



Review Article

# Childhood and adolescent obesity and depression: A systematic literature review

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## Abstract

Childhood and adolescent obesity is a major health concern worldwide. This review summarizes the current literature on the association between childhood and adolescent obesity and depression. Multiple scientific databases (PubMed, Ovid, Web of Science, CINAHL and PsycINFO; January 1990 to April 2011) were searched for articles focusing on the association between childhood and adolescent obesity and depression. Inclusion criteria were age  $\leq 19$  years and studies published in English or translated into English. Fifty-one articles were identified including 19 prospective cohort studies, one randomized controlled trial and one meta-analysis. Fifteen prospective cohort studies reported that childhood obesity is associated with depression, whereas three prospective cohort studies, one systematic literature review, and one meta-analysis showed that childhood depression leads to future obesity. Some cross-sectional studies found no association between childhood obesity and depression. Compared with boys, obese girls are more likely to be depressed. Depression is associated with increased actual body weight, but this relation is also mediated through perceived body weight and dissatisfaction with body image. The majority of studies have shown that childhood and adolescent obesity is associated with depression. Studies have also shown that childhood depression leads to future obesity. Clinicians should be aware of this association and provide mental health assessment, obesity prevention, and treatment when indicated.

## Key word

Obesity, Overweight, Pediatric, Adolescent, Depression, Mood disorder.

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## Background

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Obesity has become a major public health concern throughout the world [1, 2]. Obesity is defined in terms of body mass index (BMI), which is calculated as body weight in kilogram divided by height in meter squared ( $\text{kg}/\text{m}^2$ ). For children and adolescents (age 2-19 years), overweight is defined as age-specific BMI between 85<sup>th</sup> and 95<sup>th</sup> percentile, and obesity as BMI  $\geq$  95<sup>th</sup> percentile [3]. According to World Health Organization data, the worldwide prevalence of overweight among adults was 1.5 billion and that of obesity was 500 million in 2008. In 2010, about 43 million children age less than 5 years were overweight [4]. Over the last 2 to 3 decades, the population prevalence of overweight and obesity among children has increased dramatically throughout the world [1, 3]. Easy and inexpensive availability of food containing excessive fat and carbohydrate combined with insufficient physical activities result in rapid weight gain among children. Children also tend to spend more time in on television, computer, and video games, which restricts their exposure to outdoor play [5, 6, 7].

Pediatric obesity has overtaken under-nutrition as a problem [8, 9, 10]. Oniset, et al. reported survey data from 144 countries showing a global prevalence of overweight and obesity to be 6.7% in preschool children. In this age group, the prevalence in developed countries was reported to be 11.7% and that in developing countries was 6.1%. By 2020, this prevalence is estimated to increase to 14.1% and 8.6%, in developed and developing countries, respectively [11]. According to National Health and Nutrition Examination Survey (NHANES) 2008, 9.5% of US infants and toddlers are obese. Among the age group 2-19 years, 16.9% were obese and 31.7% were overweight [12]. In Healthy people 2020, the U.S. Department of Health and Human

Services has targeted overweight and obesity as a major public health issue needing to be prevented as per [www.healthypeople.gov](http://www.healthypeople.gov).

Childhood obesity has emerged as a major public health concern because of its various health consequences in adulthood, such as high cholesterol levels, hypertension, type II diabetes, asthma, fatty liver and sleep apnea [13, 14, 15, 16]. Obesity also predisposes children to low self-esteem [17, 18, 19, 20], body dissatisfaction [19, 21, 22, 23] and depression [24, 25]. Adolescence is a critical phase when individuals experience dramatic physical and psychological growth. During adolescence, physical appearance and peer approval become a top priority. Socially unacceptable physique predisposes adolescents to psychological consequences. Obese children and adolescents are often stigmatized [26, 27, 28]. Failure to adapt to new physical changes and dissatisfaction with physical appearance may trigger a psychological response that leads to depression [29].

Approximately 15% of obese children age < 18 years manifests symptoms of depression, and 3-5% of these develop major depressive disorders [30, 31]. The incidence of obesity as well as depression increase markedly as children reaches puberty. The risk of persistent childhood depression and adult depression is two to four times higher when obesity is also present [32, 33]. Fifteen percent of obese children manifest symptoms of depression before 18 years of age. This is a concern because suicide is the second leading cause of death in youth age 10- 24 years, and major depressive disorders play a key role for suicidal behavior in youth [34, 35].

According to the Diagnostic and Statistical Manual IV text, revised (DSM IV TR), the definition of major depressive disorders includes at least depressed mood or loss of interest and



five (or more) symptoms lasting at least two weeks. Symptoms include depressed mood, diminished interest or pleasure, significant weight loss/ weight gain, insomnia/hypersomnia, psychomotor agitation/retardation, feeling of worthlessness, diminished ability to concentrate and recurrent thoughts of death. Minor depressive disorders include less than five of the above-mentioned symptoms lasting for less than two weeks. Depression in children is diagnosed using the same criteria as in adults, with the exception that irritable mood in children can substitute for depressed mood in adults and failure to thrive can substitute for weight loss [36].

Though there is an association between obesity and mental health, the literature is inconsistent [37, 38]. Researchers have demonstrated that the prevalence of obesity [39, 40] and depression [41, 42, 43] increases as the child grows from adolescence to young adulthood. The majority of cross-sectional studies [44, 45, 46, 47, 48, 49, 50, 51, 52] and some prospective studies [43, 53, 54, 55, 56, 57, 58] have shown evidence of a link between obesity and depression. To date, the literature lacks a systematic review of studies linking childhood and adolescent obesity with depression. This paper aims to evaluate the association between childhood and adolescent obesity and depression, to compare gender differences for this association, and to elucidate the effects of actual body weight versus perceived body weight on self-esteem and depression.

## Methods

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We conducted a broad search of PubMed, Ovid, Web of Science, CINAHL and PsycINFO using the keywords “obesity” or “overweight” and “mood disorder”. A total of 620 articles were retrieved. After applying a filter for the pediatric and

adolescent age groups, a total of 163 articles were found. Each article was reviewed according to our inclusion criteria: study subjects age  $\leq$  19 years, English language (or English translation) published January 1990- April 2011, and focusing on the relationship between childhood or adolescent obesity and depression. A total of 51 articles met inclusion criteria. [43-93] These included 19 prospective cohort studies, one randomized controlled trial and one meta-analysis. The World Health Organization (WHO) and Center for Disease Control and Prevention (CDC) websites were also searched for the most current information and statistics. Articles were also analyzed for gender differences. Articles stressing the effect of perceived body weight rather than actual body weight were also reviewed to understand the mechanism of association between obesity and depression.

## Discussion

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Forty-eight of the 51 studies critically reviewed provide convincing evidence of an association between depression and childhood/adolescent obesity, across all age groups. Bradley, et al. in his prospective cohort study demonstrated a positive correlation among third to sixth grade students, but a statistically non-significant correlation in the younger age-group (24 months- five years) [55]. A similar finding was also noted by Lawlor, et al. [59]. Xie, et al. and Sanchez-Villegas, et al. have described associations between childhood obesity and depression in children as young as five years [60, 61]. Several studies have reported the association between childhood obesity and depression in children aged 8-15 years [44, 45, 48, 51, 52, 62, 63, 64, 65, 66, 67, 68, 69, 70], and also in the 15-19 year age group [47, 49, 71, 72]. Depression is mediated by feelings of low self-esteem in obese children, and these feelings increase during adolescence [47, 48, 62, 67, 73,



74]. In their longitudinal study, Herva, et al. found that obesity at 14 years was associated with depression at age 31 [75].

The majority of studies suggest that girls are more susceptible to depression than boys [47, 50, 52, 60, 62, 67, 68, 69, 76, 77, 78, 79]. Mustillo, et al., in their prospective study, showed an increased vulnerability for depression only in “chronically obese” boys, who were defined as being obese for most of the time over the eight-year follow up. No such vulnerability to depression was found among girls [58]. Some studies have reported no difference between boys and girls for the association of obesity with depression [44, 70, 75, 80], but the younger age of the study groups may explain these statistically non-significant gender differences. A higher prevalence among girls may be explained because girls tend to be more self-conscious about their weight [44, 45]. For girls, thinness relates to beauty; beauty is more important for girls than boys. On the contrary, for the boys, being in proper shape is far more important than being the proper weight. Young-Hyman, et al., in their cross-sectional study, summarized these differences as follows: “boys might need to experience social ostracism to feel bad about the way they look, whereas girls may respond to a more internalized standard of what they should look like” [52]. This also points out the importance of social pressure on girls to be thin.

Ozmen, et al., in a cross-sectional study, suggested that girls tend to overestimate their weight, whereas boys tend to underestimate [47]. Misperception about body-weight creates a sense of body dissatisfaction and lower self-esteem which leads to depression [45, 50, 53, 62]. In a cross-sectional study by Erickson, et al., overweight girls who were unconcerned about being overweight did not have depressive symptoms, as compared to overweight girls with

body weight concerns [45]. Similarly, weight-related anxiety is a major consideration for girls, whereas peer group teasing mainly affects boys [52, 81]. Xie, et al. demonstrated that in the adolescent age group, peer isolation is directly related to depression. Perceived availability of social support is inversely related to depressive symptoms [51]. Shaming experiences, parental employment and parental separation have also been described as mediators between childhood obesity and depression [49].

Various studies have reported a direct association between actual BMI and depressive symptoms in children and adolescents, but they have also mentioned several factors as mediators for this association [44, 45, 47, 48, 49, 50, 51, 52, 53, 55, 62]. For example, several studies have demonstrated that high BMI leads to depression by creating a sense of body image dissatisfaction [44, 48, 60, 70, 82]. Other studies have shown that perceived body weight, as opposed to actual body weight, is more commonly associated with depressive symptoms [78, 83]. Frisco, et al. found that the combined effect of actual and perceived body weight predicts depressive symptoms better than actual and perceived body weight considered independently [84]. It was also noted that a recent increase in BMI (rather than actual BMI) leads to depression [85].

On the contrary, Wardle, et al. did not find an association between obesity and depression, even when controlling for race, gender and socio-economic status. Wardle suggested that appearance is less important during adolescence than at adulthood, and that there is less stigmatization of obesity during adolescence, compared with adulthood [73]. Brewis reported similar findings in his cross-sectional study of Mexican children. Fatness is considered a sign of health by the Mexican population; no differences in diet and activity were noted



between boys and girls [86]. Vila, et al. argued that obesity is not linked to depression, but failure to lose weight was associated with depression [87]. Similarly, Pott, et al. also reported that failure to lose weight while in a weight reduction program significantly increases depression [64]. A higher rate of mood disorders was noted in treatment-seeking, as compared to treatment non-seeking obese adolescents [88]. Importantly, a dose-response relationship has been shown between the intensity of physical activity and lowered depression scores among adolescents [69, 89].

Several studies have demonstrated that depression in childhood is associated with subsequent obesity [43, 56, 71, 90, 91, 92]. Pine, et al. demonstrated that the relation between depression and obesity remains constant across different age groups and genders [43]. Goodman, et al. concluded that childhood obesity was not associated with subsequent depression, but depression is associated with subsequent obesity [56]. In contrast, Hesketh, et al. showed that obesity is clearly associated with depression, but depression is not associated with subsequent obesity [57]. Richardson, et al. reported that depression in adolescence is associated with subsequent adult obesity, particularly among girls [93]. Fuemmeler, et al. showed that males with the Monoamine Oxidase A allele, with depressive symptoms, have a higher chance of being overweight or obese [71].

## Conclusion

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An extensive literature has been published linking childhood obesity and depression. Several biological and social-cognitive factors have been suggested linking this association such as age, gender, socio-economic status, perceived body weight, social ostracism and

availability of social support. The current medical literature is directed mostly toward the organic complications of obesity such as diabetes, sleep apnea, and asthma; but the psychosocial effects of obesity, such as low self-esteem and depression remain unnoticed or diagnosed late by medical professionals. A favorable body image is important for growing children. Obesity definitely leads to social rejection, discrimination and negative stereotyping. These experiences adversely affect mood, self-esteem and self-image. Emphasis should be placed on childhood obesity prevention programs in order to promote healthy nutrition and exercise habits, reduce hours spent watching television, and create safe environments for play. Addressing obesity and its psychosocial effects will require significant efforts by patients, parents, medical professionals, and policymakers.

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