

## Mood Change During Weight Restoration in Patients with Anorexia Nervosa

Katharine G. Meehan, MA<sup>1</sup>  
Katharine L. Loeb, PhD<sup>2</sup>  
Christina A. Roberto, BA<sup>1</sup>  
Evelyn Attia, MD<sup>1\*</sup>

### ABSTRACT

**Objective:** Although depression is known to co-occur with anorexia nervosa (AN), there are few clear studies of mood in the context of weight gain treatment without the use of medication.

**Method:** Twenty-one patients admitted consecutively to an inpatient clinical research unit normalized weight to at least 90% of ideal body weight (IBW). Depression was assessed at admission and weight normalization (pre-discharge) with the Beck Depression Inventory (BDI).

**Results:** Multivariate F tests showed BDI scores to be significantly improved across these two time points (BMI:  $F(2,20) = 166.58$ ,  $p = 0.000$ ; BDI:  $F(2,19) = 22.64$ ,  $p = 0.000$ ). Moreover, improvement in

mood was also evident at partial weight restoration (80% IBW).

**Conclusion:** Patients with AN undergoing nutritional rehabilitation and psychotherapy on an inpatient unit present with significant depressive symptoms as measured by the BDI, and, with weight restoration, demonstrate statistically significant improvement in mood symptoms without the use of adjunctive medication. Data at partial weight restoration suggest that these results cannot be explained by improved mood related to anticipation of discharge. © 2006 by Wiley Periodicals, Inc.

**Keywords:** anorexia nervosa; depression; mood; weight restoration

(*Int J Eat Disord* 2006; 39:587–589)

### Introduction

Many authors have reported that depression frequently co-occurs with anorexia nervosa (AN).<sup>1,2</sup> Rates of comorbidity of AN with major depressive disorder (MDD) range from 41<sup>3</sup> to 80%<sup>4</sup> and the concurrence is too frequent to be attributable to chance.<sup>5,6</sup> Patients with anorexia nervosa at low weights often have high indices of depression and exhibit cognitive dysfunction similar to that seen in MDD.<sup>7,4</sup> Further, the course of the symptoms appears to be related; that is, symptoms of depression are elevated at the same time that symptoms of AN are most pronounced.<sup>8</sup>

This frequent concurrence is consistent with Keys and colleagues' finding on the psychological effects of starvation that irritability, poor memory, dimin-

ished concentration, and reduced physical energy—all symptoms of depression—can be caused by starvation alone in a nonpathological population.<sup>9</sup> It has also been reported that reduced caloric intake, weight loss, or changes in catabolic state alone (even in the absence of other symptoms of AN) induce major changes in several endocrine systems, and that these factors may manifest as an increase in depressive symptoms.<sup>10</sup>

Studies have found that medications are not effective in alleviating depressive symptoms when patients with AN are at a low weight.<sup>11</sup> Attia et al.<sup>12</sup> reported no significant clinical differences in outcome for 31 women receiving inpatient treatment for AN who participated in a randomized, placebo-controlled, double blind trial of fluoxetine during the weight restoration phase of treatment. Nonetheless, medications are commonly used while patients are undergoing nutritional rehabilitation. The reasons for this include the safe and frequent use of these medications for depressive symptoms, coupled with economic pressure for short treatment duration and identification of comorbid states and their effective treatment. The pervasive use of medication during this phase makes it difficult to identify the natural course of depressive symptoms in the acute state of AN.

Accepted 1 July 2006

Supported by a grant from NARSAD, Pfizer/Society for Women's Health Research and by MH60271 from National Institute of Mental Health.

\*Correspondence to: Evelyn Attia, Department of Psychiatry, New York State Psychiatric Institute, Columbia College of Physicians and Surgeons, New York, New York. E-mail: ea12@columbia.edu

<sup>1</sup> Department of Psychiatry, New York State Psychiatric Institute, Columbia College of Physicians and Surgeons, New York, New York

<sup>2</sup> Department of Psychiatry, Mount Sinai School of Medicine, New York, New York

Published online 29 August 2006 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/eat.20337

© 2006 Wiley Periodicals, Inc.

Studies addressing changes in depression in the context of weight gain for AN have been complicated by the use of medication or insufficient information about the treatment provided.<sup>13,14</sup> In this study, we hypothesized that the depressive symptoms seen in AN would remit with weight normalization (achieving 90% of ideal body weight), without the adjunctive use of antidepressant medication.

## Method

### Participants

Participants were 31 women between the ages of 18 and 45 years receiving inpatient treatment for anorexia nervosa at the New York State Psychiatric Institute. All participants were admitted as part of a study of serotonin function in AN supported by the National Alliance for Research on Schizophrenia and Depression (NARSAD). Twenty-nine patients (94%) met full DSM-IV criteria for AN, while the remaining two met all but Criterion D (amenorrhea). The study was approved by the institutional review board of the New York State Psychiatric Institute and written informed consent was obtained from all participants. Ten patients were dropped out of treatment before restoring their weight and were therefore excluded from the final analysis.

### Procedure

All participants were treated on an inpatient research unit where they participated in a structured behavioral treatment program aimed at normalizing eating behavior and weight. Patients were given a prescribed number of calories (in both food and liquid supplements) and were expected to gain 3–5 lbs. weekly until reaching 90% of ideal body weight (IBW).<sup>15</sup> Treatment included individual, group and family therapies, all focused on promoting weight restoration. No patient received psychopharmacological agents at any time during the study.

### Measures

Diagnoses were established before admission with the Structured Clinical Interview for DSM-IV.<sup>16</sup> Patients were weighed three times weekly in the morning, after voiding, wearing only underwear. Their body mass index (BMI; kg/m<sup>2</sup>) is reported because it allows for a contextualized comparison across different heights.

Patients completed the Beck Depression Inventory (BDI)<sup>17</sup> at admission, 80% of IBW, and at 90% of IBW. The BDI assesses largely cognitive and motivational symptoms of depression. Generally, a score above 13 is considered to be indicative of depression.<sup>18</sup>

**TABLE 1. Mean and standard deviation of BMI and BDI at admission, at 80% of IBW, and at 90% of IBW**

	Admission		80% of IBW		90% of IBW	
	M ± SD	N	M ± SD	N	M ± SD	N
BMI (kg/m <sup>2</sup> ) <sup>a</sup>	14.38 ± 1.47	21	18.09 <sup>b</sup> ± .35	21	19.87 <sup>b,c</sup> ± .33	21
BDI <sup>d</sup>	27.81 ± 12.25	21	14.76 <sup>b</sup> ± 11.08	21	9.05 <sup>b,c</sup> ± 7.41	21

BMI: body mass index; BDI: Beck Depression Inventory; IBW: ideal body weight.

<sup>a</sup>Main effect of assessment occasion  $F(2,20) = 166.58, p = .000$ .

<sup>b</sup>Significant difference from admission  $p = .000$ .

<sup>c</sup>Significant difference from 80 to 90%  $p = .009$ .

<sup>d</sup>Main effect of assessment occasion  $F(2,19) = 22.64, p = .000$ .

### Data Analysis

Changes in BMI and BDI were analyzed using a repeated measures anova design with three assessment points (admission, 80% of IBW, and 90% of IBW). Post-hoc pairwise comparisons with Bonferroni corrections were also conducted.

## Results

The mean age of the 21 women who completed the study was 24.76 years (SD = 5.8). The majority of this sample (20 women, or 95.2%) was Caucasian; one participant (4.8%) was Hispanic. Of the subset of treatment completers, 14 women (66.7%) were classified as binge-purge subtype, while the remaining 7 (33.36%) were restrictors. The mean duration of illness was 8.62 years (SD = 5.66). The mean number of previous hospitalizations for the sample was 3.33 (SD = 3.29); 76.2% of the sample had been hospitalized at least once prior to this admission.

Multivariate F tests showed that BMI increased significantly from admission to 90% IBW and BDI scores decreased significantly over this same time period. The pairwise post-hoc comparisons for each variable also indicated a significant increase in BMI from admission to 80% of IBW, from admission to 90% of IBW and from 80 to 90% IBW. Comparisons of BDI scores between the same time points indicated significant improvement as well. These data are presented in **Table 1**.

## Conclusion

This study provides evidence that treatment focused on weight gain alone, without the use of pharmacological agents, is effective in reducing the depressive symptoms seen in low weight patients

with anorexia nervosa. To assess whether the attenuation of depressive symptoms may be due to improved mood related to anticipation of discharge, change in BDI score between admission and 80% of IBW was also analyzed. The data show something akin to a dose-dependent response in that the BDI scores are significantly lower at 80% of IBW than they had been at admission and that this decrease continues at least until 90% of IBW is reached. This limits the possibility that patients were simply reporting fewer depressive symptoms as an effect of their imminent discharge.

Notably, while depressive symptoms improved over the course of weight gain, they did not remit. This could be explained either by a weight threshold effect or by a time course effect. It is possible that reaching 90% IBW is insufficient to attain relief from depression in the context of AN, but that weight restoration to 100% IBW would achieve this result. Alternatively, 90% IBW may be sufficient but need to be maintained for a longer period of time before comorbid depression remits. A study conducted by Pollice et al.<sup>19</sup> lends support to the latter explanation. In contrast with our findings, this study did not find a significant reduction in depression in patients recently reaching 90% IBW. However, BDI and Hamilton Rating Scale for Depression<sup>20</sup> scores were significantly reduced in a comparison sample of long-term (6 months–10 years) sustained weight-restored patients, whose scores were not significantly different from healthy controls. More definitive studies of the utility of medication for subpopulations of individuals with AN, such as those who meet criteria for depression after weight restoration, are needed.

### Limitations

One limitation of this study is the small sample size. Additionally, the study did not assess nutritional rehabilitation in the absence of all other interventions. The participants received various forms of psychotherapy during their stay on the inpatient unit and it is possible that some of these treatments had a positive effect on depressive symptomatology. However, the therapies offered on the unit were not targeted at or indicated for the treatment of depression or depressive symptoms. Thus, it can be inferred that a significant amount of the improvement in BDI scores can be attributed to weight gain. Therefore, refeeding on an inpatient unit should improve depressive symptoms for most patients without the use of medication.

In summary, the current study found a significant decrease in Beck Depression Inventory scores

after successful weight regain in women with anorexia nervosa in the absence of psychopharmacologic treatment.

We thank B.T. Walsh for his assistance and the entire staff of the General Clinical Research Unit at the New York State Psychiatric Institute/Columbia University Medical Center.

### References

1. Altshuler KZ, Weiner MF. Anorexia and depression: A dissenting view. *Am J Psychiatry* 1985;142:328–332.
2. Katz JL, Walsh BT. Depression in anorexia nervosa. *Am J Psychiatry* 1978;135:507.
3. Herzog DB, Keller MB, Sacks NR, Yeh CJ. Psychiatric comorbidity in treatment-seeking anorexics and bulimics. *J Am Acad Child Adolesc Psychiatry* 1992;31:810–818.
4. Viesselman JO, Roig M. Depression and suicidality in eating disorders. *J Clin Psychiatry* 1985;46:118–124.
5. Fornari V, Kaplan M, Sandberg DE, Matthews M, Skolnick N, Katz JL. Depressive and anxiety disorders in anorexia nervosa and bulimia nervosa. *Int J Eat Disord* 1992;12:21–29.
6. Szmukler G. Some comments on the link between anorexia nervosa and affective disorder. *Int J Eat Disord* 1987;6:181–190.
7. Herzog DB, Nussbaum KM, Marmor AK. Comorbidity and outcome in eating disorders. *Psychiatr Clin North Am* 1996;19:843–859.
8. Rastam M, Gillberg C, Gillberg I. A six year follow-up study of anorexia nervosa with teenage onset. *J Youth Adolesc* 1996;25:439–453.
9. Keys A, Brozek J, Henschel A. *The Biology of Human Starvation*. Minneapolis, MN: University of Minnesota Press, 1950.
10. Fichter MM, Pirke KM, Holsboer F. Weight loss causes neuroendocrine disturbances: Experimental study in healthy starving subjects. *Psychiatry Res* 1986;17:61–72.
11. Attia E, Mayer L, Killory E. Medication response in the treatment of patients with anorexia nervosa. *J Psychiatr Pract* 2001;7:157–162.
12. Attia E, Haiman C, Walsh BT, Flater SR. Does fluoxetine augment the inpatient treatment of anorexia nervosa? *Am J Psychiatry* 1998;155:548–551.
13. Eckert E, Goldberg S, Halmi K, Casper R, Davis J. Depression in anorexia nervosa. *Psychol Med* 1981;11:1–8.
14. Channon S, Desilva WP. Psychological correlates of weight gain in patients with anorexia nervosa. *J Psychiatr Res* 1985;19:267–271.
15. Metropolitan Life Insurance Company. New weight standards for men and women. *Stat Bull Metropol Life Insur Co* 1959;40:1–11.
16. First MB, Spitzer RL, Gibbon M, Williams JBW. *Structured Clinical Interview for DSM-IV (SCID)*. New York: Biometrics Research, New York State Psychiatric Institute, 1998.
17. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh, J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;122:83–85.
18. Lasa L, Ayuso-Mateos JL, Vazquez-Barquero JL, Diez-Manrique FJ, Dowrick CF. The use of the Beck Depression Inventory to screen for depression in the general population. *J Affect Disord* 2000;57:261–265.
19. Pollice C, Kaye W, Greeno C, Weltzin T. Relationship of depression, anxiety and obsessiveness to state of illness in anorexia nervosa. *Int J Eat Disord* 1997;21:367–376.
20. Hamilton M. A rating scale for depression. *J Neurol Neurosurg Psychiatry* 1960;23:56–62.