Brief Report

Obesity Reduces the Risk of Pressure Ulcers in Elderly Hospitalized Patients

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Background. Both underweight and obesity have been suggested as risk factors for pressure ulcers (PU) development, although data are limited. Our aim was to evaluate the odds of PU in underweight and obese, relative to optimal weight patients.


Results. Patients who were underweight had greater odds of developing PU (adjusted odds ratio [OR] = 1.8, 95% confidence interval [CI], 1.2–2.6). Patients who were obese had reduced odds (adjusted OR = 0.7, 95% CI, 0.4–1.0), and those with severe obesity had the lowest odds of PU (adjusted OR = 0.1, 95% CI, 0.01–0.6).

Conclusions. These data suggest that extra body fat reduces the risk of PU in elderly hospitalized patients.

PRESSURE ulcers (PU) are common in elderly persons, with prevalence in the United States of 1.3 to 3 million adults (1). Malnutrition, typically defined as low albumin concentration (2–8) and/or weight loss (9,10), has been associated with PU in epidemiologic studies, although studies examining body weight as a risk factor are rare (2). Nursing practice reviews (11–13) and case studies (14,15) also suggest that nurses consider obesity a risk for PU. By contrast, studies have suggested that higher body mass index (BMI) may be associated with protection against PU (16–18).

The purpose of this project was to analyze data from a previously published prospective cohort study (17) to test the hypotheses that underweight is associated with increased odds of PU and that obesity is associated with decreased odds.

Materials and Methods

The source of data was a prospective cohort study carried out between 1998 and 2001 in two large inner-city hospitals affiliated with the University of Pennsylvania, using a protocol approved by the University of Pennsylvania Institutional Review Board. The methods have been described in detail elsewhere (17). Eligible patients were ≥ 65 years of age, admitted through the Emergency Department to the medical service. For patients too ill or confused to give verbal informed consent, proxy consent was obtained from the next of kin or authorized representative.

PU status was determined by a thorough visual skin assessment by specially trained research nurses on the third day of the patient’s hospital stay. Standardized examinations were performed with conventional overhead lighting, with the patient in flat and 45° supine positions on both the right and left side (18). Lesions in an area with active skin disease, wounds on the plantar surface of the foot, and wounds in the gaiter area of the leg were not considered to be PU. Standard recommendations were followed to avoid errors of diagnosis in patients with dark skin (19). For this analysis, PU was defined as one or more PU observed at the time of the skin examination.

During the physical examination, the research nurses recorded evidence of dry skin on a bony prominence, urinary and fecal incontinence, and whether the patient needed help turning in bed. Information on nursing home residence prior to admission and hospitalization within the past 6 months was obtained by interview of the patient or proxy.

Information on body weight and height was obtained from the hospital chart when available or by verbal report from the patient or proxy. Height and weight were available by self-report for all study patients and also by medical record abstraction for approximately 23% of patients. When both sources were available but disagreed, the medical record value was used. When either height or weight was not available (10%), the variable was estimated by multiple imputation as a function of demographic characteristics, anthropometric measures, and presence of a PU (20,21). BMI was defined as weight (kg)/[height(m)]2. The following BMI categories were created: malnourished (< 18.5), optimal (18.5–24.9), overweight (25–29.9), obese (30–39.9), and severely obese (≥ 40 kg/m2) (22).

Prevalence and central tendencies were described as percentage of total and mean ± standard deviation, respectively. The chi-square test was used to compare BMI, age,
Table 1. Prevalence of Pressure Ulcers (PU) by Stage and by Site

<table>
<thead>
<tr>
<th>Pressure Ulcer Stage and Site</th>
<th>N</th>
<th>% of Total PU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PU</td>
<td>608</td>
<td></td>
</tr>
<tr>
<td>PU Stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>93</td>
<td>15.3</td>
</tr>
<tr>
<td>2</td>
<td>304</td>
<td>50.0</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>4.3</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>2.0</td>
</tr>
<tr>
<td>Unstageable because of necrotic tissue</td>
<td>64</td>
<td>10.5</td>
</tr>
<tr>
<td>Unstageable because of dressing</td>
<td>109</td>
<td>17.9</td>
</tr>
<tr>
<td>PU site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacrum</td>
<td>259</td>
<td>42.6</td>
</tr>
<tr>
<td>Heel</td>
<td>111</td>
<td>18.3</td>
</tr>
<tr>
<td>Ischium</td>
<td>89</td>
<td>14.6</td>
</tr>
<tr>
<td>Trochanter</td>
<td>28</td>
<td>4.6</td>
</tr>
<tr>
<td>Lateral malleolus</td>
<td>19</td>
<td>3.1</td>
</tr>
<tr>
<td>Iliac crest</td>
<td>11</td>
<td>1.8</td>
</tr>
<tr>
<td>Other</td>
<td>91</td>
<td>15.0</td>
</tr>
</tbody>
</table>

race, and gender groups with respect to the proportion of patients with PU. Logistic regression analysis was performed with PU as the outcome variable, BMI as the predictor (using the optimal weight group as the reference category), and adjusting for sociodemographic and clinical variables and participants whose inclusion changed the estimate for BMI by $> 10\%$. Statistical analyses were conducted using SPSS 13.0 (SPSS, Chicago, IL) and S-PLUS 6.0 (Insightful Corp., Seattle, WA). For all procedures, $p < .05$ was considered statistically significant.

RESULTS

As reported previously (17), a total of 5303 patients were identified and 3233 enrolled, comprising 1971 females, with mean age 77.3 ± 7.9 years. There were 2242 African Americans, 856 Caucasians, and 127 patients of other races. For this analysis, Caucasians and patients of other races were combined. Eighteen patients with amputations, in whom BMI interpretation is unclear, and one patient with an extreme BMI value of 92 kg/m², were excluded. Thus, the number of participants included in the data analysis was 3214.

PUs (Table 1) were identified in 378 patients (11.8%), with most Stage II and in the sacral area. The mean BMI was 26.1 ± 6.7 (range = 11–68.1). Underweight patients represented 9.6% of the sample, optimal weight 37.9%, overweight 29.1%, obese 19.6%, and severely obese 3.8%. The prevalence of PU was greatest in the underweight patients (27.3%) and decreased as BMI increased, with a prevalence of 3.3% in patients with severe obesity (Table 2).

Odds ratios for the association between presence of PU and BMI status, adjusting for clinical and sociodemographic variables, are shown in Table 3. The odds of PU were 1.8 times greater (95% confidence interval [CI], 1.2–2.6) for underweight than optimal weight patients, adjusting for the other variables in the model. There were decreasing odds of PU with increasing BMI. The OR for overweight was 0.9 (95% CI, 0.6–1.3), for obesity 0.7 (95% CI, 0.4–1.0), and for severe obesity 0.1 (95% CI, 0.01–0.6). When the two obese groups were collapsed into a single group with BMI ≥ 30 kg/m², the adjusted risk of PU was 0.6 (95% CI, 0.4–0.9). For the 2820 patients who did not have imputed BMI, the adjusted OR was similar to the entire group, and the underweight, obese, and severely obese had OR that did not include 1.

DISCUSSION

PU prevalence was highest in the underweight patients in this sample of elderly hospital patients, whereas patients with overweight and obesity had fewer PU than the optimal weight patients. This latter finding is counter to the enhanced risk of obesity for PU development published by some authors (11–15) but strengthens the reduced risk stated by other authors (16–18).

Although the national concern with burgeoning obesity rates has been focused on negative health outcomes (22,23), these data suggest that obesity reduces the risk of developing PU in obese patients who live to old age. Perhaps the extra body fat stores, rather than adding pressure on the skin, provide an enhanced subcutaneous cushion to ease the pressure. This possibility was suggested by a recent study of measured peak-to-seat interface pressures in 75 elderly nursing home patients (24). The pressures were highest in thin patients and decreased stepwise as BMI increased to the maximum studied BMI of 40 kg/m².

Two studies have suggested that BMI might be protective against PU in nursing home patients. In 827 patients in Spain, where PU prevalence was 35.7%, BMI (as a continuous variable) was associated with an OR for PU of 0.94 (95% CI, 0.92–0.97) (16). In 14,607 patients in the United States, PU occurred in 2.3% and BMI (as a continuous variable) was associated with an OR of 0.97 ($p = .001$); however, the association between BMI and PU was not linear, and there was little increase in the OR after BMI 22.5–23.9 (25). The mean BMI in the current cohort of hospitalized patients (26.1) was higher than that in patients with PU (22.7) or without PU (24.2) in the Spanish study (16) and higher than that in patients in the previous U.S. study (23.2 kg/m²) (25). Furthermore, with the higher levels of obesity reported in this study, the odds of PU continued to decrease with increasing obesity.
The clinical implications of this study for nutritional screening of elderly patients are considerable. The results of this study suggest that a simple calculation of BMI can be used to evaluate the body weight–related risk of PU in elderly patients. Although we may be concerned about many clinical issues in patients with overweight and obesity, the risk of PU appears not to be a concern. In contrast, these data suggest that we need to redouble the effort for underweight patients.

Certain study limitations need to be recognized. Patients in this study were representative of the racial mix of West Philadelphia, which is heavily African American and Caucasian, and study findings may not apply to other ethnic groups. A concern is the small number of PU in the obese groups (46 in 630 patients with obesity and only 4 in 123 patients with severe obesity), which may limit the precision of estimates in these groups. The method of skin assessment used by our research nurses was rigorous and standardized, and included the turning of all patients on their side to inspect the sacral area. The research nurses were instructed to ask a hospital nurse if they needed help turning an obese patient. We recognize that there is some possibility that wounds might be obscured in flesh folds, although the likelihood seems limited due to the fact that PUs occur more typically over bony prominences.

When measured weight and height were not available, self-reported measures were used. In the healthy population, use of self-reported BMI underestimates the prevalence of obesity relative to measured values, largely due to the stigma of obesity in the culture (23). Self-reported BMI may also have a high degree of error in patients who have memory loss, who are not weighed regularly because of a physical disability that requires special equipment for weighing, or for whom the source of information was a proxy respondent.

The cross-sectional nature of this study makes it difficult to establish the temporal relationships between BMI and PU. If a change in BMI occurred after the PU arose, BMI might not be causally related to PU risk. However, PU status was measured on day 3 of the hospital stay. Given the acute nature of PU and the slower progression of BMI change, it is unlikely that the observed results were due to reverse causality.

According to this study, obesity in the elderly population provides protection against the development of PU. Obesity is also known to be associated with chronic conditions such as diabetes mellitus, hypertension, and sleep disorders. The decision about recommending weight loss in obese elderly patients must be made after evaluating all the health risks and benefits associated with obesity. Clearly, the greatest nutritional concern for PU risk is in patients who have already developed malnutrition, as evidenced by low BMI.

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References


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