Food intake, nutritional status and physical activity between elderly subjects with and without chronic constipation. A comparative study
Elisa Joan Vargas-García,1 Enrique Vargas-Salado2

Abstract

Introduction: Constipation is one of the most frequent gastrointestinal problems in elderly persons because aging modifies food intake, nutritional status and physical activity, which are associated factors in the development of constipation. We undertook this study to compare food intake, nutritional status and physical activity in elderly subjects with or without chronic constipation.

Methods: The study included a total of 140 subjects who were divided into two groups according to the presence or absence of constipation using the Rome III criteria. Dietary intake was obtained through a 3-day dietary recall (2 days during the week and 1 day from the weekend, either Saturday or Sunday). Height, weight, arm circumference, and triceps skinfold thickness were measured and the International Physical Activity Questionnaire (IPAQ) was applied to all participants.

Results: Fiber and water intake were not statistically different between groups. Participants with constipation showed significantly less variety and less inclusion of all food groups in their diets compared to their nonconstipated counterparts (p <0.02; p <0.03). Mean nutritional status was overweight and did not differ between each studied group (p = 0.49). Higher levels of physical activity were found in nonconstipated subjects (1664 vs. 1049 MET, p = 0.004).

Conclusion: Lower physical activity levels as well as an incomplete and less-varied diet are associated with constipation in the elderly. Water and fiber intake do not seem to be contributing factors for constipation.

Key words: Constipation, elderly, diet, nutritional status, and physical activity.

Introduction

Constipation is one of the most common problems of the digestive system, affecting up to 27% of the population worldwide.1 It is estimated that in Mexico 14.4% of the population suffers from constipation.2 The differences in both figures could be related to the definition of “chronic constipation.” The Roma III diagnostic criteria include the co-existence of two or more of the following symptoms during a period of >3 months: straining for more than one-quarter of the stools, hard or scybalous stools, sensation of incomplete evacuation in at least one-quarter of the evacuations, manual manipulation to facilitate evacuation in more than one-quarter of bowel movements, and three or fewer bowel movements weekly.3

Although constipation is common in elderly subjects, it is emphasized that there is nothing in the aging process per se that causes it.4 Despite this, local and general changes have been found in the elderly that contribute to its appearance, i.e., decrease of bifidobacteria in the intestinal and fecal flora with age, which leads to alterations in intestinal motility.5

Causés of constipation in the elderly are noted as follows: low ingestion of fiber1,5-7 (attributed to the gastrointestinal intolerance to foods that contain fiber and to the difficulty in chewing and producing saliva), reduced physical activity (especially in elderly persons who are subjected to prolonged bed rest or have difficulty in moving the lower extremities),1,7-9 less fluid intake (as one ages the threshold for sensitivity of the receptors that control thirst in the central nervous system decreases),1,10,11 Malnutrition is associated with constipation more than overweight and obesity12 (weight loss may alter the intestinal ecosystem that causes
a dysbiosis. 13,14 Constipation affects the quality of life of those who suffer from it and increases the costs of the health systems. 1,2,15,16

The objective of this study is to evaluate, in the elderly population, the repercussions of consuming foods with high fiber content, nutritional status and physical activity in chronic constipation.

As a working hypothesis it was postulated that elderly subjects with chronic constipation consume little fiber, have a poor fluid intake, are sedentary and have disorders related with malnutrition.

**Methods**

A comparative, prospective and cross-sectional study was carried out between May and October 2009 in groups of patients during outpatient consultations of the Department of Family Medicine #51 of the IMSS in the city of Leon, Guanajuato. Sample size, determined on the basis of the results of a prior study of elderly patients with constipation of whom 23.2% (140 subjects) performed no physical activity, was significant at α = 0.5.7

The patients were assigned to two groups according to whether or not they had constipation according to the Roma III diagnostic criteria. 3 Excluded from the study were elderly patients with diabetes mellitus, hypothyroidism, disorders of the digestive tract such as chronic pancreatitis, ulcerative colitis, Crohn’s disease, anal fissure, ulcerative proctitis, irritable bowel syndrome, cirrhosis and those who could not provide information because of cognitive deterioration (Alzheimer’s disease) or who were unaccompained by family members capable of providing information. Also not included were those patients in whom it was not possible to perform some of the measurements of the investigation due to mobility problems (such as being in a wheelchair).

Each participant was informed about the nature and procedures to follow and informed consent was obtained from all participants before the study.

We recorded age, gender, actual ailment, type and dosage of medications (including laxatives). Food consumption was obtained from a 3-day food-recall diary, of which 2 days were during the week and 1 day from either Saturday or Sunday. All participants were explained on the correct procedure for recording data. With the information obtained from the diary, the quantitative variables were evaluated, kilocalories ingested, grams and percentages of macronutrients, grams of fiber consumed and milliliters of water ingested. The diary was also used to evaluate the qualities of the diet and the following criteria were established: complete, sufficient, balanced and varied.

Food consumption data were analyzed with the assistance of the NutriKcal VO® System program for clinics (Marván, Pérez-Lizaur, 2005). The characteristics of a balanced diet were interpreted according to the recommended dietary intake for elderly persons published by the National Resource Center on Nutrition, Physical Activity and Aging of Florida International University. 17 The remaining qualitative characteristics were evaluated in accordance with the NOM-043-SSA2-2005 for the promotion of health education in nutrition. 18

Weight and height were obtained with a clinical scale and a stadiometer to calculate body mass index. Results were interpreted based on the parameters established by the WHO.19 Other anthropomorphic data recorded were arm circumference evaluated according to the Lastrue tables.20 Triceps skin fold was measured with a plicometer and the results were interpreted with Esquius tables.21 All determinations were carried out using the techniques described by Lohman et al.22 From the results of the body mass index, arm circumference and triceps skin fold established the complete nutritional diagnosis. The level of physical activity was calculated with the international physical activity questionnaire IPAQ 23 using the metabolic equivalent record (MET).

For statistical analysis we used the SPSS v.16.0 program. Continuous variables were described using mean and standard deviation. Comparison between groups with and without constipation was done with the Student t test for independent samples. Categorical variables were expressed in percentages and were analyzed with χ²; p <0.05 was considered significant.

**Results**

We studied 140 elderly patients of whom 71 suffered from chronic constipation. The average age was 71.6 ± 8.4 years; 24.3% males and 75.7% females. Table 1 shows their characteristics and the medications with astringent properties. Drug consumption analysis did not show any differences between the study groups; the dosages had a tendency to be higher for patients with constipation. However, according to their number and variability they were not statistically significant.

**Food Consumption**

The results for caloric ingestion of macronutrients, fiber consumption and fluid intake in the groups with and without constipation are shown in Table 2. Comparative analysis did not demonstrate significant differences between groups.
Factors related to chronic constipation in the elderly

Table 1. Characteristics of the studied subjects (n = 140)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Patients with constipation</th>
<th>Patients without constipation</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 71 Mean ± SD</td>
<td>n = 69 Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>71.9 ± 8.2</td>
<td>71.2 ± 8.7</td>
<td>0.36</td>
</tr>
<tr>
<td>Female/Male</td>
<td>47 / 22</td>
<td>59 / 12</td>
<td>0.04</td>
</tr>
<tr>
<td>Use of astringent medication</td>
<td>57</td>
<td>49</td>
<td>0.20</td>
</tr>
<tr>
<td>Predominant type of astringent medication</td>
<td>Analgesics</td>
<td>β-blockers, analgesics</td>
<td></td>
</tr>
<tr>
<td>Dose of astringent medication (mg)</td>
<td>296 ± 812</td>
<td>135 ± 180</td>
<td>0.66</td>
</tr>
<tr>
<td>Laxative use</td>
<td>36 (%)</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

n = number of elderly subjects; SD, standard deviation.

Table 2. Differences in dietary indicators between groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients with constipation</th>
<th>Patients without constipation</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 71 Mean ± SD</td>
<td>n = 69 Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Food consumption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy (kcal/day)</td>
<td>1504 ± 479</td>
<td>1527 ± 381</td>
<td>0.75</td>
</tr>
<tr>
<td>Protein (g/day)</td>
<td>55.6 ± 18.4</td>
<td>56.3 ± 17.4</td>
<td>0.84</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>15.0 ± 3.2</td>
<td>14.9 ± 3.9</td>
<td>0.80</td>
</tr>
<tr>
<td>Lipids (g/day)</td>
<td>46.8 ± 23.0</td>
<td>47.4 ± 19.8</td>
<td>0.85</td>
</tr>
<tr>
<td>Lipids (%)</td>
<td>27.0 ± 6.6</td>
<td>27.5 ± 7.2</td>
<td>0.71</td>
</tr>
<tr>
<td>Carbohydrates (g/day)</td>
<td>220.6 ± 63.1</td>
<td>224 ± 57</td>
<td>0.68</td>
</tr>
<tr>
<td>Carbohydrates (%)</td>
<td>59.4 ± 7.1</td>
<td>59.3 ± 7.8</td>
<td>0.96</td>
</tr>
<tr>
<td>Fiber (g/day)</td>
<td>15.1 ± 6.9</td>
<td>17.5 ± 8.7</td>
<td>0.08</td>
</tr>
<tr>
<td>Water intake (ml/day)</td>
<td>1196 ± 608</td>
<td>1334.42 ± 493</td>
<td>0.14</td>
</tr>
</tbody>
</table>

n, number of individuals; SD, standard deviation.

Figure 1 shows the results of the qualitative characteristics of the diet (sufficient, balanced, complete, varied) in both groups. The group of elderly patients without constipation consumed a more complete diet than the group of patients with constipation and was significantly different (p < 0.03). Similarly, when comparing the variety of the diet, the group without constipation showed a greater diversity in the foods consumed. This difference reached statistical significance (p < 0.02).

Nutritional Status

The results of the anthropometric parameters of weight, body mass index, tricipital cutaneous fold and arm circumference are shown in Table 3. None of these parameters showed statistically significant differences between groups. Diagnosis of nutritional status in the group with constipation vs. without constipation did not show significant differences (p = 0.49). Overweight was predominant in both groups.
Physical Activity

The levels of physical activity were expressed as metabolic equivalents. Results for the group with constipation were 1043 ± 1008 and for the group without constipation were 1664 ± 1491. The difference between the groups was significant ($p = 0.004$). Figure 3 shows the results for the levels of physical activity, from mild to intense. A statistically significant difference was found ($p = 0.001$) between groups.

Discussion

This study identified the factors of nutrition and lifestyle that could provide a better response in the treatment of constipation in the elderly. Comparison of the characteristics of food consumption, nutritional status and level of physical activity of elderly subjects with and without chronic constipation demonstrated an inverse relationship with constipation between the level of physical activity and complete and varied diet. Although the findings in this study are consistent with what has been published in the literature,24-28 the proposed recommendations aim towards increasing fiber and water consumption. These dietary measures have been progressively adapted by the elderly due to the wide availability of potable water and high-fiber foods. This would explain the similarities of the results between study groups.

The characteristics of the diet in relationship to it being complete and varied are revealed as distinctive factors for the nonconstipated group vs. the constipated group. For this reason, it is important for the elderly to consume foods from all the food groups (fruits, vegetables, cereals, legumes and animal products). In this manner, the fiber contribution and other nutrients may be more easily reached according to Kant et al.29 and may have an effect on the risk of mortality observed with consumption of less than two food groups a day compared with patients who consume foods from all food groups.

Although the literature indicates that malnutrition has serious gastrointestinal effects, in our study this was not demonstrated. This may have been due to the low number of participants with malnutrition and because our patients were not bed-bound in the hospital, which appears to have more impact on colonic motility.14

Table 3. Differences in anthropometric indicators between groups

<table>
<thead>
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<th>$p$ value</th>
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<tbody>
<tr>
<td><strong>n = 71</strong> Mean ± SD</td>
<td><strong>n = 69</strong> Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>67.68 ± 14.05</td>
<td>69.91 ± 15.72</td>
<td>0.38</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.79 ± 5.89</td>
<td>28.53 ± 5.27</td>
<td>0.79</td>
</tr>
<tr>
<td>TSF (mm)</td>
<td>20.58 ± 8.83</td>
<td>19.18 ± 9.03</td>
<td>0.35</td>
</tr>
<tr>
<td>AC (cm)</td>
<td>23.11 ± 3.02</td>
<td>23.59 ± 3.52</td>
<td>0.39</td>
</tr>
</tbody>
</table>

BMI, body mass index; TSF, triceps skin folds; AC, arm circumference, SD, standard deviation.
Although there are drugs that affect intestinal peristalsis, this study as others did not find a significant association between drug consumption and constipation.15,30 The sample of older adults included in this study also had a substantial amount of various medications, which may explain why the astringents did not reach a statistically significant value when the groups were compared.

The effect of physical activity on intestinal motility may have different mechanisms31-37 and, according to Rao et al.,32 exercise decreases blood flow to the intestine, with lower phasic motor activity and increase in strength of propagation of the colon, resulting in lower resistance to the approach and better propulsion of stool. Other studies showed changes in the plasma concentration of several hormones that stimulate gastrointestinal motility.31-35 It has been reported that during exercise it stimulates movement compression of the colon by the abdominal musculature.36,37 However, most of these studies were conducted for short periods of physical activity with varying intensities and without control variables; therefore, their long-term effects are unknown. More research is needed in this field to explain the variability of responses in the elderly.38

With respect to performing physical activity, it has been identified that the risk of constipation decreases 35% when exercise is done 2 to 6 times/week.39 This observation is the basis for the guidelines of the American College of Sports Medicine and National Commission of Physical Culture and Sports in Mexico. Both institutions establish for older adults a minimal frequency of 5 days a week of moderately intense aerobic exercise for 30 min.40,41 The recommendation of physical activity for older adults has been expanded to include muscle resistance exercises at least 2 days/week. This is supported by the study by Sullivan et al.,42 where the authors observed that resistance exercises such as lifting weights accelerate intestinal transit time in middle-aged and older adults with constipation. This same study did not find differences between the average amount of liquids and fiber consumed between groups with and without constipation. In our study, none of the groups reached the minimum recommended amount of fiber which, for males, is 30 g a day and for females 21 g a day according to the guidelines of the National Resource Center for Nutrition, Physical Activity and Aging.17 Other authors have reported similar results,16,30 however, in order to confirm these results it will be necessary to carry out clinical trials that evaluate these interventions.

The limitations of this study are related to the information of the dietary characteristics which, because these are self-reported, may be different from what is really eaten, although the information provided by the participants, written and verbal, intended to decrease this bias. At the same time, because the study design is cross-sectional, it is only possible to point out the associations without determining relationships of cause and effect, which requires a controlled and blinded clinical trial design. Incorporation of other measurement techniques of the intestinal transit would also add value to the study.

In conclusion, according to the results obtained in our study, ingestion of fiber is not related to constipation in the elderly. It is more important to include all food groups and increase the dietary variety of elderly subjects who suffer from constipation to guarantee that the ingestion of food and fiber is sufficient. In elderly subjects, constipation is associated with a sedentary lifestyle. In this population an exercise program that includes moderate aerobic activities and muscle resistance would be beneficial.

References
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