EATING DISORDERS AND SLEEP DISTURBANCES IN YOUNG ADULTS: A PROSPECTIVE COHORT STUDY

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Purpose: There is a paucity of large-scale, long-term, prospective data enabling the examination of the association between eating disorders and sleep disturbance. The objective of this study was to determine the association between eating disorders, disordered eating behaviors, and sleep disturbance in a nationally representative sample of young adults in the US, and evaluate the contributing role of depression to the associations.

Methods: We used prospective cohort data of young adults ages 18-26 from the National Longitudinal Study of Adolescent to Adult Health (N=12,082). Exposures of interest (at 18-26 years) included 1) an eating disorder diagnosis; 2) unhealthy weight control behaviors including fasting/skipping meals, vomiting, laxatives/diuretics, or diet pills for weight loss; and 3) loss of control/overeating. Sleep disturbances at seven-year follow-up included trouble falling or staying asleep (number of days per week). A nine-item version of the Center for Epidemiologic Studies-Depression Scale (CES-D) was used to assess depressive symptoms. Negative binomial regression analyses were used to identify associations with sleep (trouble falling and staying asleep at seven-year follow-up) as the dependent variables, and eating disorders/disordered eating behaviors as the independent variables, adjusting for age, sex, race/ethnicity, household income, parents' highest education, body mass index, and baseline sleep disturbances, with or without depression. Regression coefficients were transformed to incidence rate ratios (IRR).

Results: In negative binomial regression models, an eating disorder diagnosis, unhealthy weight control behavior, and overeating or loss of control eating were all significantly associated with trouble falling and staying asleep. An eating disorder diagnosis (versus no eating disorder diagnosis) was associated with trouble falling (IRR 1.36, 95% CI 1.16-1.59) and staying (IRR 1.25, 95% CI 1.09-1.43) asleep, adjusting for socio-demographics but not depression. When depression was added to the model, depression was also significantly associated with difficulties falling (IRR 1.05, 95% CI 1.04-1.05) and staying (IRR 1.03, 95% CI 1.03-1.04) asleep. In the context of depression, the associations between eating disorder diagnosis and trouble falling (incidence rate ratio [IRR] 1.24; 95% CI 1.05-1.46) and staying (IRR 1.16; 95% CI 1.01-1.35) asleep remained statistically significant; however, the associations between eating behaviors (unhealthy weight control behaviors and overeating or loss of control eating) and sleep disturbances were attenuated and no longer statistically significant.

Conclusions: Our findings reveal a prospective relationship between eating disorder diagnosis and subsequent sleep disturbances seven years later. Interestingly, even after accounting for socio-demographics and depressive symptomatology, the relationship between eating disorder diagnosis and sleep disturbance remained. Depression is an important covariate to consider when assessing the relationship between eating disorder and sleep disturbance, given that sleep disturbance is a primary symptom of depression and the high comorbidity between eating disorders and depression. Clinicians caring for young adults with eating disorders or who engage in disordered eating behaviors should assess for and intervene upon sleep disturbances.
YOGA AS AN INTERVENTION TO PROMOTE BONE HEALTH IN ADOLESCENTS WITH RESTRICTIVE EATING DISORDERS

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**Purpose:** Bone density in adolescent girls with restrictive eating disorders (EDs) may be adversely affected by insufficient nutrition, energy imbalance, and a low estrogenic state. Yoga promotes stress reduction, and strengthens joints and muscles around bones. The aim of this study was to examine the effects of a yoga intervention on axial and peripheral bone mineral density (BMD) in adolescent females with restrictive EDs.

**Methods:** Participants were young women 13-18 years of age (n=15) with a restrictive ED being treated in an outpatient ED program. All 15 participants received standard outpatient care. The participants who were randomized to the yoga group (n=7) also participated in a twice weekly yoga intervention. Yoga classes were at a beginners’ level and followed a standardized structure which begins with release of tension and gentle breathing exercises. The active component involved balancing poses including inversions, hip and shoulder movements, and moving the spine in all directions to improve balance and flexibility. Axial BMD was evaluated by dual energy x-ray absorptiometry (DXA) and peripheral BMD was evaluated by peripheral quantitative computed tomography (pQCT) at baseline and six months. Anthropometric data were collected and participants completed the Youth Adolescent Food Frequency Questionnaire (YAQ) to assess nutritional intake at each study visit. Independent sample t-tests were used to evaluate the difference in bone density between the two groups. The study was IRB approved.

**Results:** Participants randomized to the yoga intervention showed improvement of both absolute BMD for the lumbar spine (+0.02 g/cm\(^2\) in the yoga group vs. -0.01 g/cm\(^2\) in the non-yoga group, p<0.05) and the accompanying BMD Z-score (+0.04 in yoga group vs. -0.19 in the non-yoga, p<0.05) compared to the non-yoga group. No significant differences were observed in peripheral bone density between the groups. Participants in both groups gained weight (3.1 ± 2.2 kg in the yoga group vs. 1.7 ± 3.2 kg in the non-yoga group). However, changes in weight, body mass index, fat mass, lean body mass, and nutritional intake between the groups did not differ significantly.

**Conclusions:** Axial (non-weight-bearing) BMD improved among the yoga participants, compared to the non-yoga group. However, no significant differences in weight, body composition, and nutritional intake were observed. A gentle yoga intervention may be beneficial for improving axial bone health in patients with a restrictive eating disorder. Yoga may be an adjunct therapy for this patient group to engage in safe, gentle physical activity that focuses on mindfulness and body awareness while also mediating the deleterious impact that a restrictive eating disorder can have on BMD.

**Sources of Support:** Division of Adolescent and Transition Medicine, CCHMC, NIH Grant 5UL1TR001425-04 (Clinical and Translational Science Award to the University of Cincinnati). LEAH training grant #T71MC00009, MCHB, HRSA
HOUSEHOLD FOOD INSECURITY DURING ADOLESCENCE: ASSOCIATIONS WITH DISORDERED EATING BEHAVIORS AND OVERWEIGHT AT BASELINE AND 8-YEAR FOLLOW-UP
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Purpose: Food insecurity during adolescence poses a particular threat to appropriate growth and development due to adolescents’ elevated energy and nutrient needs. The prevalence of disordered eating is high during adolescence, yet studies examining the relationship between food insecurity and disordered eating in this population are limited. The current population-based longitudinal cohort study examines how household food insecurity during adolescence is related to disordered eating behaviors and weight status at baseline and 8-year follow-up.

Methods: Participants were ethnically diverse and primarily low-income adolescents (baseline mean age=14.5 years, n=2,285) surveyed within Minneapolis/St. Paul public middle and high schools in the EAT 2010-2018 study. Their parents/caregivers were surveyed by mail. At 8-year follow-up, young adults completed surveys via mail and online. All study procedures were approved by the University of Minnesota’s Institutional Review Board Human Subjects Committee. Parent report of household food insecurity was assessed at baseline with the validated six-item US Household Food Security Survey Module. At baseline and 8-year follow-up, outcome measures included unhealthy weight control behaviors, binge eating, meal frequency, and weight status. Crude and adjusted (socioeconomic status and race/ethnicity) generalized regression models with robust standard errors were used to estimate marginal probabilities and 95% confidence intervals for each baseline outcome variable. Additional analyses will explore associations between baseline food insecurity and both eating behaviors and weight status at 8-year follow-up.

Results: At baseline, 38.9% of adolescents resided in a household that experienced food insecurity in the past year, 43.2% reported disordered eating, and 39.6% were overweight. In unadjusted models, food insecurity was associated with higher overweight status (food insecure: 42.3% versus food secure: 37.9%, p=0.039), lower breakfast consumption (food insecure: 4.1 times/week versus food secure: 4.4 times per week, p=0.005), and greater use of unhealthy weight control behaviors (food insecure: 49.0% versus food secure: 39.5%, p<0.001). After adjustment for socioeconomic status and ethnicity/race, food insecurity was associated with unhealthy weight control behaviors (food insecure: 44.7% versus food secure: 38.2%, p=0.003), but not with weight status or other eating behaviors. Longitudinal analyses are underway and results will be discussed.

Conclusions: To the best of our knowledge, this study is the first to investigate cross-sectional and longitudinal associations between household food insecurity during adolescence with both weight status and disordered eating. Results highlight the prevalence of disordered eating, household food insecurity, and overweight in urban adolescents and suggest that food insecurity may be an independent risk factor for unhealthy weight control behaviors, indicating a need to approach these intersecting issues in a comprehensive manner.

Sources of Support: This study was supported by grant numbers R01HL127077 and R35HL139853 from the National Heart, Lung, and Blood Institute. It was also supported by grant number 5 T79MC00007-31-00 from Health Resources and Services Administration Maternal and Child Health
51. DISTANCE TO CARE AS A PREDICTOR OF LOSS TO FOLLOW-UP IN ADOLESCENT EATING DISORDER TREATMENT

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Purpose: This study aims to determine whether distance to care predicts loss to follow-up amongst adolescents and young adults (AYA) receiving treatment for an eating disorder.

Methods: Retrospective data on 10-25-year-old AYA meeting DSM-IV criteria for anorexia nervosa (AN), bulimia nervosa (BN), or EDNOS were reviewed as part of a secondary data analysis. AYA were evaluated as inpatients or outpatients at a large children's hospital between 2004-2008 and had at least one documented follow-up visit at the institution. Zip code centroids were generated with ArcGIS, a geographic information system, to estimate Euclidean distance, network travel distance, and travel time between primary residence zip codes and the hospital. Data from 235 patients were reviewed with 202 included in the final analysis after excluding patients without follow-up at the institution (25) or with missing data (8). Data analysis was performed using STATA/IC 15.1. Predictors, outcomes, and potential interaction variables were defined a priori. Descriptive and inferential statistics were utilized to compare outcome and predictor variables with parametric (Student’s t-test, one-way ANOVA) and non-parametric (chi-square, Wilcoxon ranksum, Kruskal-Wallis) tests. Time-to-event analyses were performed to assess the impact of distance to care on loss to follow-up. The Cox proportional hazards regression model was used to estimate hazard ratios with Kaplan-Meier curves used for visual representation of survival analyses.

Results: The sample population was 90% female with a mean age of 15.6 years and mean initial percent ideal body weight (IBW) of 86.4%. 39% met DSM-IV criteria for AN, 14% for BN, and 47% for EDNOS. 23% had a history of overweight or obesity; 38% had a history of prior admission; and 61% had a co-morbid psychiatric diagnosis. Median Euclidean distance from primary zip code centroids to the institution was 17.5 miles (IQR 7.86-25.44), and median network travel distance was 20 miles (IQR 11.66 – 32.58). Subjects who traveled an estimated network distance greater than 17.5 miles from their primary residence to the institution were 74% more likely to be lost to follow-up (HR 1.74; p 0.005; 95% CI [1.18-2.57]). Similarly, older subjects were 10% more likely to be lost to follow-up for each one-year increase in age (HR 1.096; p 0.016; 95% CI [1.01-1.18]). In contrast, subjects with a co-morbid psychiatric diagnosis were 49% less likely to be lost to follow-up (HR 0.51; p <0.001; 95% CI [0.36-0.73]), and those with any prior admissions for eating disorder management were 38% less likely (HR 0.62; p 0.014; 95% CI [0.43-0.91]).

Conclusions: Greater network travel distance and increasing age are associated with loss to follow-up in AYA with eating disorders evaluated at a large children’s hospital. History of prior admission and known psychiatric diagnoses were protective against loss to follow-up. To our knowledge, this is the first study to demonstrate an association between network travel distance and loss to follow-up in AYA with eating disorders. Given this along with prior data demonstrating a correlation between distance to care and worsened eating disorder severity at presentation, future studies should consider the impact of distance to care on long-term outcomes.

Sources of Support: None
ANXIETY IN HOSPITALIZED ADOLESCENTS WITH ANOREXIA NERVOSA ON A RAPID REFEEDING PROTOCOL
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**Purpose:** The approach to refeeding adolescents with anorexia nervosa (AN) traditionally has been conservative, with slow advancement of calories, to decrease risk of refeeding syndrome. Research supports the safe use of more rapid refeeding protocols. No studies have evaluated the impact of rapid refeeding on patient anxiety. The objective of this study was to describe the progression of state anxiety in hospitalized adolescents with AN on a rapid refeeding protocol.

**Methods:** Patients 12-21 were eligible to participate if they met DSM-5 criteria for AN, were hospitalized for refeeding, and were able to complete the measurement tools. Care was provided on a medical floor, with limited mental health support. Subjects were started on a standardized diet of 1500-1800 kcal daily and advanced by 300 kcal daily until consistent weight gain was achieved or they were discharged. A liquid nutrition supplement was offered for food not eaten. Supplements not consumed orally were administered via nasogastric tube. Upon enrollment, subjects completed the State Trait Anxiety Inventory for Children (STAI-CH). The STAI-Trait is comprised of separate, self-report scales for measuring two distinct anxiety concepts: state anxiety (S-Anxiety) and trait anxiety (T-Anxiety). Scores on both the S-Anxiety and T-Anxiety subscales range from a minimum of 20 to a maximum of 80 with higher scores indicative of increased anxiety. S-Anxiety was then measured daily immediately before and after breakfast.

**Results:** Twenty-two inpatients participated between October 2017- September 2018. Most were female (86%) with a mean age of 14.98 ±2.27 years, and 95% had AN-R. At admission, mean BMI was 17.33 ±3.02 kg/m2, mean heart rate 43.91± 5.93 bpm and mean estimated caloric intake 784±459 kcal/day. Mean duration of admission was 6.33±1.56 days. At time of discharge, average caloric intake was 2768±225 Kcal, and mean weight gain during admission was 1.74± 1.29 Kgs. At baseline, average S- and T- anxiety scores were 38.29± 6.66 and 36.64± 7.90, respectively. Overall, pre-meal and post-meal S-Anxiety were highly correlated (correlation coefficient 0.73, p < 0.001) with a mean pre- and post-meal S-Anxiety score of 37.34±7.73 and 38.87±8.07, respectively. Post-meal S-Anxiety, but not pre-meal, was significantly correlated with quantity of liquid supplement consumed (correlation coefficient 0.26, p = 0.04). Neither pre- nor post-meal S-Anxiety was correlated with daily caloric intake. Mean pre-or post-meal S-Anxiety did not increase from day 1 to day 8 of hospitalization (pre-meal 36.67±6.64 day1 vs. 34.00±5.94 day 8; post-meal 39.87±8.08 day 1 vs. 35.00±7.53 day 8).

**Conclusions:** Among hospitalized adolescents with AN, state anxiety did not appear to worsen with advancing calories on a rapid refeeding protocol. This study provides additional support for the use of more rapid refeeding protocols in hospitalized patients with AN.

**Sources of Support:** None
DISORDERED EATING AND BODY IMAGE DISSATISFACTION IN SEXUAL MINORITY YOUTH AND THEIR EATING DISORDER SPECIALIZED HEALTH CARE UTILIZATION PATTERNS

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Purpose: To determine the prevalence of disordered eating behaviors (DEB) and body image dissatisfaction (BID) in a large adolescent primary care population and according to sexual minority youth (SMY) status, and to describe health care utilization patterns for SMY versus non-SMY.

Methods: Retrospective teen well check questionnaire (TWCQ) data, completed by youth ages 12.5-18 years visiting one of 53 Kaiser Permanente Northern California (KPNC) facilities in 2016, was used to assess BID, DEB, and SMY status. SMY status was defined as self-reported attraction to both-sex or same-sex; non-SMY are those who report attraction to opposite-sex, "unsure", or "neither." BID was evaluated by one question on the TWCQ asking: "Do you have concerns about your weight, body size or shape? (yes/no)" DEB was evaluated by the question: "Have you used laxatives or diet pills, over-exercised, starved, or made yourself vomit to try to control your weight? (yes/no)" Descriptive multivariable statistics are reported, examining associations between SMY status and DEB and BID, adjusting for demographic characteristics (age, sex, race/ethnicity) and body mass index (BMI). The utilization of specialized eating disorder care (medical and mental health) and general mental health services were characterized among youth according to DEB, BID, and SMY status at one KPNC facility.

Results: Among 107,528 teens who answered the TWCQ, 98% responded to the BID and DEB questions. BID was reported in 20,763 (19.3%) youth, DEB in 1,458 (1.7%) youth and 5,363 (5%) youth were SMY. SMY had greater prevalence of BID (35.4% vs 19%) and DEB (7.8% vs 1.7%) compared to non-SMY. Adjusting for demographic factors and BMI, compared to non-SMY, SMY had 2 higher odds of BID (aOR [95% CI]: 2.0 [1.9-2.2]) and 4 times odds of DEB (aOR :3.8 [3.4-4.3]). Regardless of SMY status, youth with older age, female sex, non-white race, and elevated BMI had higher odds of BID and DEB. Descriptive utilization data was collected for 4,210 youth seen at one facility. SMY had higher general mental health utilization than non-SMY regardless of BID or DEB status (23.5% and 36.7%). SMY with BID or DEB had higher eating disorder medical utilization than non-SMY with BID or DEB (4.6% vs 1.6%). However, SMY status was not associated with utilization of specialized eating disorder mental health services.

Conclusions: SMY had higher rates of self-reported BID and DEB. These higher rates translate to higher utilization of specialized eating-disordered medical and general mental health services, but not specialized eating-disorder mental health services. Besides SMY status, there is a significant association of DEB and BID among female, ethnic/racial minority and older youth and among youth with higher BMIs. Eating disorders are a major public health concern among youth, with the highest mortality rates among those with mental health diagnoses and with increasing evidence of LGBTQ being at risk for eating disorders. Future targeted efforts to prevent eating disorder-related mortality and morbidity for SMY should include targeted eating disorder screening and referral to specialized eating disordered medical and mental health services.

Sources of Support: n/a