



# Addressing Adverse Childhood Experiences and Psychological Symptoms Among Bariatric Patients

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Accepted: 20 September 2022 / Published online: 27 September 2022  
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## Abstract

Adverse Childhood Experiences (ACEs) have been shown to be prevalent in bariatric surgery candidates with comorbid psychological symptoms. While bariatric patients who have mental illness or a history of ACEs are less likely to lose weight, presence of a support system has been reported to mitigate ACEs' effects and to maintain long-term weight loss. The current study aims to examine the association between ACEs and psychological symptoms and the effect of potential protective factors on the association among bariatric patients. The study included a total of 199 subjects seeking bariatric surgery who completed a psychological evaluation including ACEs, psychological symptoms, and presence of support system as part of the presurgical multidisciplinary weight management consultations at a large university hospital. Multivariate regression models were used to examine the association between ACEs and psychological symptoms and potential effect of support system on the association. The study found that there is a significant association between ACEs and psychological symptoms. The study also revealed that patients who reported having a childhood supportive person were significantly associated with a lower BMI, while those who reported having adulthood supportive person showed significantly less symptoms of depression, anxiety, and binge eating. The findings have significant implications that addressing ACEs in preoperative surgical process in relation to psychological conditions and therapeutic interventions within their close environmental system will be beneficial for patients to achieve optimal surgical outcomes.

**Keywords** Adverse childhood experiences · Psychological symptoms · Bariatric · Obesity

## Introduction

Obesity is a complex health issue resulting from a combination of multiple causes. One of the well-known social determinants for adult obesity is Adverse Childhood Experiences (ACEs) (Kim et al., 2020; Lodhia et al., 2015; Wiss & Brewerton, 2020). ACEs are traumatic events that happened during childhood including abuse, neglect, domestic violence, parental divorce, household substance abuse, mental illness, and criminal activity (Felitti et al., 1998). Approximately 60% of U.S. adults reported to have

at least one ACEs (Centers for Disease Control and Prevention (CDC), 2021). Many studies have demonstrated the association between ACEs and adult obesity and stressed the importance of its treatment (Hughes et al., 2017; McDonnell & Garbers, 2018). As the etiology of obesity is multi-factorial, the treatment and management of obesity can vary from exercise, dietary restriction, and behavioral modification along with weight loss surgery. While all of these are important components in the treatment of obesity, studies have shown that weight loss surgery is a highly effective treatment for obesity and significantly successful in achieving long-term results compared with non-surgical treatment modalities (Lodhia et al., 2015; Holgerson et al., 2018, Peterhansel et al., 2020). While weight loss surgery is the most effective and enduring treatment for morbid obesity, not all patients experience optimal outcomes.

Many patients seeking and undergoing bariatric surgery have comorbid psychopathology including mood, anxiety, eating, substance use, and personality disorders (Glinski et al., 2001; Holgerson et al., 2018; Kalarchian et al., 2007; Wildes et al., 2008). ACEs have been shown to be prevalent

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in bariatric surgery candidates and yet are not routinely screened for in the preoperative evaluation. There is a paucity of data evaluating the relationship between a history of ACEs and psychopathological symptoms among bariatric patients. It is possible that bariatric patients with ACEs are at higher risk for experiencing psychopathological symptoms, and untreated symptoms may negatively influence subsequent health benefits from bariatric surgery. Bariatric patients with psychopathological symptoms reported high rates of ACEs (Fink & Ross, 2017), and bariatric patients with high ACEs showed significantly less postoperative weight loss (Lodhia et al., 2015). Studies reported that bariatric patients who have mental illness or a history of ACEs lost significantly less weight than those without mental disorders or history of ACEs. Recognizing a history of ACEs is important given that many individuals presenting for bariatric surgery report a history of ACEs and psychopathological symptoms, which adversely influence optimal surgical outcomes (Clark et al., 2007; Fink & Ross, 2017; Kinzl et al., 2006).

Current preoperative education for bariatric surgery mainly focuses on dietary, nutritional, behavioral, and lifestyle changes. The preoperative psychological evaluation includes assessment of a number of domains such as health behaviors, cognitive-emotional aspects that influence health, and patients' motivation for surgery along with their expectations. With the goal to consider potential adverse treatment factors that may lead to suboptimal health improvement after surgery, the preoperative evaluation is high likely to be geared toward identification of patients' potential challenges after surgery including alterations in physiological function, changes in body images, and new cognition and feelings. As such, despite the fact adverse childhood events may have initially contributed to obesity and be related to current psychological symptoms, in depth review of childhood trauma, may not be a main domain evaluated in the assessment. In order to achieve optimal health improvement after bariatric surgery and to sustain long-term weight loss outcomes, ACEs should be addressed in association with psychological conditions among bariatric patients as a part of preoperative processes.

Moreover, one of the hallmarks of long-term weight loss is persistence and resiliency when confronted with challenges in adherence to diet, nutrition, activity, and lifestyle (Lodhia et al., 2015). Presence of a support system would help the patients to mitigate ACEs' effects and to maintain long-term weight loss. Research has found that the presence of safe and stable relationships mitigates the negative effect of ACEs on physical and mental health outcomes (Crouch et al., 2019; McElroy & Hevey, 2014; Moore & Ramirez, 2016; Walker et al., 2011). Assessing childhood and current presence of support system would have important implications to improving long-term surgical outcomes and quality of life.

The current study examines the association between ACEs and psychological symptoms and the effect of potential protective factors on the association among bariatric patients.

## Methods

The study sample consisted of patients seeking bariatric surgery at a university hospital that participates in the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) through the American College of Surgeons (ACS). The center has a high patient volume that reflects the needs of the state as having one of the highest prevalence of obesity in the United States. As part of the presurgical multidisciplinary weight management evaluation, patients complete a psychological evaluation including self-reported surveys on ACEs, weight history, eating disorder symptoms, psychosocial history, and health related behaviors. The study used collected survey data from January 2020 to May 2020. Inclusion criteria for the sample were those eligible for bariatric surgery including: being age 18 years or older, having a BMI  $\geq 40$  kg/m<sup>2</sup> or  $\geq 35$  kg/m<sup>2</sup> with one insurance recognized comorbidity including obstructive sleep apnea, type II diabetes, and/or hypertension requiring multiple medications. A total of 204 patients completed the psychological evaluation with 5 patients excluded for missing ACEs questionnaire data, giving a final sample of 199 that was used for the current analysis. This study received approval from the Institutional Review Board (IRB).

## Measures

**Adverse Childhood Experiences (ACEs)** The ACE questionnaire is a self-reported measure assessing exposure to 10 categories of childhood adverse experiences, which is most commonly reported in the ACEs research (Felitti et al., 1998). The first five items include maltreatment experiences (e.g., physical, sexual or emotional abuse, physical or emotional neglect), and the last five items include family dysfunction (e.g., parental separation or divorce, witnessing domestic violence, incarceration, substance abuse, or mental illness of a household member). A total maltreatment scores was calculated by summing the first five items, and a total family dysfunctions score was calculated by summing the second five items. A total ACEs score was then created by summing both scores of maltreatment and family dysfunctions. The ACEs measure has been reported to have satisfactory test and retest reliability for each category of maltreatment and family dysfunction (Dube et al., 2004).

**Body Mass Index (BMI; kg/m<sup>2</sup>)** Body Mass Index was calculated using participants' weight and height based on self-reported surveys during the intake assessment that were later confirmed during clinic evaluation.

**Psychological (Psychopathological) Symptoms** Three sub-measures were used to assess participants' psychological symptoms, including depression, anxiety, and binge eating. Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) are a 21-item self-report measures of depression and anxiety, and both are widely used self-report rating inventories that screen for depression and anxiety. Both have established strong construct validity and test–retest reliability (Beck et al., 1988, 1996; Fydrich et al., 1992). Binge Eating Scale (BES) is a 16-item questionnaire assessing binge eating severity as well as the feelings and thoughts associated with such behavior. The BES has been reported as good validity and high internal consistency (Freitas et al, 2006; Gormally et al., 1982).

**Presence of Support System** Two items were measured to assess the presence of participants' support system. For the presence of childhood support, the question “In your childhood, was there a person (e.g., parent, relative, friend, teacher, neighbor) who made you feel safe and protected?” was asked. For the presence of current support, the question “In your adulthood or current life, is there a person (e.g., spouse/partner, parent, relative, friend, teacher, neighbor) who makes you feel safe and protected?” was administered. The presences of both childhood and current support were coded as dichotomous variables.

**Controls** Basic demographic characteristics (e.g., age, gender, and race/ethnicity) were used as controls. Age was measured as a continuous variable (years), and female was coded as 1 (male as 0) since the participants' responses were identical in the sequential questions about sex that they were assigned a birth and gender that they currently identify as themselves. Because 95% of the sample were identified themselves as white, race/ethnicity was dichotomized (white vs. other groups).

## Analysis

Descriptive analyses were conducted to describe the sample. Separate multivariate regression models were used to examine the association between ACEs and psychological symptoms and potential effect of support system on the association while adjusting for age, gender, race/ethnicity. All analyses were conducted using Stata/MP version 15 software (StataCorp, College Station, TX).

## Results

The majority of the sample were white (94%) and female (84%) with average age of 42 years old (SD = 10). The sample's average BMI was 48.1 kg/m<sup>2</sup> (SD = 8.3). Over half of the sample reported having at least 1 ACEs (52%). About 34% of the sample experienced at least one type of childhood maltreatment, and 44% experienced at least one family dysfunction item. The mean of depression and anxiety scores were 9.08 (SD = 9.3) and 7.8 (SD = 7.4) respectively. The average score of binge eating scale was 13.6 (SD = 8.5). The majority of the respondents reported that they grew up with an adult who made them feel safe and protected in their childhood (92%), and there is a person who makes them feel safe and protected in their current life (90%) Table 1.

As seen in Table 2, total number of ACEs is significantly associated with depression and anxiety symptoms after controlling for age, gender, and race/ethnicity. Depression and anxiety increase by about 1 unit with any additional number of ACEs ( $\beta = 1.07$ ,  $p = 0.000$  for depression;  $\beta = 0.83$ ,  $p = 0.000$  for anxiety). While maltreatment experience is significantly associated with depressive symptom ( $\beta = 1.52$ ,  $p = 0.01$ ) and binge eating ( $\beta = 1.01$ ,  $p = 0.05$ ), family dysfunction is significantly associated with anxiety symptom ( $\beta = 1.54$ ,  $p = 0.01$ ). After adjusting for age, gender, and race/ethnicity, respondents who grew up with an adult who made them feel safe and protected in their childhood reported significantly lower BMI ( $\beta = -4.31$ ,  $p = 0.03$ ) and anxiety symptom ( $\beta = -6.28$ ,  $p = 0.01$ ). Patients who reported having adulthood supportive person and having both childhood and adulthood supportive persons showed significantly less symptoms of depression ( $\beta = -8.69$ ,  $p = 0.001$  for adulthood support;  $\beta = -4.6$ ,  $p = 0.01$  for both childhood and adulthood supports), anxiety ( $\beta = -6.10$ ,  $p = 0.01$  for adulthood support;  $\beta = -4.32$ ,  $p = 0.01$  for both childhood and adulthood supports), and binge eating ( $\beta = -4.41$ ,  $p = 0.03$  for adulthood support;  $\beta = -2.50$ ,  $p = 0.05$  for both childhood and adulthood supports).

## Discussion

The study examined the association between ACEs and psychological symptoms and the effect of potential protective factors on the association among preoperative bariatric patients. The study found that there is a significant association between ACEs and psychological symptoms. On average, exposure to ACEs is significantly associated to an increase risk of depression and anxiety symptoms among patients seeking bariatric surgery. Particularly, childhood maltreatment is significantly associated with depression and binge eating, and family dysfunction is associated with anxiety. This is consistent with previous studies reporting that

**Table 1** Descriptive Data on the Sample

	% (N) or M (SD)
<b>Gender</b>	
Female	84% (171)
<b>Race</b>	
White	94% (192)
<b>Age (years)</b>	42.2 (10.3)
<b>BMI (kg/m<sup>2</sup>)</b>	48.1 (8.3)
<b>ACEs</b>	
Total	1.7 (2.2)
0	48.2% (96)
1	14.6% (29)
2	9.1% (18)
3	8.0% (16)
4+	20.1% (40)
<b>Maltreatment</b>	
0	66.3% (132)
1	10.6% (21)
2	8.5% (17)
3	9.1% (18)
4+	5.5% (11)
<b>Family Dysfunction</b>	
0	55.8% (111)
1	16.6% (33)
2	13.1% (26)
3	7.5% (15)
4+	7.0% (14)
<b>Psychological Symptoms</b>	
Depression	9.08 (9.3)
Anxiety	7.8 (7.4)
Binge Eating	13.6 (8.5)
<b>Presence of Social Support</b>	
Childhood	92% (188)
Current	90% (184)

child maltreatment is related to developing depressive symptoms as a consequence of stress and low self-esteem (Chartier et al., 2009; Kim & Cicchetti, 2006; Park, 2014). It is also known that high stressful events like maltreatment are related to increased food intake as a coping strategy to reduce stress, alter eating behaviors, and become a crucial risk factor for the development of eating disorder, particularly binge eating (Davis et al., 2009; Greenfield & Marks, 2009; Schienle et al., 2009). Childhood maltreatment involves direct victimization, which shatters children’s security and confidence that may result in development of depression and binge eating symptoms. On the other hand, family dysfunctions including household violence, substance abuse or incarceration may lend to substantial disruption in the family environment rather than direct victimization, which may cause increasing anxiety within the household. There are many studies reporting that children who witnessed violence showed anxiety symptoms (Adamson & Thompson, 1998; Maker et al., 1998; Sternberg et al., 1993). These findings suggest that childhood maltreatment and family dysfunction may have different predictive strengths on developmental consequences. Atzl et al. (2019) found that childhood maltreatment significantly predicted depressive symptoms during pregnancy, whereas family dysfunction did not. A few studies also reported that childhood maltreatment and family dysfunction have differential effects on adolescent and adulthood mental health outcomes (Higgins & McCabe, 2003; Ryan et al., 2000). However, these findings should be interpreted cautiously and in the context of other evidence supporting the independent effects of maltreatment and family dysfunction on mental health outcomes (Atzl et al., 2019; Higgins & McCabe, 2003).

Interestingly the study revealed that the presence of childhood support system is significantly related to BMI, while the presence of current adulthood support system is significantly associated to psychological symptoms. Respondents who grew up with an adult who made them feel safe and protected during childhood reported significantly lower BMI than those who did not have a childhood support person. It may be possible that the presence of a supporting adult helps

**Table 2** Multivariate Analyses of ACEs and Presence of Support on Psychological Symptoms

	BMI Estimates (SE)	Depression Estimates (SE)	Anxiety Estimates (SE)	Binge Eating Estimates (SE)
<i>After adjusting for gender, race, and age:</i>				
<b>ACEs</b>				
Model 1: Total ACEs	<i>n.s</i>	1.07 (0.28) ***	0.83 (0.23) ***	<i>n.s</i>
Model 2: Maltreatment	<i>n.s</i>	1.52 (0.57) **	<i>n.s</i>	1.01 (0.54) *
Family Dysfunction	<i>n.s</i>	<i>n.s</i>	1.54 (0.44) **	<i>n.s</i>
<b>Presence of Support</b>				
Model 1: Childhood	-4.31 (2.19) *	<i>n.s</i>	-6.28 (1.93) **	<i>n.s</i>
Model 2: Current	<i>n.s</i>	-8.69 (2.18) ***	-6.10 (1.74) **	-4.41 (2.06) *
Model 3: Childhood and Current	<i>n.s</i>	-4.68 (1.36) **	-4.32 (1.07) **	-2.50 (1.28) *

*n.s.* non significance

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$

children reduce potential stress or stress-induced eating, which may be related to a relatively lower BMI as compared to those without childhood supportive adults. The presence of adulthood support system has significant effects on current psychological symptoms and adding childhood support to adulthood support (both childhood and adulthood support system) did not change any significance of adulthood results. Crouch et al. (2019) reported the similar finding that the level of protective factors did not show significant effects between ACEs and poor health or mental distress.

The current study provides evidence that there is a strong association between ACEs and psychological symptoms in patients pursuing bariatric surgery. As many studies demonstrated that bariatric patients with high ACEs or psychopathological symptoms showed significantly less improvement in postoperative outcomes (Clark et al., 2007; Fink & Ross, 2017; Kinzl et al., 2006; Lodhia et al., 2015), addressing ACEs in preoperative surgical process in relation to psychological conditions would be beneficial for patients to achieve optimal surgical outcomes. Also, this study has significant implications for therapeutic interventions for those with ACEs and psychological symptoms within their close environmental systems.

Potential interventions based on trauma-informed care would be beneficial for those who experienced high exposure of ACEs with psychological symptoms to ensure optimal surgical outcomes. Additionally, a family system approach addressing patients' close supportive system would have important clinical implications to sustain the outcome effects. As reported, the presence of supporting persons during childhood and current life showed significantly protective effects on bariatric patients' BMI and psychological symptoms. Woodard et al. (2011) also demonstrated that positive bariatric surgical outcome can be a family intervention whereby family members can mutually support each other in their goal of weight loss. Weight loss has been shown to be socially contagious (Woodard et al., 2011), particularly within a close systemic environment like family. Social support can mitigate the effects of ACEs on obesity and psychological symptoms, help patients sustain the outcome effect, and lead to more success in lifestyle changes within family through a halo effect (Lodhia et al., 2015; Woodard et al., 2011).

There are some limitations that must be noted in this study. First, data were collected cross-sectionally using a small sample and may not be representative of the general population of patients pursuing bariatric surgery. Future research should longitudinally examine the effects of ACEs on psychological symptoms and surgical outcomes. Second, the current study used the original ACEs measure derived from Felitti et al.'s (1998) study. Although it is commonly used in the ACEs research, there are growing literature that suggest expanding the measure into broad

contextual domains reflecting more diverse populations (Leban & Gibson, 2020; SmithBattle et al., 2022). Recent studies have been expanding the ACEs screening tool beyond child maltreatment and family dysfunctions by including poverty, discrimination, witness community or online violence, and bullying (Anand et al., 2019; Bailey et al., 2017; Cronholm et al., 2015; Lebrun-Harris et al., 2020), and revising the screening tool has been suggested. There is still a lack of consistency in operationalization of ACEs, but future studies should consider a more expanded measure of ACEs reflecting the study's population and context. Also, adverse childhood experiences were measured retrospectively. Although binary retrospective measures are showed to be adequately reliable compared with prospective measures (Reuben et al., 2016), certain types of adverse experiences may not have recalled at the same level of other forms. For example, emotional maltreatment might be less likely to be identified or recalled because it is less visible or memorable and could be marginalized as compared with physical or sexual maltreatment (Tabone, 2019). Moreover, it could be possible that different types of adverse experiences may have different mechanisms linking the experiences and psychological symptoms and obesity. This should be considered in future research. Third, the majority of the sample were white in this study as the sample was collected from the major university hospital accredited bariatric surgery programs in a state where 93% of population are white (US Census Bureau, 2022). Also, the current study used majority of female sample. There is a criticism that individuals from racial minority groups have been underrepresented in bariatric research (Sarwer et al., 2019), and the way individuals develop obesity in relation to ACEs could differ depending on different gender identities. The results for the current study may not be generalizable to other demographic samples, and more studies with gender and racial/ethnic diversity are required in the future. Fourth, the study measured childhood and adulthood supportive persons as potential protective factors as research has found that protective factors significantly moderate the long-term risks of ACEs. Although the similar questions were used in other studies to measure protective factors (e.g., Crouch et al., 2019), these questions should be expanded to more inclusive measures including resilience scores and include the information about whether they have received any mental health services. Finally, it is important to note that associations do not imply any causal inference.

## Declarations

**Conflict of Interest** The authors declare that they have no conflicts of interest.

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