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Review Article

A Review of the Association between Obesity and Depression

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ABSTRACT

Depression and obesity are growing, and major health concerns in the United States of America, and all other countries. These diseases account for significant morbidity and mortality and loss of vocational productivity as well as healthcare spending. A clear, bi-directional relationship exists between depression and obesity, and obesity and depression. Particular demographics are more affected than others, young females being more affected than males. The association between depression and obesity is most more pronounced in extreme obesity when compared to overweight or mild obesity, indicating a dose response type of relationship. Social victimization and abuse from peers in the childhood age group is strongly associated with overweight and obese body types and has been shown to be more statistically common than teasing based on gender, race, ethnicity or other divisional category. Such abuse early on is also understood to be a risk factor for both depression and obesity, again indicating the multifactorial, complex and self-reinforcing nature of the relationship between depression and obesity. Multiple mechanisms are known and considered. Systemic inflammation and associated physiological and pathological changes accompanying elevation of inflammatory cells, Interleukins (predominantly IL-6, and IL-1), CRP and others has been linked with development of depression, atherosclerosis, diabetes, insulin resistance and other conditions. Dysregulation of the HPA Axis (overactivity) and hypersecretion of cortisol both centrally and peripherally, and cortisol receptor dysfunction are also linked to depression, and stimulated or enhanced by high body visceral fat concentration. Psychological trauma, stress, poor self-esteem and other psychological pathologies are also clearly linked to depression, and obesity.

Introduction

OBESITY:

The terms Overweight, and Obesity are defined by the World Health Organization as excessive accumulation of fat which may impair health [1]. Body Mass Index BMI (Kg/m2) is commonly used to classify weight as Overweight with BMI ≥ 25, and Obesity with BMI ≥ 30. Worldwide prevalence has doubled since 1980 [1]. In the American population 154.7 million (age > 20) are obese. Racial and gender based differences in obesity prevalence (BMI > 30) exist, and are mentioned by the American Heart Association [2] as:

"- For non-Hispanic whites, 33.8 percent of men and 32.5 percent of women.

- For non-Hispanic blacks, 37.9 percent of men and 53.9 percent of women.

- For Mexican Americans, 36.0 percent of men and 44.8 percent of women [2]."

The financial burden associated with obesity (directly or indirectly) at current prevalence levels is $254 billion, and by 2030, some estimates predict as high as $957 billion [2]. Highest obesity rates in the United States of America are seen in West Virginia, Mississippi, Arkansas, Louisiana and Alabama [3].

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DEPRESSION:

Depression is an underdiagnosed, undertreated condition, known to affect 350 million people globally [4], of which 19 million in the United States of America [5]. As many as one million deaths by suicide are attributed to depression annually [5]. The American states with the highest depression rates are mirrored by the states with most obesity: West Virginia, Mississippi, Arkansas, Louisiana, Alabama [6]. Mental illness, including depression accounts for more morbidity than any other disease including cancer, and heart disease [7].

RELATIONSHIP:

There is a clear association between diabetes and obesity, and that the association works bidirectionally. Obesity is a risk factor for depression, and depression is a risk factor for obesity [8]. One study found that being overweight increased the chances of developing depression 1.27 times (in adults age 20+). Depression increased the chances of obesity 1.58 times [8]. This data suggest that even though the prevalence of the diseases is so high (approximately 10% depression in American Population and approximately 65% overweight/obese), there is more than an expected overlap, indicating positive association [9]. Another study [10] found that in middle aged women, the prevalence of depression went from 6.5% in those with BMI < 25 up to 25.9% in those with BMI >35. The prevalence of obesity jumps from 25.4% in patients with no depression symptoms, up to 57.8% in those with moderate or severe depression [10]. The bidirectionally associated risk factors are clearly demonstrated, particularly with depression as a risk factor, or precursor of obesity. The same study found that patients with depression were consistently less physically active and had higher daily caloric intake than controls without a history of depression [10].

The process of both depression and obesity often begins in childhood, where physical attacks, social mistreatment, verbal abuse, height/weight related teasing and poor self esteem based on physical appearance are found to be significantly more common in obese and overweight youth [11]. Regardless of ethnic group and gender, BMI is one of the most common grounds for social victimization of children and youths [12]. A 20 year long study conducted by Hawker and Boulton found that such victimization is strongly related to the development of depression and anxiety [13]. The particularly vulnerable demographic of adolescent females was identified by Blaine to have 2.57 times the presentation of obesity if there was a history of depression, as compared to those without depression [14]. Dissatisfaction with body image is a reliable predictor of depression. Depression is a reliable indicator for obesity, particularly in certain demographics. The same is true of the reverse, where obesity is a reliable indicator for depression [15]. The correlation between depression and obesity is stronger than the correlation between depression and overweight, which indicates a dose response relationship [16]. Class 3 obesity (BMI ≥ 40) has OR 4.98 according to Onyike et al. [17]. The association remains concrete despite controlling for age, education level, marital status, dieting, cigarette smoking, and use of alcohol, marijuana, and cocaine [17].

MECHANISM:

The mechanisms by which obesity and depression are linked are multiple, complex and not completely understood. A complex interplay of physiological, pathological and psychological mechanisms to varying degrees ultimately culminate in a clinical presentation which may be unique to individual patients. Obesity is understood to be accompanied by systemic inflammation suggested by inflammatory cells and biochemical markers of inflammation [18]. It is suspected that this chronic, subacute systemic inflammation plays a pathogenic role in the manifestation of other diseases such as atherosclerosis, and diabetes mellitus and insulin resistance [18]. The association of obesity and depression found in a study by Vogelzangs N and Kritchevskyet al. showed that specifically abdominal and visceral fat accumulation is pathophysiologically linked to depression, regardless of overall obesity [19]. Vaccarino V, Johnson BD et al. found that depression and systemic inflammation are observably linked. Women with depression were found to have 70% higher CRP and 25% more Interleukin-6 than those without depression. [20]. They further found that depression with inflammation is predictive of cardiovascular disease. The study concluded that despite this direct link, inflammation plays a small part in the overall active mechanism [20]. Another study by Bremmer MA, Beekman AT et al. also demonstrated the presence of high IL-6 levels in the plasma as being more prevalent in depressed patients [21].

Another possible mechanism for association of obesity to depression is via Hypothalamo Pituitary Axis dysregulation. Pasquali and Vicennati demonstrated "functional hypercortisolism" in obese patients, and overactivity of the HPA Axis [22]. Both a central pathway (alteration of normal pulsatile ACTH secretion), and a peripheral pathway (hyperproduction of cortisol by hepatic and visceral adipose tissue) are observed [22]. Belanoff JK et al. showed that some kinds of depression (namely psychotic depression) are endocrinologically distinct from other types of depression [23], but it is therefore deducible that the HPA Axis, and endocrine factors play a significant role in the onset, and progress of depression, and further that the HPA Axis is influenced by obesity.

Psychological mechanisms are also very likely to be involved, as dissatisfaction with personal body image resulting from comparison of the obese/overweight bodyform to a more societally accepted view of "beauty in slimness" is likely to create stress, and negative self dialogue which may give rise to depression development over time.

CONCLUSION:

The association between Depression and Obesity is a complex and intricate one, involving multiple physiological, pathological and psychological mechanisms. The relationship has been long documented however and ample information and data demonstrating the solidity of the relationship is available. There is a dose-response phenomenon seen in which generally higher BMI patients have higher probabilities of developing severe depression, and vice versa. Social factors also play a crucial role. Children exposed to social abuses over physical appearance tend to develop self-esteem issues around dissatisfaction with body image. This can further instigate obesity and lead to depression. Systemic Inflammation involving CRP, IL-1, IL-6 and other inflammatory markers plays a role both conditions, and is also at least partly responsible for co-morbid conditions accompanying depression and/or obesity. HPA Axis alteration Corticosteroid Receptor dysfunction are also implicated. Physician and health care provider awareness of this interaction of factors is important because by targeting the individual mechanisms, and root causes of Obesity and Depression, we can attempt to help patients in the most comprehensive way possible.

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