Disability and Health Journal 9 (2016) 632–637

Disability and Health Journal

www.disabilityandhealthjnl.com

Research Paper

The bidirectional association between body weight and mobility disability: A population-based cohort

Jeroen S. de Munter, Ph.D.[a,*], Per Tynelius, M.Sc.[a], Gerd Ahlström, Ph.D.[b], and Finn Rasmussen, Ph.D.[a]

[a]*Child and Adolescent Public Health Epidemiology Research Group, Department of Public Health Sciences, Karolinska Institutet, Sweden*
[b]*The Swedish Institute for Health Sciences, Department of Health Sciences, Lund University, Sweden*

Abstract

Background: Obesity is more common in people with mobility disability than in non-disabled individuals, but less is known about the longitudinal effects leading to this health state.

Objective: To explore the potential bidirectional association between mobility disability and obesity.

Methods: Participants were identified in the population-based Stockholm Public Health Cohort (2002–2010, n = 17 945). Observations with schizophrenia, depression, eating disorder, or cancer within 5 years during and prior to baseline were excluded. Mobility disability and height and weight to calculate BMI (kg/m^2) were self-reported. We used multivariate-adjusted regression models to estimate relative risks (RRs) and 95% confidence intervals (CI) based on new cases of mobility disability in cohorts that were obese, overweight or normal weight at baseline, and increases in BMI over time by mobility disability status.

Results: Obesity at baseline was associated with incident mobility disability. The highest risk was observed in middle-aged women (RR = 3.95, CI = 2.35–6.65). Young men and middle-aged women with long-term mobility disability increased more in BMI (men: 1.55 kg/m^2, 0.61–2.49; women: 0.38, 0.01–0.75), as well as young and middle-aged people with incident mobility disability (young men: 0.68 kg/m^2, 0.10–1.27; middle-aged men: 0.49, 0.20–0.77; young women: 1.41, 0.94–1.87; middle-aged women: 0.64, 0.36–0.93) compared to the groups without any mobility disability.

Conclusions: In this paper, we demonstrated the bidirectional and longitudinal associations between body weight and mobility disability and thus the increased risk of developing the combination over time from either condition. Effective health-promotion and prevention strategies are needed to prevent worse health for these vulnerable groups in society.

Keywords: Walking limitation; Disability; Physical disability; Weight gain; Observational cohort

Currently, levels of overweight and obesity in most industrialized countries are increasing or, at least, at their highest points in recent history.[1] Certain lifestyle characteristics, such as healthy eating habits and physical activity, may help to protect against or delay the development of obesity.[2] However, people with a mobility disability may be limited in their physical activity.

People with a mobility disability are more often obese than people without,[3–5] and people with obesity report more often joint pain or osteoarthritis,[6] which is expected to lead to mobility disability. However, people with a mobility disability without obesity might also be more prone to gain weight, for example, because of a limited opportunity to engage in physical activity. Additionally, co-morbidities such as diabetes, heart failure and depression are often present in people with a mobility disability,[7,8] which can be considered contributing factors to cause mobility disability and weight gain. The International Classification of Functioning, Disability and Health is a theoretical framework developed by the WHO that may facilitate understanding of hypothesized bidirectional relationships between obesity and mobility disability.[9] In brief, the framework distinguishes six components of health (body functions & structure, activity, participation, environmental factors, health condition, and personal factors), and includes bidirectional relationships between the health components. The mobility disability can therefore be seen as determinant of worsened personal factors as well as being

An earlier version of these findings was presented at the European Congress on Obesity in 2013.

Conflict of interest: None declared.

Funding: This work was supported by a program grant from the Swedish Council for Working Life and Social Research [grant number: 2010-1828].

* Corresponding author. Child and Adolescent Public Health Epidemiology Research Group, Department of Public Health Sciences, Karolinska Institute, Tomtebodavägen 18A, 171 77 Stockholm, Sweden. Tel.: +46 (0) 8 524 801 62.

E-mail address: jeroen.de.munter@ki.se (J.S. de Munter).

1936-6574/$ - see front matter
http://dx.doi.org/10.1016/j.dhjo.2016.06.001

affected by personal factors. The bidirectional state of personal factors with the previously mentioned health components is in conceptual agreement in the scientific community.[10] However, most previous studies presented results from cross-sectional data or were limited to only one of these causal patterns, which prevented testing hypotheses of bidirectionality.

Better understanding of the nature and strengths of longitudinal and bidirectional associations between mobility disability and obesity in population settings may facilitate development of more efficient health-promotion efforts. Accordingly, the aim of this study is twofold: First, to explore whether people with overweight or obesity at baseline, but without mobility disability, are at greater risk of developing mobility disability during follow-up, and second, to explore whether those with mobility disability at baseline are at increased risk of weight gain during follow-up than people without such a disability independent of their baseline BMI.

Methods

Study design and population

In 2002, a stratified random sample of 49,909 individuals aged 18–84 years, living in Stockholm County (total population: 1.9 million), Sweden, were invited to answer a questionnaire.[11] In 2002, the response rate was 62.5% (n = 31 182), with subsequent response rates of 76.3% (n = 23 794) in 2007 compared to 2002, and 81.2% (n = 19 327) in 2010 compared to 2007. Thus, compared to the original stratified random sample 38.7% of the individuals responded in 2010. Register data from Statistics Sweden's Education Register was linked to the questionnaire as well as register data from the Cancer Registry and the National Patient Registry. The present study was approved by the Stockholm Regional Ethical Review Board (number: 2012/1193-31/5).

Inclusion criteria

This study was based on individuals that responded to both the baseline and follow-up in 2010 and reported weight, height, and the question regarding their mobility. To minimize misclassification based on erroneous reporting of weight or height in the surveys, we excluded participants with an extreme change in BMI (greater than 15 kg/m^2) between 2002 and 2010 (n = 29), or with extreme values for height (less than 150 cm or greater than 210 cm), or weight (less than 40 kg or greater than 150 kg), or BMI (less than 14 kg/m^2 or greater than 60 kg/m^2, n = 32). These cut-offs were predefined according to data cleaning recommendations.[12] Since our focus was not on underweight, and because underweight can be a determinant of various other health problems, we removed participants with underweight (BMI between 14 and less than 18.5 kg/m^2) at both times of measurement (n = 108). Following exclusions, the final study sample comprised 17,945 individuals.

Weight status and mobility disability

Body mass index (kg/m^2) was calculated from self-reported height and weight by dividing weight (in kg) by length in squared meters (m^2), while overweight (BMI ⩾ 25) and obesity (BMI ⩾ 30) were defined according to WHO criteria.[13]

Mobility disability was identified on the basis of a positive response to either of the following statements: ''I have some problems in walking about'' and ''I am confined to bed.'' Further, we operationalized long-term mobility disability as the reporting of mobility disability in both 2002 and 2010. Baseline mobility disability was attributed to participants who reported mobility disability in 2002 only. Incident mobility disability was present in participants who reported mobility disability in 2010, but not in 2002.

Other variables

Highest level of education was register linked from the Register of Education in 2002 and 2010. Groupings were based on relevant education categories and defined for the whole study period as: less than primary or primary school (up to 9–10 years), secondary school (11–13 years), and post-secondary including university education (> 13 years). Disease diagnoses were added by record-linkage of the National Patient Registry and the Cancer Registry. We excluded individuals with any of the following diagnoses within 5 years prior to or during 2002: eating disorder (ICD-10 code F50), schizophrenia or related (F20–F22, F25, F28–F29), mood disorders and depression (F30–F39), or malignant cancer (C0–C9, D45–D47). We excluded these conditions because of their known direct effect on weight status or indirect effects on body weight through use of prescription drugs.[14] However, new disease events after baseline were not excluded. As obesity is a determinant of health conditions other than mobility disability, e.g. heart disease and type 2 diabetes, which are in their turn, risk factors for mobility disability, we decided to not exclude or adjust for any of these conditions, because they might be mediating factors on the causal pathway between obesity and mobility disability. Cross-tabulations between disease status and mobility disability are included in our descriptive tables (Tables 1 and 2).

Analyses

Baseline characteristics are presented by mobility-disability status and by sex (Tables 1 and 2). The subsequent analyses were structured in two parts. First, we estimated relative risks (95% confidence intervals) to obtain the associations between weight-status group (normal weight, overweight, or obesity) at baseline and incident mobility disability in 2010 using Poisson regression with