An Assessment of Daily Food Intake in Participants with Anorexia Nervosa in the Natural Environment

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Abstract

Objective—To examine the caloric intake in women with anorexia nervosa (AN) and how it varies by day as a function of the presence or absence of binge eating and/or purging behaviors.

Method—Female participants with AN ($n = 84$, mean age = 24.4, range 18–51) were recruited from three different sites. Data on food intake were obtained through the use of 24-h dietary recall using the Nutritional Data Systems for Research, and data on binge eating and purging behaviors were collected on palmtop computers using an ecological momentary assessment paradigm. Daily macronutrient intake was compared on days during which binge eating and/or purging behaviors did or did not occur.

Results—On days during which binge eating and purging behaviors both occurred, participants reported significantly greater kilocalorie intake when compared with days when neither behavior occurred, or when only binge eating or purging occurred. Binge eating episodes were only modest in size on days when purging did not occur. Energy intake overall was higher than expected.

Discussion—Intake on days where binge eating occurred varied dramatically based on whether or not purging occurred. Whether markedly increased binge eating intake was causally related to purging is unclear. Nonetheless eating episodes were at times quite large and equivalent to those reported by participants with bulimia nervosa in other research.

Keywords

AN; binge eating; compensatory behaviors; caloric intake

Introduction

Anorexia nervosa (AN) is a psychiatric disorder characterized by significant weight loss, fear of gaining weight, body image disturbance, and amenorrhea in females.[1] In the current Diagnostic and Statistical Manual of Mental Disorders, AN is classified into a restricting subtype (ANR) comprised of those who restrict food intake and at times exercise to control their weight, and the binge/purge (ANBP) subtype, comprised of those who engage in binge

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eating and/or purging behaviors.[2] Garfinkel et al.[3] were among the first to subdivide patients with AN into those who had bulimic symptoms and those who did not. In the same year, Casper et al.[4] found that patients with symptoms of AN and bulimic behavior represented a distinct subgroup, who appeared to evidence a worse prognosis than those patients with symptoms only of restrictive AN. Subtype classification of AN is supported by some research that shows differential eating disorder severity, psychopathology and prognosis between patients who exhibited binge-eating and/or purging behaviors and those who do not,[5–9] although recent longitudinal research[10–14] suggests minimal differences and considerable crossover between subtypes, which raises questions about the validity of the subtypes.

Analyses of food intake during meals and through dietary recall have shown the ANR subtype to have an avoidance of fat intake compared with healthy controls[15–18] which may also be true of patients with bulimia nervosa (BN).[19] Caloric intake in AN has been found to be significantly less than healthy controls.[15–17,20] The use of multiple purging methods, namely vomiting and laxative abuse, has also been linked to greater eating pathology and eating disorder severity in AN.[8,21] Edler et al.[21] also found that greater purging frequency was associated with increased binge eating frequency and general psychopathology. To our knowledge, no research has looked specifically at food intake using a structured computer based data system with repeated 24-h dietary recall and its relationship to binge eating and purging in AN, as recorded using ecological momentary assessment. The aim of this article was to measure the differences in caloric intake on days when women with AN engaged in binge eating and/or purging behaviors. Our intent was to provide further insight into the day-to-day structure of food intake exhibited by women with AN and it's relationship to problematic eating-related behaviors. A secondary aim of the investigation was to examine binge eating episode size in AN. Our assumption based on clinical experience was that binge eating episodes are often modest in size in patients with AN.

Method

Participants

Participants were women ($n = 84$), diagnosed with anorexic symptoms, who were originally recruited from three communities for a multisite RO1 study of ecological momentary assessment in AN. The women were diagnosed with AN or subsyndromal AN after undergoing a SCID interview using DSM-IV-TR criteria.[22] Subsyndromal patients met all DSM-IV criteria, except for one of the following: (1) amenorrhea, (2) the cognitive pattern of AN (body image disturbance and an intense fear of fat), or (3) had a BMI between >17.5 and 18.5. The average age of participants was 24.4 years (SD = 7.5, range 18–51) with a mean body mass index (BMI) of 17.2 (SD = 0.9, range 14.5–18.5). Of the 84 women, 96.4% were Caucasian and 88.1% were unmarried. Both restrictor and binge/purge subtype patients were included in the analysis, after inspection of the data showed that several patients initially diagnosed as restrictors reported binge and purge episodes in the self-report data.

Measurement

Participants in this study underwent data collection for one ($n = 8$), two ($n = 11$), or three ($n = 65$) 24-h dietary recalls using the Nutrition Data Systems for Research (NDS-R). The NDS-R allows for nutrient calculations over 24-h time intervals based on specific foods contained in a database with over 18,000 foods and 8,000 brand-name products. NDS-R was developed by the Nutrition Coordinating Center in the Division of Epidemiology and School of Public Health at the University of Minnesota. Dietary recalls using NDS-R were conducted over the telephone and data were directly entered into the computer. Members of staff at each facility had been trained in this system and administered the NDS-R interviews

on a regular basis. The NDS-R system is considered a useful, valid method of assessment of food intake by self-report and has been used widely in nutrient research.[23,24]

Binge eating and purging behaviors were recorded by participants on palmtop computers using ecological momentary assessment (EMA). This method of data collection as discussed by Smyth et al.,[25] is used to avoid some of the biases associated with traditional self-report or cross-sectional research by recording "in the moment" reports from participants in their natural environment. In this study, data were collected using palmtop computers and included momentary reports of binge eating and purging obtained at the time of the occurrences of the behaviors or shortly thereafter following random beeps which prompted responding. Thus recall intervals were short for eating disorder behaviors (2 h for EMA) and the NDS-R recalls were relatively short (24 h).

Statistical Analysis

Types of day (e.g., binge eating only, purging only, both binge eating and purging, neither binge eating nor purging) were compared on the number of eating episodes per day, number of kilocalories consumed per day, and number of kilocalories consumed per eating episode using a two-level hierarchical linear model (HLM), with daily totals on the outcome variable nested within participants. Analyses were performed using SPSS version 16.0.1 (SPSS Inc, 2008). Pairwise Bonferroni-corrected contrasts were used to make post-hoc comparisons.

Results

The entire group had an average 6.3 eating episodes per day (SD = 2.4) with 85.4% of these episodes including the ingestion of less than 500 kcal and 96.4% including the ingestion of less than 1,000 kcal. Mean daily caloric intake was 1812.6 kcal (SD = 1857.2). Days recorded using NDS-R were divided into four categories, based on the presence or absence of binge eating and/or purging behaviors. This resulted in 156 days (73.2%) characterized by no binge eating and/or purging, 10 days (4.7%) with binge eating only, 30 days (14.1%) with purging only, and 17 days (8.0%) with binge eating and purging behaviors.

The average number of eating episodes per day for the no binge and/or purge day was 6.3 (SD = 2.5); the average for purge only days was 5.7 (SD = 1.6); the average for binge only was 6.5 (SD = 2.4); and the average for binge and purge was 6.8 (SD = 2.8). This did not differ significantly across types of day [$F(3,209) = 0.96$; $p = .412$]. Average kilocalories per eating episode differed significantly among categories of day [$F(3,209) = 9.20$; $p < .001$]. The average for the binge and purge day was 764.5 (SD = 536.4) and was significantly higher than binge only days (mean = 292.6, SD = 268.4), purge only days (mean = 256.8, SD = 233.2), and no binge or purge days (mean = 287.1, SD = 366.7). Binge only, purge only, and no binge and/or purge days did not significantly differ from each other. A similar patter of results was observed for total kilocalories per day. The average number of kilocalories for binge and purge days (mean = 4557.2, SD = 3070.0) was significantly higher than binge only days (mean = 1606.7, SD = 856.1), purge only days (mean = 1368.8, SD = 1340.5), and no binge or purge days (mean = 1612.1, SD = 1568.0).

Discussion

The methodology used in the present study provides a unique perspective about the eating behavior of participants with AN. Eating episodes ranged from 0 (diet soft drink) kcal up to over 15,000 kcal, suggesting that some episodes of eating in patients with AN are quite large, although 96.4% were below 1,000 kcal. Weltzin et al.[26] found that in patients with BN, 37% of meals were found to be greater than 1,000 kcal. This suggests that an eating episode that may be considered a "binge" for a woman with AN is in general rather small in

comparison with those reported in BN, which have been found to be much larger in laboratory studies.[27,28] However, the eating episodes of participants with AN can and do in some cases resemble those seen in BN that are usually in the caloric range above 1,000 kcal. Also of note was the finding that the overall kilocalorie intake was higher than expected. The reason for this is unclear but this may be at least partially explained by the inclusion of subsyndromal patients. Also some participants may have engaged in excessive exercise.

Reported binge eating in combination with purging correlated with markedly higher food intake in comparison with days during which neither behavior occurred or only binge eating or purging occurred. Binge eating coupled with purging resulted in an almost three-fold increase in caloric intake compared with other types of days. It would appear that on days when purging does not occur, binge eating results in modest food intake; whether this is in anticipation of not purging or due to a failure to purge is unclear.

Strengths of the study included the methodology of measuring food intake as a function of daily AN behaviors, having both dietary data from NDS-R and momentary assessment data from palmtop computers. Our findings show clear disturbances and variability in food intake associated with eating and purging behaviors.

There are several limitations to the current study. Because the women only reported 1–3 days of food intake in NDS-R, only those days could be analyzed with the corresponding EMA data. This picture of eating patterns and behaviors over a short period of time for each participant may not be fully representative of their usual eating behaviors. Another limitation to these results was the inability to associate a particular binge eating episode recorded on the palmtop computers to a particular eating episode recorded using NDS-R, since NDS-R did not characterize episodes as "binge eating" or "non-binge eating." Further research is needed to pinpoint and quantify specific binge eating episodes in AN.

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