Rapid Communication

Body Weight Changes in Elderly Psychogeriatric Nursing Home Residents

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Objective. This study was undertaken to identify predictors of body weight change in nursing home patients with possible to severe dementia.

Methods. For 24 weeks, 108 elderly residents of a nursing home were followed. Body weight was measured every 2 weeks. Other anthropometric characteristics, dietary intake, food behavior restrictions, psychological characteristics, medical status, and use of medicines were measured at baseline. Dietary intake was measured with a combined 3-day food record and by observations during the hot meals. Food behavior restrictions were measured following the classification of Berkhou. Dependency was measured by a questionnaire (Care Index Geriatrics), which measures restrictions in cognitive, physical, and social functioning. A generalized linear mixed effects model was used to investigate weight changes over time. The model was adjusted for age and sex.

Results. During the follow-up period, 26% of the participants lost and 22% gained at least 2 kg of body weight. Dependency ($β = -0.11, 95% confidence interval [CI] = -0.21, -0.01$) and decreased appetite ($β = -2.17, 95% CI = -4.32, -0.01$) were significantly associated with body weight loss, whereas body mass index ($β = 2.25, 95% CI = 1.98, 2.51$) and intake of fat ($β = 0.07, 95% CI = 0.01, 0.15$) were predictors of weight gain.

Conclusion. Dependency, body mass index, intake of fat, and decreased appetite are significant predictors of body weight changes.

MALNUTRITION and weight loss are often observed in institutionalized elderly persons (1–10). Consequences of weight loss, which can vary from 4% to 65%, include an increased risk of infections, number of falls, and length of hospitalization; it even increases mortality risk (8,10,11). Causes of weight loss are summarized in Morley’s mnemonic Meals on Wheels (Medication, Emotional, Alcoholism, Late-life paranoia, Swallowing problems, Oral problems, Nasocomial infections, Wanderling, Hyperthyroidism, Enteric problems, Eating problems, Low-salt or low-cholesterol and other diets, Stones and shopping problems) (12) and in Robbin’s nine Ds (Dentition, Dysgeusia, Dysphagia, Diarrhea, Disease, Depression, Dementia, Dysfunction, and Drugs) (13).

So far, the impact of these factors on body weight changes has been shown in retrospective or comparative studies (7,8,14–18). Morley and Kraenzenz (18) found in their retrospective study that depression is the most common cause of weight loss in nursing home residents. Gilmore and colleagues (15) found that, in nursing home residents, reduced functional ability, intake of 50% or less of food served for the past 3 consecutive days, and chewing problems were the most prevalent indicators of weight loss.

However prospectively, limited knowledge exists on the combined effects of these factors on body weight in institutionalized elderly persons. Therefore, this prospective longitudinal study in nursing home residents aims to identify predictors of body weight changes.

METHODS

Participants and Setting

The study was conducted in a geriatric nursing home in The Netherlands that houses elderly people with possible to severe dementia. Inclusion criteria were: age ≥ 65 years, body mass index (BMI) < 35 kg/m², probable presence of dementia, and having been in the nursing home for > 3 months. Exclusion criteria included: having terminal care, cancer, rheumatoid arthritis, or diabetes. Of the 192 residents, 46 did not meet the inclusion criteria, 5 had limited psychological functioning, and for 31 informed consent could not be obtained. For two residents, body weight was assessed only once. In total, 108 residents became involved in the study. The Medical Ethics Committee of Erasmus University Rotterdam approved the study protocol. For all participants, a family member’s written informed consent was obtained.

Design

Enrolled residents were followed for 24 weeks. Body weight was measured at baseline and at every 2 weeks.
Height, dietary intake, food behavior restrictions, psychological characteristics, medical status, and use of medicines were assessed at baseline.

**Measurements**

Participants were weighed to the nearest 0.1 kg on a calibrated balances scale (F. H. Balances Cormier, Cormier-Paribel, Romainville, France). Height or knee height (if it was impossible to measure height) was measured to the nearest 0.1 cm at the start of the study using a tape measure or knemometer, respectively, and height was then calculated from knee height (19). BMI was calculated as body weight (in kg) / (height)² (kg/m²).

Dietary intake data were collected using a 3-day record in combination with observations during the hot meals. Nurses recorded food and beverage consumption in individual food diaries. Trained dieticians observed dietary intake during bread-based meals and the hot main meal. Portion sizes were estimated with weighing-back methods. Energy and nutrient intakes were calculated using the Dutch food composition database (NEVO), version 1996 (20). Dependency was measured by a Dutch geriatric nursing scale, the Zorg Index Geriatrie (ZIG) (Care Index Questionnaire) (21), which measures three types of restrictions in behavior: cognitive, physical, and social. Total ZIG scores were calculated by adding the ZIG cognitive items (orientation, attention, insight into his/her disease, memory, language, taking actions), ZIG physical items (washing, dressing, eating, toileting, moving, needing care), and ZIG social items (social contacts, talking, activities, mood, unrest). The higher the ZIG score, the more restrictions. The resident’s personal companion together with a nurse filled out the ZIG questionnaire.

The nurse also assessed restrictions in food behavior using the classification of Berkhout (22) in which disabilities (able vs not able) were recorded for chewing, swallowing, and bringing food to the mouth. Residents’ appetite and thirst (increased or normal vs diminished) and dental status (complete vs not complete) were recorded (22).

Past medical information was obtained from medical records. These records included reports on chronic diseases; cardiovascular, renal, bone fracture, and other diseases; cardiovascular accidents; transient ischemic attack; chronic infections; influenza; higher and lower bronchial tube infection; gastrointestinal tract diseases; and urinary and other infections. Receiving a prescription for antibiotics was used as an objective criterion for acute infections.

**Statistical Analyses**

Changes in body weight were calculated by subtracting baseline body weight from the last measurement of body weight. A difference of ≥2.0 kg was seen as a change in body weight. Three body weight change categories were created: a weight-loss (≥2.0 kg weight loss) group, a weight-gain (≥2.0 kg weight gain) group, and a weight-stable (≤–2.0 kg < body weight < 2.0 kg) group.

Differences between the three groups were tested by analysis of variance, chi-square tests, or exact tests. A generalized linear mixed effects model for longitudinal data was fitted to investigate which variables predict weight changes during 24 weeks of follow-up. First, the model was fitted for each possible predictor variable separately. All variables that were significant at alpha = 0.1 were used to fit a final generalized linear mixed model. The analyses were repeated excluding the dropouts. Data were analyzed using SAS version 8.2 (proc mixed) system for Windows.

**RESULTS**

Baseline characteristics of the residents are presented in Table 1. Mean body weight change was –0.14 kg (range: –12.7; +8.9). Of the 108 participants, 28 participants lost at least 2 kg of body weight, 56 remained stable, and 24 gained at least 2 kg. In the weight-loss group, the mean weight loss was –4.1 kg. The mean weight gain in the weight-gain group was 4.0 kg. The mean ZIG cognitive score was significantly higher in the weight-loss group than in the weight-gain group (p = 0.03). Of the 108 participants, 17% did not complete the study. There were significantly more dropouts in the weight-loss group than in the weight-gain group (p = 0.03). Dependency (β = –0.11, 95% CI = –0.21, –0.01) and decreased appetite (β = –2.17, 95% CI = –4.32, –0.01) were significantly associated with body weight loss, whereas BMI (β = 2.25, 95% CI = 1.98, 2.51) and intake of fat (β = 0.07, 95% CI = 0.01, 0.15) were predictors of weight gain (Table 2). The effect of difficulties (β = 2.51, 95% CI = –0.15, 5.16) with bringing food to mouth was only borderline significant. However, if we investigate the crude effect of bringing food to mouth, the effect was significantly related to body weight changes. In this study, chronic diseases, chronic infections in the past, pressure ulcers, acute infections, medicine use, decreased thirst, not having all teeth, problems with chewing or swallowing, energy intake, protein intake, and carbohydrate intake were not associated with body weight changes. Excluding participants who didn’t complete the 24 weeks of follow-up did not change our conclusions.

**DISCUSSION**

During the 24 weeks of follow-up, 26% of the residents lost at least 2 kg and 22% of the residents gained at least 2 kg of body weight. In this study, dependency and decreased appetite were significantly associated with body weight loss, whereas BMI and intake of fat were significant predictors of weight gain.

Morley and Kraenzle (18) found a similar percentage of weight losers in their study; 19% of the population lost 5 or more pounds in 6 months. The effect of the ZIG total score on body weight loss is caused mainly by the cognitive items on the ZIG questionnaire. In other studies (8,13,18), both dementia and depression appeared to be the most important explanations of weight loss. All participants resided in the nursing home because of their mental health problems, so dementia and/or depression were highly prevalent at baseline. But even in this population, a significant difference in cognitive ZIG score between weight gainers and weight losers was found.

In other studies, it remains unclear whether the energy imbalance and the accompanying body weight changes associated with dementia in elderly psychogeriatric nursing
the high prevalence of dementia and depression in this population, the presence of decreased appetite is related to weight loss.

A limitation of our study is that edema was not well registered. Edema may cause a change in body weight. Another limitation of our study is that, because of the low numbers of weight losers and weight gainers, the power for detecting differences in other predictors, for example, chronic diseases, pressure ulcers, and chronic infections in the past, was possibly too low.

In Morley’s mnemonic Meals on Wheels, eating problems were suggested as a cause of weight loss. However, we also found in our study that difficulties with bringing food to the mouth were associated with body weight gain.

Although this study has some limitations, it seems to be that further decrease in cognitive functioning, the intake of fat, BMI, and a decreased appetite are associated with body weight changes.

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REFERENCES


Table 1. Baseline Characteristics of the Population for the Different Groups of Change in Body Weight

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Weight Loss (≥2 kg)</th>
<th>Weight Gain (≥2 kg)</th>
<th>No Change in Body Weight (&lt;2 kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>82.1 ± 7.6</td>
<td>83.0 ± 7.5</td>
<td>83.6 ± 7.0</td>
</tr>
<tr>
<td>Sex (%)</td>
<td>29</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>% Dropouts</td>
<td>32</td>
<td>17</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 2. Predictive Model of Body Weight Changes During 24 Weeks of Follow-Up

<table>
<thead>
<tr>
<th>Predictor</th>
<th>β (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at baseline</td>
<td>−0.09 (−0.23, 0.04)</td>
<td>.17</td>
</tr>
<tr>
<td>Sex</td>
<td>−8.64 (−12.45, −4.83)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Body mass index at baseline</td>
<td>2.25 (1.98, 2.51)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>ZIG total score at baseline</td>
<td>−0.11 (−0.21, −0.01)</td>
<td>.039</td>
</tr>
<tr>
<td>Intake of fat (g/day) at baseline</td>
<td>0.07 (0.01, 0.13)</td>
<td>.27</td>
</tr>
<tr>
<td>Decreased appetite (yes, no)</td>
<td>−2.16 (−4.32, −0.01)</td>
<td>.049</td>
</tr>
<tr>
<td>Difficulties with bringing food to mouth (yes, no)</td>
<td>2.51 (−0.15, 5.16)</td>
<td>.064</td>
</tr>
</tbody>
</table>

Notes: ZIG = Dutch Zorg Index Geriatrie questionnaire.

- Cardiovascular diseases, renal diseases, cardiovascular accidents, transient ischemic attacks, bone fracture diseases, and other diseases.

+ Influenza, higher bronchial tube infection(s), lower bronchial tube infection(s), gastrointestinal tract diseases, urinary infection(s), and other infection(s).

- Antibiotics, gastrointestinal medicine, diuretics, diabetics’ medicine, cardiovascular medicine, analgesics, psychotic medicine, vitamin preparations, and other medicines.

- Body mass index, kg/m²

- Energy intake, kJ

- Fat intake, g/day

- Carbohydrate intake, g/day

- Body weight, kg

- Height, cm

- Body mass index, kg/m²

- Different Groups of Change in Body Weight

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased appetite (yes, no)</td>
<td>2.51 (−0.15, 5.16)</td>
</tr>
<tr>
<td>Difficulties with bringing food to mouth (yes, no)</td>
<td>2.51 (−0.15, 5.16)</td>
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</table>

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