of patients experience a clinically significant weight loss of >5% of body weight after a year of treatment with liraglutide 3.0 mg/day.¹⁶⁸ Moreover, there is a limited body of research suggesting that in non-diabetic patients with BED, it may improve binge eating while also resulting in weight loss.¹⁶⁹ Therefore, in comorbid BED and T2DM patients who are already receiving metformin for T2DM and who require dual pharmacotherapy, liraglutide may be an early consideration. Finally, while there has limited research into other GLP-1 agonists like exenatide or lixisenatide, this is an important avenue for future research.

Other Pharmacological Targets

Anticonvulsants have also been investigated for BED treatment, with topiramate being the most studied of these medications. While further investigation into various medications of this class are required, topiramate has been shown to be linked with weight loss and decreased binge

frequency.¹⁷⁰ Additionally, while metformin is a first-line treatment for T2DM and has been used to induce weight loss, it has never been tested as a treatment for BED. Therefore, this would be a worthwhile target of future study in patients with comorbid BED and T2DM.

Challenges and Future Directions

The comorbid diagnosis of BED in a patient with T2DM complicates the course of treatment, though research into the implications of this relationship is still limited. The current body of research suggests that not only is BED screening and diagnosis a challenge to clinicians, but management is also a difficult balancing act of weighing the relative evidence of interventions. Metabolic and dietary concerns further complicate care. The best evidence suggests that health-care providers should familiarize themselves with at least one of the brief screening tools mentioned above, with progression to a more elaborate screening tool as warranted or referral to a mental health specialist. Once a BED diagnosis is made, choices between types of therapy is dependent on clinician training and patient preference, though CBT does have the greatest body of evidence. If pharmacologic intervention is considered, lisdexamfetamine is FDA approved for BED. Future research focusing on the extent of dietary effects of BED on T2DM and further pharmacological research into BED may elucidate a uniform treatment algorithm.

Funding

AMC was supported, in part, by the National Institute of Nursing Research of the National Institutes of Health under Award Number K23NR017209.

Disclosure

Dr Thomas A Wadden reports personal fees from Novo Nordisk, Weight Watchers (WW), outside the submitted work. Dr Ariana M Chao reports grants, personal fees from Shire Pharmaceuticals, WW International, Inc., outside the submitted work. The authors report no other conflicts of interest in this work.

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