Effects of Education on the Quality of Life, Diet, and Cardiovascular Risk Factors in an Elderly Spanish Community Population

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An inverse relation between education and health has been reported, suggesting the importance of examining the underlying mechanism of this association. We examined whether cardiovascular risk factors, diet, and indicators of quality of life (mood, self-perceived health, social relationships, self-rated sensory, and dental adequacy) vary according to educational level among 352 old people (65–95 years old) in the city of Oviedo (Northern Spain). Lower educational level (LE) was associated with unhappiness, poor social relationships, poor self-assessed health, and sensory, and masticatory problems. LE elderly consumed less vegetables and meat products and more carbohydrates. LE women had a lower contribution of proteins and lipids to their total energy intake as well as a lower vitamin A intake. Except for hypercholesterolemia, no differences

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were found for the cardiovascular risk factors studied. The educational level of old people has a strong influence on their quality of life, nutrient intake and food consumption. These findings may provide part of the explanation for the social gradient in mortality.

The rapid expansion and the disproportionate expenditure on health care for elderly people, have led researchers to focus on identifying social and behavioral factors that impair both the health and the quality of life of the elderly. In this sense, educational attainment is one of the most influential variables; people with a higher level of education enjoy better health and a longer life.

Several studies have shown higher mortality rates for those with a lower educational level in both sexes, different age groups, and races (Sundquist & Johansson, 1997; Amaducci et al., 1998; Fernandez & Borrell, 1999; Arias & Borrell, 1998; Borrell et al., 1999). Factors potentially involved in the production of these mortality differentials have been examined by various researchers. An inverse association of educational level with cardiovascular disease risk factors is fairly well established (Helmer, Shea, Herman, & Greiser, 1990; Cirera, Tormo, Chiralaque, & Navarro, 1998). The relation between diet and cardiovascular disease has been the focus of substantial investigative effort for several decades and many studies have attempted to determine whether the differences found in the prevalence of cardiovascular risk factors with educational level are accounted for by different dietary habits in various educational strata (Hulshof et al., 1991; Roos, Prattala, Lahelma, Kleemola, & Pietinen, 1996). Also, a strong association of low education with disability has been found that may contribute to explaining the inverse association with mortality. Disability, indeed, seems to be the link between education and mortality (Amaducci et al., 1998). Of particular interest is the ability of self-rated health status to predict mortality, making it as powerful a predictor as reports of serious chronic disease or functional disability (Sundquist & Johansson, 1997; Regidor et al., 1999).

Other factors must be taken into account in order to understand the underlying mechanism of the association of education, not only with mortality but also with quality of life. First a lower educational level has been found to be a predictor of decline in social relationships, with a causal relation between social relationships and health outcomes (Cerhan & Wallace, 1993). Second, the quality of life of elderly people is significantly linked to sensory impairment (either visual or auditory) (Carabellase et al., 1993; Appollonio, Carabilese, Magni, Frattola, & Trabucchi, 1995) and dental status (Appollonio, Carabilese, Frattola, & Trabucchi, 1997), which, indeed, is associated with survival and quality of life.
There has been little research into social inequalities and health in Spain, especially in the elderly population, and findings from previous studies in other countries may not apply to older Spanish people. Most studies have been limited in that they focus on a single risk factor. In this report, we contribute to this line of investigation by examining whether behavioral and other risk factors known to influence both survival time and quality of life (cardiovascular risk factors, mood, self-assessed health, sensory and dental impairment, social relationships, diet) have a different distribution in the Spanish elderly according to their level of education.

**SUBJECTS AND METHODS**

The sample was composed of 352 elderly persons (134 males and 218 females) aged between 65 and 95; of these 161 were living in institutions and 191 in their own homes. The institutionalized elderly resided in the urban nursing homes in the city of Oviedo supported by the State Social Security System. All the elderly who followed the inclusion criteria were selected. The sample of subjects living at home was randomly selected after contacting the two main centers for pensioners in Oviedo (North of Spain). To be included in the study, subjects could not be bedridden or confined to a wheelchair and could not be suffering from any terminal disease. Study design was approved by the Committee on Ethical Research of the Oviedo University Hospital.

Height, to the nearest 1 mm, was registered using a stadiometer (Aflo-Sayol, Barcelona, Spain). Weight was measured with the subject wearing light clothes using a weighing machine with 500g precision (Seca, Hamburg, Germany). The body mass index (BMI) was calculated \( \left( \frac{kg}{m^2} \right) \).

Information was collected on sociodemographic and potential determinants of quality of life and health: years of education, physical activity (“How many minutes per day do you spend walking”), current smoking status \(0=\text{never smoked or previously smoked [more than a year before the study]}\) and \(1=\text{currently smoking}\), self-assessments of health (“Would you say your health is good or poor?”), social relationships (“Do you have satisfactory relationships with your friends and relatives?”), mood level (“Do you feel happy?”), self-reported sensory impairment (visual or auditory) (“Do you have vision or auditory problems?”), and self-perception of chewing ability (“Do you have masticatory problems?”). All these variables were dichotomized into lower and higher levels, because empirical studies have generally shown that there is no pronounced dose-response relation (Cerhan & Wallace, 1993). Two levels of education were distinguished: low (primary education or less) and high (partial secondary education to completed university education). Confounders included in the analyses were age (as a continuous variable) and place of residence (three categories: alone, in one’s own family, in an institution).
Food consumption data on current eating habits were obtained from a semiquantitative food frequency questionnaire performed by a dietitian. The reliability and validity of such a questionnaire has been confirmed in different studies (Willett, Reynolds, Cottrell Hoehner, Sampson, & Browne, 1987; Horwath & Worsley, 1990). Elderly living in institutions could choose their menu daily from several set menus. Amounts consumed were recorded in household units, by volume or by measuring with a ruler and when this was not possible, participants were asked if the portion of food eaten was smaller, equal to, or larger than a previously established portion. Food items were then converted into food quantities (g/day) and analyzed for energy and nutrient contents by using the nutrient database developed in Spain by the Institute of Nutrition and Bromatology (CSIC, Madrid).

Blood samples were taken after 12-hour fast. Total cholesterol and triglyceride levels were measured using enzymatic methods (Bucolo & David, 1973; Allain, Poon, Chan, Richmond, & Fu, 1974). Plasma glucose was measured by enzymatic spectrophotometry with the use of glucose oxidase (Gochman & Schmitz, 1972).

The statistical analysis was performed by using SAS (SAS Institute, Cary, NC). Comparisons of group means were made by analysis of variance (PROC GLM analyzed with LSMEAN-option). Means and all analyses were adjusted for age and place of residence and in the case of the analysis of food and nutrients, adjustments were also made for energy intake. Because the distribution of the dietary intake of food and nutrients was skewed, the natural logarithms of intakes were used in the analysis. Chi square analysis was used to test for differences in categorical variables between levels of education. A probability ≤ .05 was considered significant. Odds ratios (ORs) from a multiple logistic regression model were calculated to determine the association between each factor affecting quality of life and educational level. Potential confounders, such as age and place of residence, were introduced into the models.

RESULTS

Some anthropometric and biochemical data relative to cardiovascular risk factors adjusted to age and place of residence, and according to sex and educational attainment are presented in Tables 1 and 2. Women who have received more schooling are taller than those with a lower educational level (153.3 vs. 150.9 cm, respectively). Except for hypercholesterolemia (Table 2), where we observed a higher percentage in men with a higher level of education (27.3% vs. 10.3%, for high and low educational level, respectively), no significant differences were detected for the other risk factors studied according to educational level. Of particular importance, is the high percentage of elderly in both sexes and levels of education who are overweight and obese, this proportion being higher for the group with fewer years of education (nonsignificant difference).
<table>
<thead>
<tr>
<th></th>
<th>Educational level</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td></td>
<td>Women</td>
</tr>
<tr>
<td></td>
<td>Low ($n = 86$)</td>
<td></td>
<td>High ($n = 44$)</td>
</tr>
<tr>
<td></td>
<td>Low ($n = 184$)</td>
<td></td>
<td>High ($n = 34$)</td>
</tr>
<tr>
<td>Age, years</td>
<td>74.7 ± 7.2</td>
<td>76.9 ± 7.1</td>
<td>76.3 ± 7.4</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>71.2 ± 10.5</td>
<td>70.4 ± 10.5</td>
<td>65.7 ± 11.5</td>
</tr>
<tr>
<td>Height, cm</td>
<td>163.6 ± 8.6</td>
<td>164.8 ± 7.2</td>
<td>150.9 ± 6.9*</td>
</tr>
<tr>
<td>BMI, kg/m$^2$</td>
<td>26.6 ± 3.9</td>
<td>25.7 ± 3.2</td>
<td>28.8 ± 4.8</td>
</tr>
<tr>
<td>Physical activity, min</td>
<td>62.0 ± 62.0</td>
<td>72.0 ± 71.0</td>
<td>40.2 ± 37.2</td>
</tr>
<tr>
<td>Cholesterol, mmol/L</td>
<td>5.23 ± 1.34</td>
<td>5.69 ± 1.04</td>
<td>6.05 ± 1.38</td>
</tr>
<tr>
<td>Triglyceride, mmol/L</td>
<td>1.38 ± 0.95</td>
<td>1.24 ± 0.7</td>
<td>1.28 ± 0.57</td>
</tr>
<tr>
<td>Glucose, mmol/L</td>
<td>5.29 ± 1.5</td>
<td>5.29 ± 1.02</td>
<td>5.64 ± 2.42</td>
</tr>
</tbody>
</table>

* Adjusted for age and place of residence, except for age itself.
* $p \leq .05$.

TABLE 2 Adjusted† Prevalence of Cardiovascular Risk Factors by Educational Level in Men and Women

<table>
<thead>
<tr>
<th></th>
<th>Educational level</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
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<td>Women</td>
</tr>
<tr>
<td></td>
<td>Low ($n = 86$)</td>
<td></td>
<td>High ($n = 44$)</td>
</tr>
<tr>
<td></td>
<td>Low ($n = 184$)</td>
<td></td>
<td>High ($n = 34$)</td>
</tr>
<tr>
<td>Current smoker†</td>
<td>13 (15.1)</td>
<td>8 (18.1)</td>
<td>3 (1.6)</td>
</tr>
<tr>
<td>Overweight††</td>
<td>58 (67.8)</td>
<td>23 (52.3)</td>
<td>134 (72.8)</td>
</tr>
<tr>
<td>Hypercholesterol+++</td>
<td>9 (10.3)*</td>
<td>12 (27.3)</td>
<td>52 (28.3)</td>
</tr>
<tr>
<td>Hypertriglyceride++++++</td>
<td>8 (9.2)</td>
<td>(2) 4.5</td>
<td>9 (4.9)</td>
</tr>
<tr>
<td>Diabetes+++++++</td>
<td>4 (4.6)</td>
<td>(2) 4.5</td>
<td>19 (10.3)</td>
</tr>
</tbody>
</table>

* Adjusted for age and place of residence.
† At least 1 cigarette/day.
‡‡ Body mass index ≥ 25 kg/m$^2$.
+++ Serum total cholesterol ≥ 6.2 mmol/L.
++++ Serum total triglyceride ≥ 2.2 mmol/L.
++++++ Serum glucose ≥ 7.7 mmol/L.
Several logistic regression models were constructed that examined the association between different variables affecting quality of life and educational level adjusted for age and place of residence. Prevalence and adjusted odds ratio are reported in Tables 3 and 4. A strong association can be observed between lower educational attainment and all these variables, except for self-assessment of health in men. A lower level of education was associated with feeling unhappy (ORs = 5.7 [2.6, 12.5] for men and 3.2 [1.7, 6.1] for women), poor social relationships (ORs = 2.1 [1.2, 2.4] for men and 1.7 [1.2, 2.4] for women), poor self-reported health in women (OR = 4.2 [1.2, 14.6]), visual impairment (ORs = 2.7 [1.6, 4.7] and 4.3 [2.5, 7.3] for men and women, respectively), auditory deterioration (OR = 2.3 [1.4, 3.8] for men and 2.8 [1.6, 4.9] for women) and worse chewing ability (ORs = 2.0 [1.2, 3.3] and 2.7 [1.6, 4.6] for men and women, respectively).

Data that describe food consumption according to sex educational level adjusted for age, place of residence, and energy intake, are given in Table 5. Participants of both sexes of a lower educational level consumed more sugar and less fish products. Furthermore, women with less schooling years consumed fewer vegetables and meat products. On the other hand, a tendency to consume more cereals, eggs, and legumes was observed, although in this case differences do not reach statistical significance.

Table 6 presents energy and nutrients intake according to educational level and gender and adjusted for age, place of residence, and energy intake. Differences were observed regarding the contribution of macronutrients to total energy intake. In women with a lower education, 13.6% of energy is derived from protein, 49.1% from carbohydrates, and 39.2% from fat.

### TABLE 3 Prevalence and Adjusted Odds Ratio (95% CIs) of Factors Affecting Quality of Life in Men With Lower and Higher Education

<table>
<thead>
<tr>
<th></th>
<th>Lower education (n = 86)</th>
<th>Higher education (n = 44)</th>
<th>Odds Ratio (95% CIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling unhappy</td>
<td>37 (42.5)</td>
<td>4 (9.1)</td>
<td>5.7 (2.6–12.5)</td>
</tr>
<tr>
<td>Poor social relationships</td>
<td>18 (20.6)</td>
<td>1 (2.1)</td>
<td>2.1 (1.2–2.4)</td>
</tr>
<tr>
<td>Poor self-assessment of health</td>
<td>16 (18.4)</td>
<td>7 (15.9)</td>
<td>1.1 (0.4–3.0)</td>
</tr>
<tr>
<td>Poor self-rated vision</td>
<td>7 (8.0)</td>
<td>2 (4.5)</td>
<td>2.7 (1.6–4.7)</td>
</tr>
<tr>
<td>Poor self-rated hearing</td>
<td>13 (14.9)</td>
<td>3 (6.7)</td>
<td>2.3 (1.4–3.8)</td>
</tr>
<tr>
<td>Poor chewing ability</td>
<td>21 (24.1)</td>
<td>5 (11.3)</td>
<td>2.0 (1.2–3.3)</td>
</tr>
</tbody>
</table>

*Note: From a single forward stepwise logistic regression model, adjusted for age and place of residence.*
### TABLE 4 Prevalence and Adjusted Odds Ratio (95% CIs) of Factors Affecting Quality of Life in Women With Lower and Higher Education

<table>
<thead>
<tr>
<th>Feeling unhappy</th>
<th>Lower education (n = 184)</th>
<th>Higher education (n = 34)</th>
<th>Odds Ratio (95% CIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Feeling unhappy</td>
<td>75 (40.7)</td>
<td>10 (29.4)</td>
<td>3.2 (1.7–6.1)</td>
</tr>
<tr>
<td>Poor social relationships</td>
<td>32 (17.4)</td>
<td>4 (11.8)</td>
<td>1.7 (1.2–2.4)</td>
</tr>
<tr>
<td>Poor self-assessment of health</td>
<td>50 (27.2)</td>
<td>3 (8.8)</td>
<td>4.2 (1.2–14.6)</td>
</tr>
<tr>
<td>Poor self-rated vision</td>
<td>40 (21.7)</td>
<td>1 (3.0)</td>
<td>4.3 (2.5–7.3)</td>
</tr>
<tr>
<td>Poor self-rated hearing</td>
<td>20 (10.8)</td>
<td>3 (8.8)</td>
<td>2.8 (1.6–4.9)</td>
</tr>
<tr>
<td>Poor chewing ability</td>
<td>46 (25)</td>
<td>5 (14.7)</td>
<td>2.7 (1.6–4.6)</td>
</tr>
</tbody>
</table>

**Note:** From a single forward stepwise logistic regression model, adjusted for age and place of residence.

### TABLE 5 Food Intakes (g/day) According to Sex and Educational Level†

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (n = 87)</td>
<td>High (n = 44)</td>
</tr>
<tr>
<td>Cereals</td>
<td>184.5 ± 56.2</td>
<td>183.9 ± 49.6</td>
</tr>
<tr>
<td>Dairy products</td>
<td>420.9 ± 190.5</td>
<td>417.8 ± 243.5</td>
</tr>
<tr>
<td>Eggs</td>
<td>16.0 ± 9.9</td>
<td>15.1 ± 10.6</td>
</tr>
<tr>
<td>Sugar</td>
<td>18.6 ± 10.7*</td>
<td>14.4 ± 14.0</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>33.1 ± 7.7*</td>
<td>31.9 ± 5.5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>313.7 ± 135.1</td>
<td>291.1 ± 159.3</td>
</tr>
<tr>
<td>Legumes</td>
<td>19.6 ± 13.0</td>
<td>16.7 ± 15.8</td>
</tr>
<tr>
<td>Fruit</td>
<td>208.6 ± 124.2</td>
<td>192.8 ± 131.8</td>
</tr>
<tr>
<td>Meat products</td>
<td>112.9 ± 57.0</td>
<td>123.9 ± 57.7</td>
</tr>
<tr>
<td>Fish products</td>
<td>27.3 ± 23.4*</td>
<td>36.6 ± 25.8</td>
</tr>
<tr>
<td>Alcoholic beverages</td>
<td>137.1 ± 288.0</td>
<td>125.3 ± 199.1</td>
</tr>
</tbody>
</table>

**Note:** Data are means ± standard deviation.

* *p ≤ .05; ** *p ≤ .01; *** *p ≤ .001.

† Adjusted for age, place of residence and energy intake.
TABLE 6  Daily Intake of Energy and Nutrients † According to Educational Level and Gender

<table>
<thead>
<tr>
<th></th>
<th>Educational level</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (n = 86)</td>
<td>High (n = 44)</td>
<td>Low (n = 184)</td>
</tr>
<tr>
<td>Energy, kJ</td>
<td>8353.3 ± 1343.2</td>
<td>8064.0 ± 1437.7</td>
<td>7069.0 ± 1323</td>
</tr>
<tr>
<td>Proteins, g</td>
<td>64.3 ± 0.5</td>
<td>65.7 ± 13.8</td>
<td>40.1 ± 7.6</td>
</tr>
<tr>
<td>% Energy</td>
<td>12.3 ± 1.9</td>
<td>13.4 ± 1.6</td>
<td>13.6 ± 1.7*</td>
</tr>
<tr>
<td>Carbohydrates, g</td>
<td>249.5 ± 41.9*</td>
<td>242.7 ± 40.9</td>
<td>218.7 ± 53.3</td>
</tr>
<tr>
<td>% Energy</td>
<td>51.1 ± 4.0</td>
<td>49.6 ± 5.9</td>
<td>49.1 ± 6.6*</td>
</tr>
<tr>
<td>Fats, g</td>
<td>77.3 ± 18.4</td>
<td>79.9 ± 14.2</td>
<td>76.5 ± 13.9***</td>
</tr>
<tr>
<td>% Energy</td>
<td>35.3 ± 2.6</td>
<td>36.3 ± 4.8</td>
<td>39.2 ± 4.8**</td>
</tr>
<tr>
<td>PUFA, g</td>
<td>19.4 ± 1.1</td>
<td>19.8 ± 2.5</td>
<td>19.0 ± 3</td>
</tr>
<tr>
<td>% Energy</td>
<td>9.2 ± 1.1*</td>
<td>9.4 ± 1.5</td>
<td>9.9 ± 1.8</td>
</tr>
<tr>
<td>MUFA, g</td>
<td>25.8 ± 4.6*</td>
<td>26.9 ± 6.8</td>
<td>24.5 ± 5.7**</td>
</tr>
<tr>
<td>% Energy</td>
<td>11.9 ± 1.5</td>
<td>12.3 ± 2.4</td>
<td>12.5 ± 2.1**</td>
</tr>
<tr>
<td>SFA, g</td>
<td>23.8 ± 5.0</td>
<td>23.7 ± 8.7</td>
<td>23.1 ± 6.9</td>
</tr>
<tr>
<td>% Energy</td>
<td>10.9 ± 1.8</td>
<td>10.6 ± 3.8</td>
<td>11.7 ± 2.7</td>
</tr>
<tr>
<td>Cholesterol, mg</td>
<td>257.4 ± 45.7</td>
<td>250.3 ± 95.5</td>
<td>255.2 ± 126.0</td>
</tr>
<tr>
<td>Fiber, g</td>
<td>15.8 ± 7.3</td>
<td>14.4 ± 4.2</td>
<td>14.1 ± 3.4</td>
</tr>
<tr>
<td>Niacin, mg</td>
<td>20.6 ± 2.6</td>
<td>21.2 ± 5.2</td>
<td>19.2 ± 9.7</td>
</tr>
<tr>
<td>Riboflavin, mg</td>
<td>1.2 ± 0.1</td>
<td>1.2 ± 0.3</td>
<td>1.2 ± 0.3</td>
</tr>
<tr>
<td>Vitamin C, mg</td>
<td>53.3 ± 37.1</td>
<td>49.2 ± 20.3</td>
<td>48.9 ± 17.8</td>
</tr>
<tr>
<td>Vitamin A, µg</td>
<td>539.0 ± 197.0</td>
<td>551.5 ± 221.5</td>
<td>553.3 ± 218.2*</td>
</tr>
<tr>
<td>Vitamin D, µg</td>
<td>0.8 ± 0.7</td>
<td>0.8 ± 0.8</td>
<td>0.8 ± 0.5</td>
</tr>
<tr>
<td>Calcium, mg</td>
<td>735.5 ± 94.1</td>
<td>716.7 ± 232.3</td>
<td>764.0 ± 255.2</td>
</tr>
<tr>
<td>Iron, mg</td>
<td>11.3 ± 1.7</td>
<td>10.9 ± 2.5</td>
<td>9.5 ± 1.8</td>
</tr>
</tbody>
</table>

Note: PUFA = polyunsaturated fatty acids; MUFA = monounsaturated fatty acids; SFA = saturated fatty acids.
Data are means ± standard deviation, unless otherwise specified.
*p < .05; **p < .01; ***p < .001.
†Adjusted for age, place of residence and energy intake, except for energy itself.

Corresponding values for women with a higher educational level are 14.2%, 46.8%, and 41.2%, respectively. In addition, intake of monounsaturated fatty acids (both in grams and their contribution to energy intake) was higher in women with higher education (24.5 g and 12.5% vs. 26.3 g and 13.6%, for low and high education, respectively). Differences in men showed a similar pattern but without statistical significance, except for the amount of monounsaturated fatty acids (25.8 g in low educational level vs. 26.9 g in high
Men with fewer years of educationalso have a significantly higher intake of carbohydrates (249.5 vs. 242.7 g for low and high educational levels). Intake of vitamin A is higher for women who had received more years of education (649.5 vs. 553.3 μg). A similar trend was noted in men (551.5 vs. 539.0 μg, p < .05). Otherwise, there were no significant differences in the intake of micronutrients between the educational groups.

Table 7 records the percentage of elderly with a substandard daily intake of selected nutrients (less than 2/3 recommended daily amount) according to sex and educational level. A substantial proportion of all groups had inadequate intakes of vitamins C, A, D and calcium, but no differences between educational attainment were observed.

### DISCUSSION

The present study is one of only a few published in which the role of education in several factors affecting health and quality of life has been assessed in a Spanish population, one of the oldest in the world. Although we are aware of the multifaceted nature of socioeconomic status, we used educational level as an indicator of socioeconomic position (Regidor et al., 1999). When classifying the elderly according to their educational level, we must consider that the subjects enrolled in our study were born between 1905 and 1925. At this time, Spain was still a developing country and so hardly any of them received secondary or higher education. For that reason, we decided to divide the population into people with less than 9 years’ education (primary education or less = low level) and people with more than 9 years’
education (partial secondary education to completed university education = high education).

Several studies conducted in Spain and other populations (Cirera et al., 1998; Winkleby, Jatulis, Frank, & Fortmann, 1992; Pekkanen et al., 1995), have shown strong relationships between socioeconomic status and different cardiovascular risk factors, but to our knowledge, these are the first data on the distribution, according to educational level, of risk factors requiring direct measurement in the elderly Spanish. Our findings suggest that educational level in this elderly population is not associated with cardiovascular risk factors and only hypercholesterolemia was more frequent in elderly men with more years of schooling. Some other studies have not found a significant association of education with cardiovascular risk factors (Cirera et al., 1998; Wamala, Wolk, & Orth Gomor, 1997; Garrison, Gold, Wilson, & Kannel, 1993). This might be due to different explanations: the fact that we used education only as a measure of social class, that we did not include the whole lipid profile, or perhaps that the impact of education on cardiovascular risk factors varies with age. In this sense, many studies have observed a decline in the strength of an association with increasing age (Lasher, Fernandez, & Patterson, 2000; Taylor et al., 1991).

Several variables were used as indicators of quality of life, as this is a multidimensional concept encompassing different domains (Carabellese et al., 1993). Data from the present study suggest that a significant worsening in most of the quality of life measures were associated with a lower educational level in the old people. Elderly with a lower level of education declared themselves to be unhappier and with poorer social relationships. Low mood level and social networks are related in a reciprocal fashion (Cerhan & Wallace, 1993). The hypothesis that social relationships are protective of health has been addressed in the epidemiological literature over the last years (Winkleby et al., 1992). Increasing age and lower educational level have been found to be important for predicting declines in social relationships (Cerhan & Wallace, 1993).

Studies based on different sets of data indicate that self-reported health status is a powerful, inexpensive, and easy to obtain predictor of mortality (Sundquist & Johansson, 1997; Regidor et al., 1999). Our analyses have shown that elderly women with a high educational level rated their health status higher than less educated people. These findings corroborate those of the above mentioned studies in younger populations.

An outstanding finding of this study is the fact that the elderly with the lowest educational level had poorer self-reported visual and auditory adequacy than those of the highest level. The quality of life of elderly people has been found to be significantly linked to sensory disability; visual and hearing impairment have a strong effect on mood level, social relationships, self-sufficiency, quality of life, and mortality (Carabellese et al., 1993; Appollonio et al., 1995).
With regard to dental status, we also found that masticatory function among the elderly was associated to educational level. Elderly people with a lower educational attainment had reported worse chewing ability. The relationship between dental status, quality of life, and long-term survival has been assessed (Appollonio et al., 1997), but not the influence of education on masticatory performance in the elderly. Interpretations for these differences may include health consciousness, hygienic conditions, financial problems, or access to health services (Amaducci et al., 1998).

The measurements of factors regarding quality of life in this study may be criticized in several ways. First, measures were self-reported and so affect diagnostic quality. Also, by dichotomizing our variables we have increased our chances of misclassifying some of the participants, and our results must be interpreted in light of these potential problems. In addition, most information related to quality of life was obtained by asking a few simple questions. Nevertheless, we must take into account the specific problems that arise in conducting epidemiological studies in the elderly; factors such as fatigue, rambling, memory deficits, or inability to recognize what type of information is needed imply that many variables may have to be obtained in considerably less detail than desired (Kelsey, O’Brien, Grisso, & Hoffman, 1989).

Various authors have pointed out that the social class gradient in mortality may be mediated partly by differences in dietary habits (James, Nelson, Ralph, & Leather, 1997; Smith & Brunner, 1997). In this study, several differences in the food choice and macronutrient intake of elderly people according to educational attainment were observed, after adjusting for age, energy intake, and place of residence (because institutionalization has been shown to vary dietary patterns) (Lasheras, González, Patterson, & Fernández, 1998). Men with a lower educational level consumed more sugar and fats and less fish products than those in the higher class, a fact that was also found by other authors (Hulshof et al., 1991). For women, those in the lower level of education consumed more sugar and less vegetables, meat and fish products. Interpretations for the differences observed might be, among others, oral health status, health consciousness, and price of food. Poor oral health has been proven to affect food choices (Pla, 1994), and we have found that this problem is about twice as frequent among the lower educated elderly (OR = 2 for men and OR = 2.7 for women). Healthier foods include vegetables (and fruit, but we did not observe differences in their consumption) and more expensive foods include meat and fish products. Nevertheless, it has been described that education has a stronger association with food intake than income (Winkleby et al., 1992). Several studies show socioeconomic differences in the food consumption pattern (Hulshof et al., 1991; Roos, Prattala, Lahelma, Kleemola, & Pietinen, 1996; James, Nelson, Ralph, & Leather, 1997) and, in general, a healthier diet has been associated with higher socioeconomic educational status (Dobson, Porteous, McElduff, & Alexander, 1997).

The group of women with a higher educational level presented the highest proportion of energy derived from fat (41.2%). This may be related to the
fact that they consumed more animal foods, but also because they consumed more vegetables, which in our country are usually prepared with olive oil dressing. In line with the last observation, we found that most of the differences in fatty acid consumption among women are due to monounsaturated fatty acids (a higher consumption in women with a higher educational level), which is known to decrease serum cholesterol maintaining high-density lipoprotein (HDL) cholesterol levels (Grundy, 1989).

Intake of vitamin A was inversely related to educational level, but the mean intake of this vitamin as well as fiber and vitamin D was too low in all groups, compared with the guidelines. However, recent studies indicate that the recommendation for vitamin A in the diet of older adults might be too high (Amorin Cruz, Moreiras, & Brzozowska, 1996; Russell & Suter, 1993). Only women in the higher educational group met guidelines for calcium and vitamin C. Several other surveys also reveal that a lower vitamin C intake (reflecting a lower consumption of fruit and vegetables) is more common in groups with low educational attainment (Hulshof et al., 1991). Nutrient intakes of the elderly below reference values are frequently observed in the literature (Amorin Cruz, Moreiras, van Staveren, Trichopoulou & Roszkowski, 1991), although the standards used to assess dietary intake adequacy in the elderly are highly controversial (Beaton, 1985). Prevalence of older subjects with a substandard daily intake of riboflavin, calcium, vitamins C and A are higher among men from both educational levels compared to women, indicating a wiser selection of foods, as usually reported in the literature (Amorin Cruz et al., 1991).

In conclusion, the basic findings from this study suggest that educational factors may play an important role in food choices and all the quality of life variables that other studies have related to mortality in elderly people: unhappiness, poor social relationships, poor self-assessed health, sensory deterioration (both visual and auditory), and masticatory problems. This is not surprising as an intercorrelation of all these variables might be expected, but to our knowledge, this is the first study on the Spanish elderly that analyzes all these health-compromising factors together, showing that they are all related to the educational level of the elderly. Within the context of promoting an “enjoyable old age,” we stress the need for more intensive prevention and intervention programs aimed at improving the quality of life among old people. Although programs need to reach the elderly as a whole, approaches need to be focused on those at higher risk, in particular the elderly from low educational backgrounds.

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