LIFE STYLE CHARACTERISTICS ASSOCIATED WITH NUTRITIONAL RISK IN ELDERLY SUBJECTS AGED 80-85 YEARS


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Abstract: A logistic regression model was applied to 627 elderly men and women, who participated in all three data collections of the SENECA study in 1989, 1993, and 1999, to test the hypothesis that nutritional status in 80-85 year old persons was related to functional and cognitive status, but not significantly affected by living arrangement. Additionally, the authors hypothesized that relationships between cognitive status and self-care ability, between self-care ability and living situation, and between cognitive status and living situation would be stronger with increasing age. Nutritional status was categorized as being well nourished (≥24) or at nutritional risk (<24) using the 18-item mini-nutritional assessment questionnaire (MNA). Diminished self-care ability was defined as inability to perform all 7 self-care items on the ADL instrument. Respondents were deemed to have possible cognitive impairment if they scored <24 on the MMSE test. Residence situation was categorized as either living alone, with spouse/partner, or with others. Nutritional risk was found to be associated with diminished cognitive status and diminished self-care ability, but not associated with living alone. Elderly people with diminished cognitive function and diminished self-care ability had a more than two times higher risk of being at nutritional risk. In addition, the strength of relationships between cognitive status and self-care ability, self-care ability and living situation, and cognitive ability and living situation all increased over time. In the oldest old lifestyle characteristics and functional ability appeared to be stronger predictors of risk for malnutrition than in younger adults.

Key words: Nutritional risk, life style, elderly, cognitive status, functional status, living situation.

Introduction

There is general agreement that the nutritional status of elderly people is a result of an interdependence between cognitive performance, functional ability and living situation (1,2,3,4,5,6). It is hypothesized that the relationships between these factors become stronger with increasing age, but as much of the research with the elderly has been cross-sectional in nature the ability to adequately measure the impact on nutritional risk over time has been limited. Also, we have shown, that contrary to general opinion, living alone was not related to decreased nutrient intake or impaired nutritional status in the SENECA population up to the age of 75 (7), but there are no data in the literature on this relation for people over the age of 75. We therefore analyze in the present paper data on nutritional status, self-care ability, and living situation in the three field studies in 1989, 1993, and 1999 and relate them to nutritional status in 1999. It is hypothesized that nutritional status, as assessed by the MNA, is related to functional status and to cognitive status, but not significantly affected by living arrangement.

Methods and Materials

The SENECA study on nutrition in the elderly is a longitudinal survey designed to measure dietary patterns of elderly living in different European small towns, and to examine the relationship between diet and various measures of health and performance in a randomized sample of subjects of both sexes born in the period 1913-1918, stratified according to age and sex. Field surveys were carried out in 1989, 1993, and 1999. Data were collected by trained interviewers using a structured interview schedule. For a detailed explanation of the data gathering and analysis procedures see de Groot et al. (8,9).

In this paper data are included from 627 individuals (288 men and 339 women) who participated in all three data-collection phases of the SENECA study. They resided in 10 traditional towns in 9 European countries (Hamme/Belgium HB, Roskilde/Denmark RDK, Haguenua/France HF, Romans/France RF, Padua/Italy PI, Culemborg/the Netherlands CNL, Vila Franca de Xira/Portugal VP, Betanzos/Spain BE, Yverdon/Switzerland YCH, Marki/Poland MPL).

Diminished self-care ability was defined as not being able to perform all self-care items on the ADL instrument. The seven tasks were walk between rooms, use the toilet, wash self, dress and undress, get in and out of bed, feed self, and cut toe-nails. ADL questions were asked in all of the three field surveys.

Cognitive status can be measured by how one responds to a series of statements that evaluate orientation in time, memory, attention, as well as naming of objects, performance of written and spoken orders, writing and copying. This examination, known as the mini-mental state examination (MMSE)(11), is used to objectively describe general cognitive potential. Respondents were deemed to have possible cognitive impairment if they scored <24 on the MMSE test (12). The MMSE test was carried out in the follow-up survey in 1993 and
the final survey in 1999.

Living situation was categorized as either living alone, with spouse/partner, or with others. These data are available for all three surveys.

Assessment of nutritional status can be rapidly assessed using a validated 18-item instrument involving anthropometry, general assessments, dietary assessments, and subjective assessment known as mini-nutritional assessment (MNA) (13). Nutritional status was categorized as being well nourished (≥24 points), or at nutritional risk (<24 points). MNA-assessment data are available for the final survey in 1999.

Statistical analyses included measures of central tendency, chi-square statistics, t-tests, analysis of variance (GLM procedure) and logistic regression (CATMOD procedure) using the SAS statistical program. Significance was set at p< 0.05. Logistic regression models were used to estimate the relationship between nutritional status, well nourished or at nutritional risk, and selected life style characteristics. A model was constructed for the whole population, as well as for males and females separately. The following dichotomous variables included in the model: sex, living alone vs other situations, MMSE ≥24 vs MMSE <24, and able to do all 7 self-care ADLs vs not able to do all 7. Similar variables, excluding sex, were included in the model used for separate gender analyses.

Results

a. Prevalence of life style characteristics in 1999

There was wide variation between study locations in the percents of respondents in 1999 who were found to have possible cognitive impairment. This ranged from 4% to 39%, with an average of 16%.

The range of percents of people not able to do all seven self-care tasks by study location was even wider (42% to 90%). Overall, 61% of the respondents in 1999 were not able to perform all seven self-care tasks.

The percent of people at nutritional risk in 1999 also ranged widely by survey location, with an overall percentage of 24%. A different pattern emerged for percent of people living alone, with an average of 20%.

b. Nutritional status related to life style characteristics

The association between selected life style characteristics and nutritional risk is reported in Table 2. Cognitive status in 1999 was significantly related to nutritional risk for the sample as a whole, X2 (df1) 5.43 (p<.05 ), OR of 2.10 ( 95% CI 1.98,2.22). Those who were cognitively impaired were at nutritional risk in greater frequency than participants with MMSE ≥ 24. However, when the relationship between cognitive status and nutritional status was analyzed separately by gender there was no significant association between the variables.

The relationship between self-care status (7 items) and nutritional status (MNA) was highly significant for both genders (Males: X2 (df1) 7.17,p<.01, OR of 2.93 (95% CI 2.76,3.10); Females: X2 (df1) 4.05,p<.05, OR of 2.06 (95% CI 1.90,2.22)). Both males and females who were not able to perform all self-care tasks were more likely than the nonimpaired to be at nutritional risk. However, the association between living situation and nutritional status was not significant for either gender, or for the sample as a whole.

Table 2

Logistic regressions of nutritional risk among total sample of 80-85 year old SENECA subjects and subjects separated by gender on selected life style characteristics

<table>
<thead>
<tr>
<th>Life style characteristic</th>
<th>Total sample (n=537)</th>
<th>Females (n=286)</th>
<th>Males (n=251)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ORb 95%CIb</td>
<td>ORb 95%CIb</td>
<td>ORb 95%CIb</td>
</tr>
<tr>
<td>Female gender</td>
<td>1.08 0.97,1.19</td>
<td>0.89 0.75,1.03</td>
<td>1.15 0.99,1.31</td>
</tr>
<tr>
<td>Living Alone</td>
<td>1.04 0.93,1.15</td>
<td>0.89 0.75,1.03</td>
<td>1.13 0.96,1.30</td>
</tr>
<tr>
<td>Diminished Cognitive</td>
<td>2.10* 1.98,2.22</td>
<td>1.77 1.61,1.93</td>
<td>2.65 2.46,2.84</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced Self Care Ability</td>
<td>2.44 *** 2.32,2.56</td>
<td>2.06* 1.90,2.22</td>
<td>2.93** 2.76,3.10</td>
</tr>
</tbody>
</table>

b MNA <24 points. b Odds ratios (ORs) and 95% confidence intervals (CIs) derived from multiple logistic regression analysis including all variables in the models. c Living alone vs living with spouse or living with others. d MMSE < 24. e Not able to perform all 7 ADLs. **p<.01; ***p<.001
A similar pattern of relationship was observed when total nutrition status (MNA), cognitive status (MMSE), and self-care ability were categorized by living situation (Table 3). For the variables total nutrition status score in 1999 (MNA), cognitive status score in 1999 (MMSE), BMI in 1999, and 7 item self-care score in 1999 there were no significant differences by living situation by gender. When all the subjects were categorized by living situation, there were no significant differences in nutritive status, but there were significant differences for all the subjects and for females in cognitive status, and in seven-item self-care scores. There were also differences for all the subjects in BMI. Those who lived with others had lower cognitive scores and lower self-care ability than those who lived alone or those who lived with spouse only. In the case of females with lower scores on the 7-item instrument, the differences in scores are between those who live with spouse only and those who live with others. BMI scores for all the subjects were lower for those who lived alone vs those who lived with spouse/partner. However, mean BMI scores for all three living situations were within the acceptable range. See Table 3 for details.

### Table 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th>n</th>
<th>Alone</th>
<th>n</th>
<th>Spouse/partner</th>
<th>n</th>
<th>With others</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNA score 1999 (range 0-30)</td>
<td>Total</td>
<td>224</td>
<td>26 (3)</td>
<td>215</td>
<td>26 (3)</td>
<td>115</td>
<td>26 (3)</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>59</td>
<td>27 (3)</td>
<td>158</td>
<td>26 (3)</td>
<td>40</td>
<td>26 (4)</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td>165</td>
<td>26 (2)</td>
<td>57</td>
<td>26 (2)</td>
<td>75</td>
<td>26 (3)</td>
</tr>
<tr>
<td>MMSE score 1999 (range 0-30)</td>
<td>Total</td>
<td>224</td>
<td>26 (3)a</td>
<td>213</td>
<td>26 (3)a</td>
<td>100</td>
<td>25(5)b</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>61</td>
<td>26 (3)</td>
<td>158</td>
<td>26 (3)</td>
<td>32</td>
<td>26 (4)</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td>163</td>
<td>26 (3)a</td>
<td>55</td>
<td>26 (3)a</td>
<td>68</td>
<td>24 (5)b</td>
</tr>
<tr>
<td>BMI 1999</td>
<td>Total</td>
<td>234</td>
<td>26 (4)a</td>
<td>219</td>
<td>27 (4)b</td>
<td>118</td>
<td>26 (4)ab</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>63</td>
<td>26 (4)</td>
<td>159</td>
<td>27 (4)</td>
<td>40</td>
<td>27 (4)</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td>171</td>
<td>26 (4)</td>
<td>60</td>
<td>26 (5)</td>
<td>78</td>
<td>26 (5)</td>
</tr>
<tr>
<td>Self-care score 1999 (range 0-7)</td>
<td>Total</td>
<td>251</td>
<td>6 (2)a</td>
<td>243</td>
<td>6 (2)a</td>
<td>133</td>
<td>5 (2)b</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>65</td>
<td>6 (2)</td>
<td>178</td>
<td>6 (2)</td>
<td>45</td>
<td>5 (2)</td>
</tr>
<tr>
<td></td>
<td>Females</td>
<td>186</td>
<td>6 (2)ab</td>
<td>65</td>
<td>6 (1)a</td>
<td>88</td>
<td>5 (2)b</td>
</tr>
</tbody>
</table>

Within each row, means with similar letter superscripts (a, b) or no superscripts are not significantly different at P<0.05 using the Tukey’s Studentized Range Test.

### c. Longitudinal analysis of life style characteristics

Longitudinal change in the ability to perform self-care tasks without difficulty was analyzed. In 1999 only 31% of the females and 49% of the males were able to do all seven self-care tasks, down from 61 and 78% in 1993, which was down from 75 and 83% in 1989. The task that fewest people could perform was cutting toe-nails, followed by washing himself/herself. The greatest numbers of people could feed himself/herself.

In all three surveys, 1989, 1993, and 1999, there were significant differences between genders in the number of people who were able to perform the seven basic ADL tasks, X2 (df1) 5.48 (p<0.05), 22.78 (p<.001) and 21.13 (p<.001), respectively. In all cases more females than males were not able to do all seven tasks.

There were no significant differences by gender in the numbers of people who were cognitively impaired (MMSE <24) and those who were not impaired (MMSE ≥ 24) in either 1993 or in 1999. There were significant and highly significant differences by gender for both being unable to do all seven self-care tasks at each of the three time periods and living alone at all three times. In each case it was the women who exhibited that condition in greater frequency than men.

A strong increase over time (1993-1999) can also be seen for the relationships between cognitive status and self-care ability and between cognitive ability and living situation, as shown in Table 4.
Those not able to do all 7 self-care tasks in 1993 were more likely than other subjects to have MMSE scores of <24, X2(df1) 4.14 (p<.05). In 1999 the relationship was even stronger, X2 (df1)18.63 (p<.001). When the relationship between those same two variables were analyzed separately by gender there were no significant differences for either gender in 1993 or for females in 1999. In the 1999 study fewer males who were possibly impaired, than those who were nonimpaired, were able to do all seven self-care tasks (X2 (df1) 18.74,p<.001).

In 1993 there were no significant relationships between living arrangement and cognitive status for either males or females. However, in 1999 people with possible cognitive impairment were more likely to live with others and less likely to live with spouse/partner only than nonimpaired, X2 (df2) 13.50 (p<.001). When the same analyses were separately made by gender there were no significant relationships between the variables for males, but for females the relationship was significant, X2 (df2) 18.74.(p<.001).

In 1993 there were no significant relationships between living arrangement and cognitive status for either males or females. However, in 1999 people with possible cognitive impairment were more likely to live with others and less likely to live with spouse/partner only than nonimpaired, X2 (df2) 13.50 (p<.001). When the same analyses were separately made by gender there were no significant relationships between the variables for males, but for females the relationship was significant, X2 (df2) 18.74.(p<.001).

A strong increase in interrelations can also be shown for self-care ability and living situation when it concerns the position of living with others but not living alone. In 1989 and 1993, those who were not able to perform all seven self-care tasks were more likely than the nonimpaired to live with others,X2 (df2) 8.70,p<.05 and X2 (df2) 12.82, p<.01, respectively. In 1999 those who were not able to perform all seven tasks were more likely than the self-care able to live with others and less likely to live with spouse only, X2 (df2)14.37 (p<.001).

Discussion

a. Differences between study centers

This longitudinal study of 80-85 year old persons living in traditional towns across Europe was specifically focused on the relationships between nutritional status, cognitive and functional status, living situation, and gender, and changes in these relationships over time. The prevalence of possible cognitive limitations, as measured by the MMSE, varied greatly from one country to another, as did the proportion of people who were considered to be at nutritional risk on the MNA. Wide cross-site differences also existed for ability to perform self-care tasks (ADL) and numbers of people who lived alone. Nevertheless, after presenting the percents of people who fell within each of these categories by country, all other analyses were made by combining all data to present overall statistics across all subjects. Thus, some of the conclusions may not truly represent the practices and status of subjects in some locations.

b. Data from other surveys

Contrary to our results, Griep et al.(14) did not find significant relationships between MNA scores and self-care ability ADL scores. Their data, however, refer to only 81 subjects living in a retirement home, in contrast to the SENECA study where the subjects were mainly those living independently in the community. Relationships between MMSE scores and ADL functional capacity were also found by Rozzini et al.(15) in a study of 549 subjects aged 70 and over in Northern Italy.
Wide disparities exist between studies in the proportion of the elderly population deemed to have disabilities in one or more ADLs. Much of this difference may be the result of which ADL items are measured and in what constitutes a disability. For example, in a comparison of 11 national surveys in the United States conducted between 1982 and 1987, the number of ADLs assessed ranged from 4-9, with differences among the surveys in whether or not the measure of disability includes type of assistance, duration of problem, or level of difficulty (10). Some studies include the task of grooming (16, 17), while others specify the ability to cut toe-nails (18, 19). In our study the task “cut toe-nails” was included as one of the ADLs, and 61% of the respondents in 1999 were not able to do all seven ADLs. However, when that task was omitted from the ADL score only 28% of the respondents were considered disabled.

c. Increase in relationships over time

As hypothesized the relationship between cognitive status and self-care ability, between self-care ability and living situation, and between cognitive status and living situation got stronger with advancing age. In 1993 when the subjects were 74 to 79 years of age 29 subjects were deemed to be cognitively impaired and 13 of these were not able to perform all seven ADL self-care items (45%). In 1999 at the age of 80 to 85 years this was the case in 77 of 99 possibly cognitively impaired subjects (78%). (See Table 4). Zarit et al. (17) found even greater relationships in 313 Swedish elderly 84 to 90 years of age. Nearly all respondents who had ADL deficits also had cognitive impairments.

As nutritional risk was measured with different methods than in earlier SENECA surveys we could not analyze whether the interrelation between MNA and MMSE or ADL scores also increased with age. A longitudinal analysis of this relationship would be of high interest.

d. Living alone

We have shown earlier that living alone did not adversely affect nutrient intake or nutritional status in SENECA subjects up to the age of 75 (7). In this paper we now can show that MNA scores are not affected by living alone even in subjects as old as 80 to 85 years. There were no significant associations for either gender between living situation in 1999 and nutritional status measured in 1999 by the MNA. Thus, among those who live alone, either male or female, there is not a greater risk of being malnourished. No difference in survival for elderly living alone was reported earlier by Davis et al. (21). These results may be surprising to some who consider old people living alone by definition to be a risk group. The increase in relationships between living arrangement and MMSE and ADL scores found in our data may be one way to explain this controversy.

At the time of the 1993 survey there were no significant relationships between cognitive status or the ability to perform self-care items and living arrangement for either males or females, but by 1999 those with cognitive or functional limitations were more likely to live with others and less likely to live with spouse/partner only. In separate analyses by gender this relationship was not significant for males, but it was for females. It is possible that for cognitively impaired males the presence of a spouse who can serve as a caregiver delays a change in living situation to that of living with others, but for women with limitations a change to living with others is more of a likely scenario.

Overall, decreased cognitive and functional status is associated with both greater dependency relative to living situation and increased risk of malnutrition. Elderly people with diminished cognitive function and diminished self-care ability had a more than two times higher risk of being at nutritional risk than those without similar limitations. However, measures associated with nutritional status, including MNA scores, did not differ by living situation either for the total group or for either gender. In addition, nutritional status, as measured by MNA, did not differ by gender in this study of 80-85-year-old persons.

References

LIFE STYLE AND NUTRITIONAL RISK


