The Association Among Overweight, Obesity, and Low Back Pain in U.S. Adults: A Cross-Sectional Study of the 2015 National Health Interview Survey

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ABSTRACT

Objective: The purpose of this study was to explore the association between obesity (via body mass index [BMI]) and presence of low back pain (LBP) in a representative sample of US adults, aged ≥18 years.

Methods: This cross-sectional study used data from 32 060 respondents to the 2015 National Health Interview Survey. Body mass index (kg/m^2) was calculated using reported height and weight and expressed as normal weight (<25 kg/m^2), overweight (25 to <30 kg/m^2), or obese (≥30 kg/m^2); 3-month prevalence of reported LBP was the targeted outcome. Weighted univariate and multivariable logistic regression (adjusting for age, sex, race/ethnicity, education, and leisure-time physical activity) were performed. Interaction by sex and race/ethnicity was also explored.

Results: Findings suggest a statistically significant association between BMI categories and LBP. The adjusted odds ratios (95% confidence interval) of LBP in overweight and obese participants were higher than those in normal weight participants: 1.21 (1.11-1.32) and 1.55 (1.44-1.67), respectively. Both sex and race/ethnicity statistically significantly modified the association between BMI and LBP. Compared with normal weight white men (reference), odds ratios (95% confidence interval) of LBP were higher among obese white men, obese white women, and obese nonwhite women (1.28 [1.10, 1.48], 1.58 [1.36, 1.84], and 1.36 [1.16, 1.60], respectively), and lower in overweight, nonwhite men, and normal weight nonwhite men and women (0.80 [0.68, 0.94], 0.62 [0.51, 0.76], and 0.73 [0.61, 0.87], respectively).

Conclusion: Overweight and obesity were associated with increased odds of LBP. However, the measures of associations varied in magnitude and direction by race and sex groups. (J Manipulative Physiol Ther 2018;xx:1-10)

Key Indexing Terms: *Low Back Pain; Obesity; Overweight; Body Mass Index*

INTRODUCTION

Low back pain (LBP) is considered one of the most common musculoskeletal problems in the general population.[1] The worldwide lifetime prevalence of LBP in 2012 was 39.9% ± 24.3%, and the 1-month prevalence of LBP was 23.2% ± 2.9%.[2] Although LBP is rarely life threatening, it is a physically disabling condition. More specifically, based on a 2010 study that investigated the global burden of 291 medical conditions, LBP was ranked sixth overall in disability-adjusted life years, a measure used to determine loss of total healthy years from disease.[3] Because of the high prevalence and severity of LBP, direct medical costs for LBP treatment ranged from US$12.2 and US$90 billion annually, making it a significant public health problem.[4]

The prevalence of LBP has been shown to vary by demographic characteristics, based on epidemiologic studies. In US adults, the prevalence of LBP generally increases with increasing age categories, until ages 60 to 65 years, when prevalence estimates decline.[5] The prevalence of LBP is higher in women than men, based on a systematic review of 165 studies from 56 countries.[2] Differences in the prevalence of LBP was also identified across racial and ethnic groups. More specifically, a previous study by Deyo et al[6] reported the highest prevalence of LBP in American

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Indians and Alaskan Native (AIAN), followed by whites, Hispanics, blacks, and Asians. Sociodemographic factors, including lower educational attainment and income, have also been reported to be positively associated with LBP.[7,8] This may be due to the fact that less educated and affluent individuals are more likely to reside in rural areas and more often participate in activities that require heavy manual labor.[9] Occupational tasks requiring lifting and material handling, static work postures, and use of vibrating equipment have previously been reported to be associated with LBP.[10-12] In a study by Heneweer et al,[13] the authors reported an increased odds of LBP among those who are inactive and excessively active.

Obesity is also a highly prevalent condition. Based on data from the 2011-2012 National Health and Nutrition Examination Survey, the age-adjusted prevalence of overweight (body mass index [BMI] ≥ 25 kg/m^2) and obese (BMI ≥ 30 kg/m^2) US adults (aged ≥ 20 years) was 68.5% (95% confidence interval [CI] 65.2%-71.6%) and 34.9% (95% CI 32.0%-37.9%), respectively.[14] In fact, the prevalence of individuals classified as overweight or obese in the US has been steadily climbing since 1976.[15] Factors that are associated with LBP are also associated with obesity, including age, sex, race/ethnicity, and physical activity.[15] However, subgroups at highest risk may vary between these conditions. For example, although the prevalence of LBP is highest in women, the prevalence of obesity is higher in men.

Obesity has long been considered a risk factor for LBP as a result of underlying biological plausibility. Anatomically, weight gain causes increased mechanical loading on the lumbar spine, which introduces a cascade of changes, including a reduction in disc hydration, altered biomechanics, and deleterious stress distribution of tissues, eventually leading to disc degeneration and LBP.[16,17] Therefore, based on these biological mechanisms, health care professionals tend to associate obesity with severity of low back pain, with additional expectations of a poorer prognosis and longer recovery time among these individuals.[18] However, unlike occupational exposures that may not be amenable to change, obesity is considered a modifiable risk factor.

Despite the underlying biological plausibility, epidemiologic evidence linking obesity and LBP has been conflicting. For instance, a systematic review revealed that only 32% of the 65 studies reviewed identified a positive association between obesity and LBP, whereas the rest reported statistically null associations.[19] Based on this comprehensive review, the Leboeuf-Yde et al[19] concluded that there was insufficient evidence to establish a causal link between body weight and LBP. However, a later meta-analysis identified a positive association between obesity and LBP when data from individual studies (including more recent investigations) were pooled.[20] Specifically, the pooled odds of reported LBP in the past 12 months was 1.23 times higher in overweight (odds ratio [OR] = 1.23, 95% CI 1.15-1.31) and 1.35 times higher in the obese (OR = 1.35, 95% CI 1.12-1.56) participants compared with normal weight participants. This provides some evidence of a causal relationship. However, like the studies included in the systematic review by Leboeuf-Yde et al,[19] results from more recent studies (ie, in the past 5 years) have been mixed, with some studies reporting a statistically significant positive association[21-24] and others reporting a statistically null association.[25-27] There is also inconsistency among nations; in a 9-country study, the association between overweight/obesity and back pain was positive for some countries and null for others.[28] Beyond the meta-analysis by Shiri et al,[20] this general lack of consistency across studies may be due to a variety of factors, including inadequate sample size, use of targeted population subgroups (eg, occupational cohorts), varied measures or classifications of obesity, and potential for residual confounding. Furthermore, relatively fewer obesity-LBP studies were conducted in the United States,[22,24,29-31] which limits the external validity of most study findings. Given these limitations, further studies in large and diverse populations are needed to clarify the relationship between obesity and LBP.

Therefore, the primary objective of this secondary data analysis was to examine the association between obesity (via BMI) and LBP in a diverse sample of adults enrolled as participants in the 2015 National Health Interview Survey (NHIS). The richness of the NHIS dataset also provides the unique opportunity to account for key covariates biologically relevant to this exposure-outcome relationship. This, in turn, reduces the potential for residual confounding resulting in a more precise measure of association. The underlying hypothesis being tested is that, compared with normal weight, overweight and obesity is associated with a higher risk of reported LBP prevalence among US adults, after adjustment for key covariates.

METHODS

Study Design and Participants

The National Health Interview Survey (NHIS) is a cross-sectional household interview survey conducted by the National Health Statistics Office of the Center for Disease Control and Prevention yearly, and most data contained are publicly available. Details about the sampling and data collection procedures are available online.[32] Briefly, the NHIS samples from the noninstitutionalized civilian population of the United States using a multistage probability sampling design and oversamples Hispanics and non-Hispanic blacks to provide a representative sample of US households. Study locations include 428 of the approximately 1900 primary sampling units throughout the United States, which consist of counties, towns, and metropolitan statistical areas. Trained US Census Bureau personnel conducted in-person interviews at each selected