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A register-based case-control study of health care utilization and costs in binge-eating disorder☆

Hunna J. Watson[a,b,c,*], Andreas Jangmo[d], Tosha Smith[a], Laura M. Thornton[a], Yvonne von Hausswolff-Juhlin[e,f], Manisha Madhoo[g], Claes Norring[e,f], Elisabeth Welch[d,e,f], Camilla Wiklund[d], Henrik Larsson[d,1], Cynthia M. Bulik[a,d,h,1]

[a] Department of Psychiatry, University of North Carolina at Chapel Hill, Chapel Hill, NC, United States
[b] School of Psychology and Speech Pathology, Curtin University, Perth, Western Australia, Australia
[c] School of Paediatrics and Child Health, The University of Western Australia, Perth, Western Australia, Australia
[d] Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, Stockholm, Sweden
[e] Stockholm Centre for Eating Disorders, Stockholm, Sweden
[f] Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden
[g] Shire, Lexington, MA, United States
[h] Department of Nutrition, University of North Carolina at Chapel Hill, Chapel Hill, NC, United States

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ABSTRACT

Objective: Capturing trends in healthcare utilization may help to improve efficiencies in the detection and diagnosis of illness, to plan service delivery, and to forecast future health expenditures. For binge-eating disorder (BED), issues include lengthy delays in detection and diagnosis, missed opportunities for recognition and treatment, and morbidity. The study objective was to compare healthcare utilization and expenditure in people with and without BED.

Methods: A case-control design and nationwide registers were used. All individuals diagnosed with BED at eating disorder clinics in Sweden between 2005 and 2009 were included (N = 319, 97% female, M age = 22 years). Ten controls (N = 3190) were matched to each case on age-, sex-, and location of birth. Inpatient, hospital-based outpatient, and prescription medication utilization and expenditure were analyzed up to eight years before and four years after the index date (i.e., date of diagnosis of the BED case).

Results: Cases had significantly higher inpatient, hospital-based outpatient, and prescription medication utilization and expenditure compared with controls many years prior to and after diagnosis of BED. Utilization and expenditure for controls was relatively stable over time, but for cases followed an inverted U-shape and peaked at the index year. Care for somatic conditions normalized after the index year, but care for psychiatric conditions remained significantly higher.

Conclusion: Individuals with BED had substantially higher healthcare utilization and costs in the years prior to and after diagnosis of BED. Since previous research shows a delay in diagnosis, findings indicate clear opportunities for earlier detection and clinical management. Training of providers in detection, diagnosis, and management may help curtail morbidity. A reduction in healthcare utilization was observed after BED diagnosis. This suggests that earlier diagnosis and treatment could improve long-term health outcomes and reduce the economic burden associated with BED.

1. Introduction

Binge-eating disorder (BED) is characterized by the regular consumption of unusually large amounts of food accompanied by a sense of loss of control, in the absence of regular compensatory behaviors (e.g., self-induced vomiting) [1]. The lifetime prevalence is 3.5% in women and 2.0% in men [2,3]. BED is associated with obesity, type 2 diabetes, and suicide [2,4–7]. Despite its prevalence and somatic and psychological comorbidities [2,4,7], few studies have considered health care utilization and expenditure in individuals with BED [6,8–11].

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* Corresponding author at: Department of Psychiatry, University of North Carolina at Chapel Hill, CB #7160, 101 Manning Drive, Chapel Hill, NC 27599-7160, USA.
E-mail address: hunna_watson@med.unc.edu (H.J. Watson).

[1] These authors contributed equally to this publication.

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Investigating disease-specific healthcare utilization is crucial for forecasting demands on medical infrastructure and for guiding policy and health service planning.

Grenon et al. [11] determined that average healthcare cost in the six months prior to diagnosis was 36% higher for overweight women with BED (n = 105) relative to the age-and-sex matched national norm. Excluding non-overweight individuals may have biased the sample toward greater utilization, and generalizability was limited by the lack of an appropriate control group. Bellows et al. [8,9] compared electronic health records of veterans with BED (n = 257, 75% female) and without BED. In the year following diagnosis, cases had higher inpatient and psychotherapy use, longer inpatient stays, and more prescriptions than controls. In the year preceding diagnosis, median total health care expenditure did not differ significantly between the groups; however, in the year following BED diagnosis, total cost doubled for cases. Greater medication utilization in the year before and after diagnosis for people with BED (n = 238, 96% female) relative to matched controls was reported in a nationwide Swedish register study [6].

Individuals with BED appear to have significantly greater healthcare utilization, particularly in the year after detection, but evidence is limited. Samples have been selective (i.e., overweight, veterans), and observations were limited to the year before and after diagnosis. We fill the gap in the healthcare utilization literature by studying a large, population-based, longitudinal sample from Swedish nationwide register data. Given the morbidity and typical delay in diagnosis and help-seeking [12,13], we expected significantly greater and accelerating utilization and expenditure among those with BED in the years preceding diagnosis, relative to controls. The analyses regarding the pattern of utilization and expenditure after the index date are exploratory, due to a lack of prior research.

2. Method

2.1. Study population

The sample (319 cases, 3190 controls, total $N = 3509$) represents a total population cohort ($N = 1{,}949{,}199$) born between 1979 and 1993 identified in the Swedish registers. BED cases were identified from *Riksät* and *Stepwise*—longitudinal quality assurance registers that capture nearly all individuals receiving inpatient, day patient, or outpatient specialist eating disorder treatment in Sweden [14]. Criteria for inclusion in *Riksät* and *Stepwise* are medical or self-referral to a participating clinic, an eating disorder diagnosis by a medical provider, and intent-to-treat the patient. For the *Stepwise* register, research participation is elective via an opt out procedure (~3% decline participation [15]). All patients with a DSM-IV [16] BED diagnosis between 2005 and 2009 were included as cases. In this study, the date of the first diagnosis of BED represents the index date. The first diagnosis could occur at the initial clinic presentation or at a follow-up evaluation after presentation for another eating disorder. Follow-up eating disorder assessments (available for ~69% of registrants) are annual while treatment is ongoing.

We ascertained 10 controls for each case using the *Multi-Generation Register* [17] matched by sex, and year, month, and county of birth. Controls were also matched on immigration status and time of migration (controls could not immigrate later than their respective cases) if cases were born outside of Sweden. Controls had to be alive and a resident in Sweden for an equivalent time period: from birth or immigration until the end of study follow-up of their index case. Controls were not allowed to have received a BED diagnosis in *Riksät* or *Stepwise*, but they could have had another eating disorder (which was detected in 0.7% of controls) recorded in *Riksät*, *Stepwise*, or the *National Patient Register* [18].

The national personal identification number was used to link registers. The University of North Carolina Biomedical Institutional Review Board and the Regional Ethics Committee of Karolinska Institutet approved this study. Inclusion in Swedish population registers does not require informed consent.

2.2. Measures

2.2.1. Demographics and comorbidity

Demographics were obtained from Sweden's *Total Population Register and Longitudinell Integrationsdatabas för Sjukförsäkrings- och Arbetsmarknadsstudier* (LISA: Longitudinal Integration Database for Health Insurance and Labour Market Studies). Lifetime psychiatric comorbidity was obtained from the *National Patient Register*.

2.2.2. Healthcare utilization and expenditure

Inpatient admissions and hospital-based outpatient visits were coded from the *National Patient Register*. For each participant, data were obtained where available from 8 years prior to 4 years after the index date (denoted $year - 8$ to $year + 4$). The principal *International Classification of Diseases, Tenth Revision* [19] (ICD-10) diagnostic code for each occasion of service use was used to help establish costs. Cost information was obtained from Sweden's *Costs Per Patient* database which provides cost estimates annually based on individual patient contact with hospital care according to the principal ICD diagnosis. ICD comorbidities are recorded, but there is no adjustment to cost for these. Using the principal ICD diagnosis for the healthcare occasion, inpatient and outpatient utilization and expenditure were classified into psychiatric and somatic.

Utilization and expenditure for medication prescriptions fills were obtained from the *Swedish Prescribed Drug Register,* which contains complete data (> 99%) for all medications prescribed and dispensed to the entire Swedish population since July 1, 2005 [20].

Since this a newer database, only utilization four years before and four years after the index date could be included (i.e., $year - 4$ to $year\ 4$). The register uses the Anatomical Therapeutic Chemical (ATC) classification system. Medication use was classified into psychiatric (N codes) and somatic. See Supplementary Table S1 for information on ATC codes and availability in the Swedish Prescribed Drug Register. Costs equaled dispensed days × dose per day × corresponding unit costs. Utilization and expenditure that occurred on the index date were not included for all healthcare types. For further information on the data, see Supplementary Table S2.

2.2.3. Currency and inflation

Expenditure was calculated in Swedish crowns (SEK) then inflated to 2015 Swedish prices. Costs are reported in the tables and text in US dollars (2015). The purchasing power parity based exchange rate in 2015 was 1.00 US dollar = 9.03 SEK [11].

2.2.4. Covariates

Factors that explain variability in healthcare utilization include low socioeconomic status, advancing age, and female sex [21]. Parental education and income were included as covariates, as proxies for socioeconomic status. Parental education and income were obtained from *LISA* for the index year. Parental education was assessed as the highest level attained by either parent (primary school, secondary school, or tertiary education). Income was assessed as the individual share of disposable family income, and was obtained by calculating the sum of family members' disposable income multiplied by individual consumption weights (0.96 for adults), then divided by the total family consumption weight. Net values in SEK were grouped into median splits for analysis. Age and sex were accounted for already in the study design.

2.3. Statistical analysis

Hurdle models compared annual healthcare utilization and expenditure between cases and controls. The hurdle likelihood function