



PAPER

Obesity and mental illness in a representative sample of young women

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OBJECTIVE: To investigate the relation between mental disorders and weight, especially obesity.

DESIGN: Epidemiological study of mental disorders with a representative sample of young women.

SUBJECTS: A total of 2064 women, age 18–25 y, living in Dresden, Germany.

MEASUREMENTS: Verbal reports of body mass index, structured clinical interview for psychological disorders.

RESULTS: We found an association between psychological disorders and weight. Obese women had the highest rate of mental disorders overall, and they had higher rates of all subgroups of mental disorders, although many differences were not statistically significant. Most importantly, obese women suffered from an anxiety disorder significantly more often than women who were not obese. The observed differences were independent of socioeconomic status.

CONCLUSIONS: In young women, obesity is related to increased rates of mental disorders, most notably anxiety disorders. Future longitudinal research will have to determine the causal relationships behind this correlation.

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Introduction

Obesity is known to contribute to a variety of physical health problems. Several studies have shown an association between adult obesity and increased morbidity and mortality in men and women.^{1–3} While these links are well established, the same is not true of those between obesity and psychological health. It is widely assumed that obesity is closely associated with certain mental problems and even that these problems might be the cause for being overweight. Evidence for these views is mostly derived from case reports, whereas studies of larger samples have not always supported these results.^{4,5}

Considering that obesity is such a prevalent problem, it is astonishing that so little is known about its relation to psychopathology. Depression and, to a lesser degree, anxiety are the best studied psychological phenomena in this area. However, the correlations between BMI (body mass index) and depression are often weak, and with anxiety they are sometimes nonexistent.⁶ Moore and colleagues⁵ found that

obese women were less healthy on eight of nine psychopathological measures, but differences concerning depression and anxiety (frustration-depression, tension anxiety, childhood anxiety) were not significant. Furthermore, it is questionable how these ratings relate to diagnoses. In a longitudinal epidemiological study with a representative sample of adolescents,⁷ BMI was positively related to depression in females but inversely related in males. Furthermore, BMI was positively related to poor physical health and conduct disorder. However, all associations were rather small. In a study by Rosmond *et al*,⁸ which studied only men, 15% of the obese men were taking antidepressants, about the same amount had some type of sleeping problem, and the obese men showed a higher degree of melancholia. These results point to higher levels of depression among men. Therefore, at this point the relation between mental illness and obesity is not clear. In a review, Friedman and Brownell⁴ have argued that it would be premature to conclude that obesity and psychological distress are unrelated. The inconsistent results might reflect the heterogeneity of obesity.

The inconsistencies might also reflect methodological differences, such as different types of samples (clinical vs representative), different definitions of overweight or obesity, or different methods of assessment. There is a wide

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range in the way psychopathology is assessed, from simple items to questionnaires, to interviews that are more or less standardized. There is clearly a lack of studies with representative samples, and an even more pressing concern is the lack of studies utilizing standardized diagnostic instrument for psychological disorders. The present investigation addresses these needs. We studied a representative sample of young women, and we assessed mental illness using a structured interview, allowing for DSM-IV diagnoses, administered by trained interviewers. Since the data were not collected for the purpose of relating obesity to psychopathology, the chances of an investigator bias are small.

Method

The Dresden Study of Mental Health is funded by the German Ministry of Research and Technology (BMBF). It is a prospective epidemiological study designed to collect data on the prevalence, incidence, course and risk factors of mental disorders. The results presented here are from the baseline survey, which was conducted from July 1996 to September 1997.

Sample

In order to be eligible for the study, participants had to be German females between 18–24 y of age at the time of sampling. The sample was drawn from the Dresden government registry of residents. A total of 5204 women were

located and eligible for the study. Of this sample, 2064 took part in the interview, and 998 filled out questionnaires (a response rate of 58.8%). For more details on the socio-demographics of the sample, see Table 1.

Diagnostic assessment

The diagnostic assessment was based on the F-DIPS.⁹ The F-DIPS is a structured interview allowing for the diagnosis of axis I disorders according to DSM-IV,¹⁰ for lifetime and point-prevalence except binge eating disorder. The F-DIPS is a modified version of the DIPS¹¹ and the ADIS-L.¹² Interviewers were either medical doctors or psychology students in their last years of training. All underwent an extensive training lasting about a week. All interviewers received supervision bi-weekly. Specially trained supervisors proof-read every interview. To assess obesity, we used the BMI. It is a widely used measurement; its correlation with body fat measures is between 0.7 and 0.8.¹³ Verbal reports of the height and weight of the respondents were obtained and recorded by the interviewers. The error introduced by using verbal report is probably in the direction of regression toward the mean. We separated groups of young women according to their BMI: 405 women had a BMI lower than 19, the next group contained women with a BMI between 19 and 25 ($n = 1467$), the next group of women were slightly overweight with a BMI between 25 and 30 ($n = 149$), and the last group were obese with a BMI of more than 30 ($n = 30$).

Table 1 Sociodemographic characteristics of the sample

	All (n = 2064)	BMI < 19 (n = 405)	BMI > 19 < 25 (n = 1467)	BMI > 25 < 30 (n = 149)	BMI > 30 (n = 30)
Mean age (y)	21.35	21.15	21.37	21.62	22.00
(s.d.)	(1.89)	(1.92)	(1.89)	(1.82)	(1.68)
Mean BMI (kg/m ²)	21.19	18.04	21.22	26.90	34.17
(s.d.)	(2.99)	(0.80)	(1.53)	(1.38)	(3.73)
Marital status (%)					
unmarried	94.9	97.3	95.0	91.9	76.7
married	4.5	2.5	4.2	8.1	23.3
separated or divorced	0.4	0.2	0.4	0	0
widowed	0.2	0	0.3	0	0
Partner/spouse (%)	66.5	70.4	66.7	57.7	53.3
living with spouse	26.4	23.2	26.1	34.2	43.3
duration of relationship (months, mean)	19.7	18.9	19.52	23.1	26.3
(s.d.)	(22.1)	(20.4)	(21.96)	(25.8)	(29.9)
Children/pregnant (%)					
do have children	6.9	6.4	5.6	14.8	40.0
pregnant	3.0	2.6	2.5	6.9	16.7
Educational degree (%)					
still at school	3.6	6.7	3.1	1.3	0
dropped out	0.2	0.2	0.1	0.7	3.3
lower education	39.9	41.0	37.9	51.0	73.3
higher education	55.9	52.1	58.9	46.9	23.3
Occupation (%)					
student/apprentice	53.5	55.6	54.7	38.1	36.7
unemployed	4.8	10.9	7.7	22.2	29.4
full-time employed	31.4	31.4	32.0	27.5	23.3
part-time employed	16.0	14.6	16.8	13.5	10.0

Socio-economic-status (SES)

We categorized the young women into three socio-economic-status (SES) groups: low, medium and high SES. Two criteria were taken into account for categorization. First and foremost, we used detailed specifications of the young women's occupations. If the women were still in some kind of training (eg students or apprentices), the occupations of their parents were used to categorize their SES or in some cases a combination was used. We were unable to categorize 36 women because of insufficient data. The following occupations were classified under low SES: unemployed, housewife, worker, apprentice, and employee with low requirements. Under medium SES were foreman, craftsman, employee with medium requirements, civil servant with medium and high requirements and self-employed. Under high SES were employee with management position, civil servant with management position, self-employed and academic.

Analysis

Data were analyzed using the Statistical Package for Social Sciences, SPSS, Windows, German Versions 8.0. Statistical tests included analyses of variance and χ^2 tests. *Post-hoc* comparisons following chi-square tests were computed using standard residuals, with values larger than 2 considered statistically significant.¹⁴ A logistic regression model using the 'backward stepwise' method was computed.

Results

BMI and sociodemographics

Table 1 shows the sociodemographics for the four BMI groups. There were slight differences in age between the groups. Higher BMIs were found in older women, but it should be noted that the difference between the mean ages for the lowest and highest BMI groups was less than one year. Nevertheless, this difference was significant ($F(3.2047) = 3.9, P = 0.008$). The group with a BMI below 19 was significantly younger than the slightly overweight group ($F(1.552) = 7.2, P = 0.05$, Bonferroni corrected).

Overweight and obese women were married more often than normal and underweight women ($\chi^2 (1) = 36.7, P = 0.000$). Of the women who were not married, those in the two overweight groups were less likely to have a partner ($\chi^2 (1) = 10.3, P = 0.01$). Of those with a romantic partner, fewer women in the overweight groups lived together with their partner ($\chi^2 (1) = 11.3, P = 0.01$). There were no significant differences between the four groups regarding the duration of the partnership ($F(3.1920) = 2.1, NS$). The mean duration was slightly less than a year, but the standard deviation was high (s.d. = 22.1). Both groups of overweight women had significantly more children ($\chi^2 (1) = 69.4, P = 0.000$) than the other women. Obese women had dropped out of school significantly more often than the other women, and they had a lower education significantly

more often ($\chi^2 (1) = 76.53, P = 0.000$). Obese women and overweight women were unemployed significantly more often ($\chi^2 (1) = 52.31, P = 0.000$), and they were less often students at a university, but more often apprentices. There were no differences between the four groups regarding full-time or part-time occupations.

Table 2 shows the SES-categorization for the four weight groups. As the description of the sociodemographic data indicated, there were differences between the SES of the weight groups. The obese and the overweight women were significantly more likely to be in the low SES groups and less likely to be in the high SES group ($\chi^2 = 34.02, P = 0.000$).

BMI and mental disorders

Table 3 shows the lifetime prevalence rates of mental disorders for the four weight groups. Although there were significantly more pregnant women in the obese group, we did not exclude them. In an additional analysis, we compared women with and without pregnancy with regard to their mental disorders. There were no differences between pregnant women and non-pregnant women ($\chi^2 (1) = 1.93, NS$). A larger percentage of overweight and obese women had suffered from a mental disorder at some time of their life than women of normal weight, but the same was true for the underweight women. To find out if this group had more diagnoses than the normal-weight group because of eating disorders (mostly anorexia nervosa), we excluded all eating disorder diagnoses and re-inspected the prevalence rates. The percentages of other mental disorders in the underweight women were still higher than for the normal weight group, but the obese women still had the highest rate of mental disorders. Regarding the psychological disorders, obese women had the highest rates of anxiety disorders, affective disorders, somatoform disorders and disorders of childhood (separation anxiety, attention-deficit and disruptive behavior disorders, elimination disorders). In some cases (ie anxiety and somatoform disorders), prevalence rates for obese women were almost double the rates of the normal-weight group. Marked differences were also observed for affective disorders and disorders of childhood. Substance use disorders were generally infrequent in our sample; obese women again had the highest life-time prevalence rate, although only 3.3% received a diagnosis. Obese women tended to have more overall diagnoses, if eating disorders were excluded ($\chi^2 (1) = 7.11, P = 0.069$). Finally, obese women had significantly more anxiety disorders than the other groups ($\chi^2 (1) = 10.05,$

Table 2 Socioeconomic status (SES) (%)

SES	All (n = 2043)	BMI < 19 (n = 404)	BMI > 19 < 25 (n = 1461)	BMI > 25 < 30 (n = 148)	BMI > 30 (n = 30)
Low	33.3	35.4	30.7	48.0	60.0
Medium	52.4	50.5	53.9	45.3	40.0
High	14.3	14.1	15.4	6.8	0.0

$P=0.018$). Because of the disparate sample sizes and the sometimes low base rate of disorders, most other differences were not statistically significant.

A similar picture emerged regarding the comorbidity rates. Table 4 shows the lifetime comorbidity rates for the four weight groups. Lifetime comorbidity is defined as two or more diagnoses at any time in life; both disorders do not have to occur at the same time. Again a higher percentage of obese women had two or more disorders, but the differences did not reach significance ($\chi^2(1)=0.39$, NS).

Weight, SES, and their relation to psychopathology

In order to shed more light on the relations between body-weight (BMI), SES and psychopathology, we entered these variables into a logistic regression model using the ‘backward stepwise’ method. The factors or independent variables were: BMI < 19 yes/no; BMI \geq 30 yes/no; SES low yes/no; and SES high yes/no. The dependent variable was the lifetime occurrence of a psychological disorder. The numbers presented in Table 5 are from the final equation, which is the result of the applied logistic regression model. It is constructed by reducing the first model with all four variables to the final model, which contains only the variable(s) with the strongest relation to the dependent variable.

These results show a more differentiated picture of the associations between BMI, SES and psychopathology. Having a BMI of or above 30 tended to almost double the risk of having any psychological disorder. If eating disorders were excluded, this result still did not reach statistical significance, but the relation became stronger. Obesity significantly enhanced the likelihood of anxiety disorders at any time in life. The risk of an anxiety disorder was more than twice as high for obese women as for women with a lower BMI. Moreover, a high SES was significantly related to the occurrence of affective disorders and substance-related disorders. Low SES and disorders of childhood were significantly related. A BMI below 19 was associated only with the likelihood of eating disorders, which should be related by definition. Altogether, obesity showed a considerable relation with psychopathology, especially with anxiety disorders.

Table 3 BMI and life-time prevalence of mental disorders (%)

	All (n = 2064)	BMI < 19 (n = 406)	BMI > 19 < 25 (n = 1466)	BMI > 25 < 30 (n = 149)	BMI > 30 (n = 30)
All disorders	41.3	44.8	39.7	43.0	56.7
All disorders (eating disorders excluded)	39.8	43.1	38.1	43.0	56.7
Anxiety disorders	28.3	31.0	26.8	30.2	50.0
Affective disorders	13.7	14.0	13.3	15.4	20.0
Somatoform disorders	3.2	3.7	3.1	2.7	6.7
Substance disorders	2.2	2.5	2.0	2.7	3.3
Eating disorders (except BED ^a)	4.0	5.7	3.6	3.4	0
Disorders of childhood	9.8	9.6	9.6	11.4	16.7

^aBED, binge eating disorder.

Table 4 BMI and life-time comorbidity (%)

	All (n = 2064)	BMI < 19 (n = 406)	BMI > 19 < 25 (n = 1466)	BMI > 25 < 30 (n = 149)	BMI > 30 (n = 30)
No diagnosis	60.2	56.9	61.9	57.0	43.3
One diagnosis	21.9	25.6	20.3	23.5	30.0
Two or more	18.0	17.5	17.8	19.5	26.7

Table 5 Variable(s) in the final equation of the logistic regression model

	Variables in the equation	Odds ratio	95% CI
All disorders	BMI \geq 30	1.89	0.91–3.91
All disorders (eating disorders excluded)	BMI \geq 30	2.01	0.97–4.16
Anxiety disorders	BMI \geq 30	2.59	1.26–5.34
Eating disorders	BMI < 19	1.65	1.00–2.70
Affective disorders	High SES	1.59	1.06–2.40
Substance disorders	High SES	2.83	1.17–6.84
Disorders of childhood	Low SES	1.55	1.15–2.09

Discussion

We reported data of a representative sample of young women in Dresden. BMI was assessed by self-report, and mental disorders were assessed by a structured interview. In this sample, only 1.5% of the young women were obese; 7.2% were overweight. We found an association between psychological disorders and weight. Obese women had the highest rates of mental disorders overall as well as for all subgroups of mental disorders. Furthermore, they had higher rates of comorbidity. Due to disparate sample sizes, those relations were not significant except for the case of anxiety disorders, which obese women had significantly more often than non-obese women. This is an association that has not been reported in the literature up to this point,^{5,6} although prior studies have reported an association between depression and being overweight^{7,8} or, less specifically, between lack of self-esteem and being overweight.¹⁵ There is a lack of studies that have examined the relation between mental disorders and weight, especially with non-clinical samples and reliable diagnostic measures.

Thus it is not surprising that the relation of anxiety and overweight has not been reported yet. Non-clinical samples are of great interest, because the relations among mental problems and obesity are not overestimated as easily as in clinical samples. On the other hand, the present study contained few obese women, and the majority of the participants had no mental disorder. Furthermore, self-reports of BMI might tempt women to underestimate their weight, reducing the statistical power of our design. Despite these limitations, we believe that our findings may be replicable and are certainly of great interest.

We found a strong relation between overweight and socio-demographic variables. Overweight women were married more often and had more children. Furthermore, they had dropped out of school more frequently, had a lower educational level, and were unemployed more often—all indicators of a lower SES. Thus it is not surprising that obese and overweight women were more often in the group with a low SES. The question remains if SES is an important moderator variable. If women with a lower SES had more mental disorders, weight would be obsolete as an important variable. This is not the case. Affective disorders and substance abuse disorders were significantly related to a high SES. Obesity goes along with a low SES. Only the disorders of childhood were related to a lower SES. There was no association of SES and anxiety disorders. Therefore it may be concluded that the relationship of anxiety disorders and obesity is independent of SES. Obesity has its own significant relation to mental disorders.

We found a significantly higher rate of anxiety disorders in obese women. We do not know, however, when the obesity began, so we cannot conclude anything about the temporal or causal relationship of obesity and anxiety. Obesity might be a precursor to anxiety disorders, it might follow a disorder, or both might be caused by some third variable. Thus, we are in need of longitudinal research that examines the sequence of overweight and mental disorders. Moreover, almost all rates of mental disorders were elevated in obese women, thus, obesity might be a risk factor for mental disorders. Again, longitudinal studies of representative samples could help clarify the role of obesity. This would also be important with regard to prevention because both obesity

and mental disorders reduce quality of life, sometimes dramatically so, and put a heavy financial burden on society.

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