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Obesity and Weight Gain in Relation to Depression: Findings from the Stirling County Study

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Abstract

Objective—This study concerns the question of whether obese subjects in a community sample experience depression in a different way from the non-obese, especially whether they over-eat to the point of gaining weight during periods of depression.

Design—A representative sample of adults was interviewed regarding depression and obesity.

Subjects—The sample consisted of 1396 subjects whose interviews were studied regarding relationships between obesity and depression and among whom 114 had experienced a Major Depressive Episode at some point in their lives and provided information about the symptoms experienced during the worst or only episode of Major Depression.

Measurements—The Diagnostic Interview Schedule (DIS) was used to identify Major Depressive Episodes. Information was also derived from the section on Depression and Anxiety (DPAX) of the Stirling Study Schedule. Obesity was calculated as a Body Mass Index (BMI) >30. Logistic regressions were employed to assess relationships, controlling for age and gender, by means of Odds Ratios and 95% Confidence Intervals.

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Results—In the sample as a whole, obesity was not related to depression although it was associated with the symptom of hopelessness. Among those who had ever experienced a Major Depressive Episode, obese persons were 5 times more likely than the non-obese to over-eat leading to weight gain during a period of depression ($p < 0.002$). These obese subjects, compared to the non-obese, also experienced longer episodes of depression, a larger number of episodes, and were more preoccupied with death during such episodes.

Conclusions—Depression among obese subjects in a community sample tends to be more severe than among the non-obese. Gaining weight while depressed is an important marker of that severity. Further research is needed to understand and possibly prevent the associations, sequences, and outcomes among depression, obesity, weight gain, and other adversities.

Keywords

Obesity; Major Depression; Over-eating; Gaining Weight; Atypical Depression

INTRODUCTION

Prior to the latter part of the Twentieth Century, means did not exist for systematically investigating the question of increased appetite as a feature of depression. In earlier periods of history, depression was thought to be a syndrome in which the central feature of low and despairing mood was associated with loss of appetite rather than the obverse (1). The typical profile of a depressed person in the past was of someone who "could not eat, could not sleep, could not 'get going', and could not 'cheer-up'". Because of this prevailing view, questions about opposite ways of expressing depression were not included in the procedures developed to inquire about depression in clinic and community populations.

By 1980 when the American Psychiatric Association's Third Revision of the Diagnostic and Statistical Manual (DSM-III) was published, the definition of depression had been expanded (2). It began to be recognized that the opposite types of disturbances were sometimes associated with depression. Called "atypical" or "reversed", these neurovegetative symptoms involve over-eating and over-sleeping. Such symptoms became part of the standard criteria for Major Depression and were incorporated in the interview schedules used for gathering information.

Many clinical studies have investigated the relationship of the reversed symptoms to the definition of the Atypical Features Specifier for Major Depressive Episode given in the Fourth Revision of the Diagnostic and Statistical Manual (DSM-IV) as well as to several biological and demographic factors (3–10). Fewer clinical studies have given attention to obesity, usually without reference to the atypical symptom of over-eating and weight gain (11–13). Similarly with community-based epidemiologic investigations. Several such studies concern relationships between obesity and depression but without reference to the atypical symptoms (14–20). Other epidemiologic studies analyzed neurovegetative symptoms among depressed subjects but not in conjunction with obesity (21–25). However, a genetic study of female twin pairs has addressed questions about the relationships between obesity and the atypical symptoms (26).

This report draws on epidemiologic information from the Stirling County Study. As far as we are able to determine, it is the first study of a representative community sample of adult men and women to investigate the association of obesity with the neurovegetative symptoms experienced during periods of depression and to assess other qualities of depressive episodes among obese subjects.

MATERIALS AND METHODS

Site, Sample, and Variables

"Stirling County" is a fictitious designation used to protect the identity of an area in Atlantic Canada that is ecologically similar to New England (27,28). Sampling procedures have been described elsewhere (29). While the study as a whole was started in the early 1950s and is longitudinal in design, this report is limited to data gathered in the most recent sample which was selected in 1992. It consists of a representative sample of adults 18 years of age and older.

Subjects were visited in their homes by trained interviewers. The purpose and nature of the interview were explained and a written statement including further contact information was provided. We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research. The procedures have been approved by the U.S. National Institute of Mental Health, the Human Research Committee of the Massachusetts General Hospital, and the Ethics Committee of the Faculty of Medicine of Dalhousie University.

The schedule administered when interviewing the members of the 1992 sample included the module on depression from the Diagnostic Interview Schedule (DIS) which had been constructed in the early 1980s (30). The DIS was designed to implement the criteria of DSM-III in large-scale epidemiologic studies of psychiatric disorders, especially in the U.S. National Institute of Mental Health Epidemiologic Catchment Area (ECA) Program (31). The DIS module provides information about Major Depressive Episodes (MDE). As background for the focus on changes experienced during depression episodes, the lifetime prevalence of MDE was assessed and compared to obesity status in the sample as a whole.

The depression module inquires about the specific symptoms associated with lowered mood for the worst or only period of depression over the subject's lifetime. The question about "weight gain", for example, is cast as "when you were in such a period, 'Did your eating increase so much that you gained as much as two pounds a week or 10 pounds altogether?'". We used such symptoms as indicating changes that occur during episodes of depression. The main changes analyzed are the occurrences of both the typical and atypical neurovegetative symptoms. Other symptoms experienced in the index episode were also assessed, such as changes in motor activities, feelings about self-worth, concentration, and thoughts about death and suicide.

In addition, we investigated episode characteristics such as age of onset, number of episodes (comparing "more than 10 episodes" to "10 or fewer"), the duration of the longest episode

(comparing those that lasted longer than one year to those that were shorter in duration), and whether the subject had consulted a physician about the episode.

The subjects were also interviewed with the Stirling Study Schedule, including its section on Depression and Anxiety (DPAX) (32,33). The definition of depression in DPAX combines chronic and episodic features and can be thought of as similar to a combination of MDE and Dysthymia from the DIS. As used here, DPAX depression focuses on the clinical status at the time of interview. We used DPAX to present a current prevalence rate and to compare this to obesity status for the sample as a whole. While questions about the atypical symptoms are not covered in DPAX, we assessed the relationship to obesity of the questions about dysphoria used in DPAX such as "feeling low and hopeless", "being in poor spirits" and "wondering if anything is worthwhile anymore".

Other information was also drawn from the Stirling Schedule. This was the source of self-reported current height and weight from which, a Body Mass Index (BMI) was calculated for each subject. A standard score above 30 was employed to define obesity (34). Also from this source was a question about taking "medication for nervous trouble". The reason for using this relates to the fact that the DIS question about medication is part of a routine for determining the severity of the episode. This routine starts with a question about discussing the episode with a physician. If a positive response is given, the rest of the routine is skipped over and thus the subject was not asked about taking medication. Also because physical activity may be related to obesity, the Stirling question "Do you get regular physical exercise, would you say a lot, some, or none?" was utilized. The majority of subjects reported engaging in "some" exercise. Thus responses of "a lot of exercise" were compared to the other responses merged together.

None of the questions from the Stirling Schedule were specific to the index episode identified by the DIS. They were analyzed in order to implement information about the sample as a whole as well as the subjects with lifetime MDE.

Statistical Analysis

Logistic regression models were fit using SAS PROC GENMOD (35). Analysis was conducted to see if obesity varied significantly according to age (<45 versus 45+) and gender as well as whether obesity was associated with either lifetime MDE or with DPAX current depression in the sample as a whole (predictor variables were obesity status, age and gender, with the outcome variable in each case being the depression diagnosis). Among the 114 subjects diagnosed with lifetime MDE, the individual neurovegetative symptoms were taken as outcome variables as were also the other associated symptoms reported for the worse or only episode as well as other features of the episode. The predictor variables were obesity, age, and gender. The findings are mainly given as estimated Odds Ratios with 95% Confidence Intervals. Findings described as significant are those that gave p values <0.05.

RESULTS

The sample as selected consisted of 1618 subjects, among whom 1396 provided full information (completion rate of 86%). In the sample as a whole, the rate of obesity was

22.6%, the lifetime rate of MDE was 7.9%, and the prevalence of current DPAX depression was 5.7% (Table 1). Although obesity was somewhat more common among women, there were no significant differences by gender, nor age. Women had significantly higher prevalence of depression by both definitions (MDE $p < .0001$; DPAX $p < 0.02$). Age was not significantly related to either definition but according to each definition women under 45 years of age had the highest prevalence.

Also in the sample as a whole, obesity was not associated with increased risk of MDE, nor was it related to DPAX depression (Table 2). With one exception, the individual questions about dysphoric mood did not show a significant relationship comparing the obese and non-obese. The exception was from DPAX and indicated that the obese were more likely to report "feeling low and hopeless" than the non-obese ($p < 0.05$).

Among the 114 diagnosed with lifetime MDE, the typical symptoms were considerably more common than the atypical (Table 3). Obese subjects, however, had 5 times the odds of over-eating with weight gain during an episode than the non-obese ($p < 0.002$). The numbers were sparse when the subjects were stratified by gender but the data suggested that the risk of gaining weight was somewhat stronger among obese men than among obese women. Over-sleeping was not significantly associated with obesity. Like weight gain, however, hypersomnia more frequently occurred among the obese than the non-obese. The typical symptoms were not significantly related to obesity but both loss of appetite with attendant weight loss as well as insomnia were less likely to be reported by the obese than the non-obese.

Also among the 114 depressed subjects, the obese had 3 times the odds of being preoccupied with death than did the non-obese ($p < 0.05$) but none of the other symptoms associated with depression in the index episode were significantly related to obesity (Table 4). Regarding other episode features, obese subjects compared to the non-obese had 4 times the odds of having more than 10 episodes over their lifetime ($p < 0.01$) as well as having 3 times the likelihood of the longest episode lasting more than a year ($p < 0.05$). There were no significant differences in terms of age of onset or speaking with a physician about the index episode (Table 5).

Drawing on information from DPAX even though it was not specific to the episode, the obese and non-obese among the 114 did not differ significantly in terms of taking "medication for nervous trouble". While the obese reported a lower rate of "exercising a lot" than did the non-obese, this relationship was also not significant. Where feeling "low and hopeless" was concerned, all of the obese reported this kind of dysphoria while fewer of the non-obese did (100% compared to 88%). Using the Fisher's Exact Test because of the absence of negative reporting among the obese, we found that the association was not statistically significant ($p = 0.06$).

DISCUSSION

The information given here about Stirling County is similar to evidence from other parts of North America. In 1992, almost a quarter of the Stirling sample members were obese by the

standard of BMI >30. This rate was virtually the same as that for the U.S. in 1994 and similar to that in Canada (36,37).

The prevalence rate of 7.9% for lifetime MDE in the Stirling sample was reasonably similar to that given in other studies that used the same version of the DIS. The U.S. ECA Program gave a rate of 6.3%, and the Edmonton Study in Alberta, Canada, gave 8.6% (38,39). In all three studies, MDE was more characteristic of women than men. In the Stirling sample, DPAX current depression was moderately correlated with one-month MDE combined with Dysthymia from the DIS as indicated in a kappa of .40 (40). The prevalence rate for DIS was 5.5% and for DPAX it was 5.7% (29).

There is considerable evidence that obesity is related to hypertension, diabetes, cardiovascular disease, and other medical conditions as well as social adversities and mortality (41–45). Where obesity and depression are concerned, findings are inconsistent (11–20,46). The available studies have used different methods and strategies. Some have reported a positive association, others have not. In this study, it was possible to assess the relationship using two definitions of depression, lifetime MDE from the DIS, and current depression from DPAX. Obesity was not significantly related to either definition. On the other hand, the dysphoric mood of "feeling low and hopeless" was significantly more distinctive of the obese than the non-obese in the sample as a whole. This suggests that even if the complete syndrome of depression does not vary by obesity status, hopelessness may be a forerunner of a clinically diagnosable depression.

The main findings of this report concern characteristics of depression among the subjects -- obese and not obese -- who had ever had a Major Depressive Episode. A paramount question was whether obese subjects are more likely than the non-obese to report over-eating to the point of gaining weight during episodes of MDE. We found that obese subjects were 5 times more likely to gain weight while depressed than were the non-obese. While only the atypical symptom of weight gain was significantly associated with obesity, both over-eating and over-sleeping were more common among the obese and the traditional types of neurovegetative disturbances were less common.

In addition to this central finding, we observed that the obese subjects were also more likely than the non-obese to have had an MDE episode that persisted for more than a year as well as to have had more than 10 episodes. If gaining weight is a symptom of each of the greater number and more long-lasting episodes of depression, the cumulative effect of over-eating would not only increase the amount of weight gained but would also contribute to the overall seriousness of depression and its consequences. These features coupled with the fact that the obese MDE subjects were more vulnerable to preoccupation with death during such episodes emphasizes that the nature of depression may be more chronic and severe than pertains to the non-obese.

Preoccupation with death, including suicide ideation, among depressed obese subjects is not an isolated finding since it was reported in another general population study, although in that instance it was limited to women (15). The seriousness of this association is strengthened by clinical evidence that hopelessness is often a precursor of suicide (47,48). While

hopelessness was not limited to periods of depression in our study, its relationship to obesity generally strengthens the interpretation that it may be especially important in understanding the quality of dysphoria among those who are overweight.

A recent clinical study of obesity among depressed outpatients found that the obese tended to be less "well" than the non-obese but otherwise did not differ in the character of depression, including "somatic symptoms" (13). That characterization did not, however, focus on within-episode changes and it is not clear how the somatic symptoms were specified. In contrast, our findings from an epidemiologic sample suggest that the quality of depression does differ in several regards according to obesity status.

A genetic study of female twin pairs emphasized that depression is heterogeneous and indicated that "Atypical Depression" is notable for "increased eating, hypersomnia, frequent, relatively short episodes, and a proclivity to obesity" (26). Our findings among a representative sample of men and women gave rather similar results in terms of over-eating but the episodes in this study appeared to be "many and long" and to involve preoccupation with death.

The study of female twins also followed subjects over time and reported that the features of "Atypical Depression" had considerable consistency. Such consistency has also been reported in other clinical investigations (6,11). One of these showed a correlation between obesity and the direction of weight change with evidence that the "heavier the patient, the greater the tendency to gain weight" (11). The latter study indicated that weight gain was more characteristic of depressed women than depressed men while our evidence suggests that both men and women were at risk.

There are a variety of possible hypotheses for the association between obesity and atypical symptoms. Some of our subjects volunteered comments such as "When I am depressed, I eat", suggesting that eating may assuage the gloomy thoughts associated with depression in much the same way that cigarette smoking or alcohol consumption may (49–53). Biochemical features of depression may be implicated as possibly triggering a craving for carbohydrates (8). On the other hand, the stigmatization of obesity could be a feature that inclines an obese person to become hopeless. The emphasis on weight control in the media and the emergence of well-known organizations to help people lose weight attest to the fact that obesity confers social disadvantages that could lead to depression.

There are several limitations in this study. A general one is that the numbers are not as large as would be desirable. Another relates to psychiatric medication. Our data indicated that obese subjects did not differ from the non-obese in taking such medication. However, the data available do not include the types of medications taken. Since some antidepressants produce weight gain, the missing information might have contributed another perspective on our findings (4). Also because we used only the depression module from the DIS, in contrast to the full schedule, we were unable to assess whether some of the subjects might have had other types of affective disorders as well as MDE (20).

Another limitation is the absence of evidence about whether obesity precedes depression or alternately whether depression precedes obesity. While the DIS includes information about

the history of MDE, our data about obesity refers only to the current status. Without extensive diary-like information, it would be difficult in a general population study to evaluate weight changes and relate them reliably to episodes of depression.

Where Atypical Depression is concerned, some of our findings are similar to the profile described as Atypical Depression in other studies. However, we lack evidence for the full syndrome as specified in DSM-IV. For example, our data do not include "mood reactivity", "leaden paralysis", and "rejection sensitivity" which are included in the Atypical Specifier. Such symptomatic responses are more easily documented in a clinical setting than in the interview schedules employed in epidemiologic research.

This study does, however, suggest that depression among the obese tends to be distinctive in that it involves several serious parameters such as chronicity and preoccupation with death as well as over-eating and gaining weight. The possibility is raised that a spiraling effect may occur in that depression leads to over-eating which leads to further weight gain which may then lead to further episodes of depression as censure about a person's weight increases.

On the basis of findings presented here, it is reasonable to recommend that clinicians who treat depression be alert to the likelihood that over-eating is a symptomatic feature of depression in their obese patients and that if possible they should help their patients interrupt such a "vicious cycle" between two phenomena -- depression and obesity -- both of which, individually, can have other very serious health consequences (41–45, 54,55).

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Table 1

Prevalence Rates by Gender and Age for Lifetime Major Depressive Episodes According to the DIS, Depression as the Time of Interview According to DPAX, and Current Obesity Status.¹

| Subjects | Number | Current Obesity Status | DIS Lifetime Major Depressive Episode | Current DPAX Depression |
|--------------|--------|------------------------|---------------------------------------|-------------------------|
| Men | 638 | 21.3% | 4.4% | 4.2% |
| <45 years | 280 | 21.0% | 4.3% | 3.2% |
| 45+ years | 358 | 21.7% | 4.4% | 5.3% |
| Women | 758 | 23.9% | 11.5% | 7.2% |
| <45 years | 333 | 23.5% | 14.2% | 8.2% |
| 45+ years | 425 | 24.2% | 8.9% | 6.3% |
| All subjects | 1396 | 22.6% | 7.9% | 5.7% |

¹) DIS = Diagnostic Interview Schedule; DPAX = Depression and Anxiety from the Stirling Study Schedule; Obesity defined as Body Mass Index >30. The prevalence rates have been standardized to the gender, age, and areas of varying socioeconomic status of the population from which the sample was drawn.

Table 2

The Relationship between Obesity and Two Definitions of Depression that Characterize a Sample of 1396 Adults.

| Diagnoses of Depression ¹ | Odds Ratio ² | 95% Confidence Interval |
|---|-------------------------|-------------------------|
| DIS: Lifetime Major Depressive Episode | 0.9 | 0.6 – 1.5 |
| DPAX: Depression as Current Clinical Status | 1.0 | 0.6 – 1.6 |

1.) DIS = Diagnostic Interview Schedule; DPAX = Depression and Anxiety from the Stirling Study Schedule.

2.) The Odds Ratios were adjusted for age and gender comparing 314 obese subjects with 1082 non-obese.

Table 3

Obesity as a risk for Typical versus Atypical Neurovegetative Symptoms among 114 sample members who had ever experienced a Major Depressive Episode.

| Neurovegetative Symptoms | Rates of Symptoms | Odds Ratios ¹ | 95% Confidence Intervals |
|--------------------------|--------------------|--------------------------|--------------------------|
| TYPICAL | | | |
| Appetite/weight Loss | 64.9% | 0.5 | 0.2 – 1.3 |
| Insomnia | 78.1% | 0.6 | 0.2 – 1.6 |
| ATYPICAL | | | |
| Weight Gain | 20.2% ² | 5.0 | 1.8 – 13.8 |
| Hypersomnia | 20.2% ² | 1.8 | 0.6 – 5.0 |

1.) The Odds Ratios were adjusted for age and gender comparing 25 obese subjects with 89 non-obese.

2.) Although there was some overlap between weight gain and hypersomnia, those who reported weight gain are not identical to those who reported hypersomnia.

Table 4

Obesity as a Risk for Symptoms Other than the Neurovegetative Symptoms as Experienced in the Worst or Only Major Depressive Episode among 114 Sample Members who had Ever Experienced such an Episode.

| Symptoms ¹ | Odds Ratios ² | 95% Confidence Intervals |
|--------------------------|--------------------------|--------------------------|
| Fatigue | 1.0 | 0.4–2.6 |
| Slowness or Restlessness | 1.2 | 0.5–3.2 |
| Loss Interest in Sex | 0.9 | 0.4–2.2 |
| Feeling Worthless | 1.3 | 0.5–3.5 |
| Trouble Thinking | 1.2 | 0.4–4.3 |
| Thoughts of Death | 3.3 | 1.0–10.5 |
| Total Number of Symptoms | 1.5 | 0.6–3.7 |

1.) In this table, the symptoms are shown in the groups by which the count for meeting criteria was made when using the DIS to implement DSM-III. Slowness or Restlessness includes moving or talking more slowly than usual as well as moving all the time; trouble thinking includes trouble concentrating as well as thoughts mixed-up or slow; thoughts of death includes thoughts of death, wanting to die, thinking of committing suicide, and attempting suicide. Single questions were used for fatigue, loss of interest in sex, and feeling worthless. The total number of symptoms shown in this table includes the neurovegetative.

2.) The Odds Ratios were adjusted for age and gender comparing the 25 obese to the 89 non-obese subjects.

Table 5

Characteristics of Major Depressive Episodes Comparing Obese and Non-Obese Among 114 Subjects who had Ever Experienced an MDE Episode.

| Characteristics | Odds Ratios ^I | 95% Confidence Intervals |
|--|--------------------------|--------------------------|
| Younger than 25 years of age a time of first episode | 1.2 | 0.4–3.3 |
| More than 10 episodes | 3.9 | 1.5–10.6 |
| Longest episode lasted more than one year | 2.9 | 1.0–8.3 |
| Told doctor about episode | 1.6 | 0.6–4.3 |

^I) The Odds Ratios were adjusted for age and gender comparing the 25 obese to the 89 non-obese subjects.

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