Cognition and Social–Physiological Factors Associated With Malnutrition in Hospitalized Older Adults in Taiwan

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ABSTRACT

Background: Malnutrition is prevalent among hospitalized geriatric patients.

Purpose: The aim of this study was to explore the impact of cognitive status and its associated factors on the nutritional status of hospitalized geriatric patients.

Methods: A descriptive and cross-sectional study design was conducted. Two instruments, the Mini Nutritional Assessment and the Mini-Mental State Examination (MMSE), were administered to 401 geriatric participants. Linear regression was used to examine the contribution of cognitive status and its associated factors to the nutritional status of participants.

Results: Participants had a mean age of 85 years, and three quarters (73.6%) were men. Participants earned a mean MMSE score of 19.1 ± 8.0 and a mean Mini Nutritional Assessment score of 20.2 ± 5.2. Two thirds (67.1%) were at risk for malnutrition, and 22.7% experienced malnutrition. One third (33.1%) had mild-to-moderate cognitive impairment, and 32.2% had severe cognitive impairment. The MMSE scores accounted for 21% of the total variability in nutritional status. In addition, the Charlson Comorbidity Index score and care status were also significant predictors of malnutrition and, together with the MMSE scores, accounted for 53% of the variability in the nutritional status of participants in the regression model.

Conclusions: Findings indicate that cognitive status, concomitant comorbidities, and care status are significant predictors of malnutrition. The results of this study provide information to help clinicians identify at-risk populations for malnutrition and develop appropriate nutrition programs based on individual needs.

Key Words: malnutrition, cognitive function, geriatric, Taiwan.

Introduction

The elderly account for an increasingly large percentage of the population in many countries. Data from the Ministry of the Interior indicate that there were approximately 1,480,000 elderly people in Taiwan in September 1993, which is 7% of the total population. Between 1951 and 1971, the old-age dependency ratio (the ratio of persons in a population that are dependent on the assistance of others) was roughly 5% in Taiwan. By October 2004, this ratio had grown to 13.25%. Many older adults in Taiwan experience cognitive decline and impairment. In 2005, Taiwan recorded 140,000 individuals with dementia. This number is expected to increase to 450,000 by 2050 (Chan & Lin, 2005; Department of Statistics, Ministry of Interior, 2009). Elderly individuals with dementia frequently have difficulty feeding themselves and may not understand the importance of maintaining good nutritional status (Cole, 2012). The nutritional status of geriatric populations is an issue that deserves greater attention from healthcare providers and caregivers (Donini, Neri, De Chiara, Poggioalle, & Muscaritoli, 2013; Saka, Kaya, Ozturk, Erten, & Karan, 2012).

The previous research in this area has focused on the effectiveness of nutritional therapies in maintaining or improving cognitive functions rather than on identifying the impact of cognitive impairment and its associated factors on the risk for malnutrition (Benton, Winichagoon, Ng, Tee, & Isabelle, 2012; Scott et al., 2006). To address this gap, this study was designed to explore the impact of cognitive functions and its associated factors on the nutritional status of elderly inpatients in Taiwan. We sought to identify the characteristics of

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this vulnerable population and to enable healthcare providers to bring attention to this issue in clinical practice.

**Methods**

Data from a retrospective cohort of 401 patients admitted to the geriatric evaluation and management unit of a general hospital in Taiwan from May 2009 to May 2011 were collected for analysis. Although the target hospital assessed the nutritional and cognitive status of all patients at admission, we excluded those patients admitted for life-threatening conditions from our analysis. Patients provided verbal consent to participate in the study. This assessment was undertaken as part of an ongoing service development program at the hospital. Pearson correlations and analysis of variances were used to identify the factors associated with levels of nutritional status. Linear regression was used to examine the contributions to nutritional status of cognitive status and its associated factors.

The demographic questionnaire included items that pertained to gender, marital status, educational level, tobacco use, alcohol use, and care status. The Charlson Comorbidity Index (CCI), a common index used in a variety of healthcare settings and countries (Seo et al., 2010), was used to assess comorbidities. The CCI contains 19 chronic disease items. Patients were categorized into four groups based on CCI scores (0, 1–2, 3–4, and ≥5), with higher scores indicative of poorer health condition.

The Mini Nutritional Assessment (MNA) was used to measure nutritional status (Guigoz, Vellas, & Garry, 1996). The MNA contains 18 questions grouped into five categories: anthropometry, for example, calf circumference; global assessment, for example, living independently; psychological stress; dietary habits, for example, number of whole meals eaten per day; and self-perception of nutritional and health status. The highest possible score is 30, with >17 indicative of malnutrition, 17–23.5 indicative of being at risk for malnutrition, and ≥24 indicative of being adequately nourished.

The Mini-Mental State Examination (MMSE) was used to assess the cognitive status of participants. This scale tests several mental capabilities, including memory, attention, and language, using a series of questions and tests. The maximum score is 30, with a score of >17 indicative of severe cognitive impairment, 17–23 indicative of mild-to-moderate cognitive impairment, and 24–30 indicative of capacity to understand the questions and texts and of normal cognitive ability.

**Results**

**Demographic Characteristics**

Data were obtained from 401 patients. The average age of participants was 85 years, and most were men (73.6%) and married (87.5%). Two fifths (40%) were their own primary caregiver, and the remainder named another (e.g., spouse, children) as their primary caregiver. Almost half (47%) had a CCI score in the category of 1–2, and 53% scored 3 or above, indicating the presence of comorbid chronic diseases.

**Cognitive and Nutritional Status**

The results showed a mean MMSE score of 19.1 ± 8.0 and a mean MNA score of 20.2 ± 5.2. Of the participants, 67.1% were at risk for malnutrition, and 22.7% experienced malnutrition. With regard to cognitive status, 33.1% were found to have a mild-to-moderate cognitive impairment, and 32.2% were found to have a severe cognitive impairment. Table 1 presents the demographic characteristics of the different nutritional status subgroups. Higher cognitive status, gender (male), younger age, fewer comorbid conditions, nonsmoker status, and self-care all related to better nutritional status.

**Contributors to Nutritional Status**

Because MMSE has been highlighted in the literature as a significant predictor of malnutrition, we positioned MMSE on the first level of the regression analysis. Pearson correlations were used to select the other associated variables (Table 2), which were combined with MMSE on the second level. We then retained the factors that were statistically significant in the regression model and deleted the factors that were not.

As seen in Table 2, MMSE scores accounted for 21% of the variability in nutritional status. CCI scores and care status were the two other significant predictors. MMSE score, CCI score, and care status accounted for 53% of the total variability in nutritional status.

**Discussion**

The results of this study indicate that the cognitive status of an individual significantly affects his or her nutritional status, with those at lower cognitive status levels tending to face a relatively higher risk for malnutrition. Requejo et al. (2003) conducted a prospective study that sampled 168 elderly individuals to examine the relationship between cognitive status, food habits, and nutrient intake. Their results showed that individuals with adequate cognitive capacities tended to have a higher intake of total food (Requejo et al., 2003). Lin, Watson, and Wu (2010) conducted a cross-sectional study of 477 institutionalized older adults with dementia in Taiwan and examined the risk factors for low food intake. They identified moderate-to-severe dementia as a risk factor (Lin et al., 2010). This finding is consistent with the results of our study.

Cognitive status affects nutritional knowledge and food intake skills. Therefore, impaired cognitive capabilities are a risk factor for malnutrition related to low food intake. Other possible causes of low food intake in older people with cognitive impairment include loss of appetite, depression, and lack of staff training to identify patients who need assistance to eat. In this study, 65.3% of the participants were identified
as having mild-to-severe cognitive impairment. Thus, identifying difficulties in effective eating or feeding in this population is critically important. On the basis of the findings of previous research, these difficulties include problems with self-feeding, chewing food, delivering food into the mouth, and swallowing food (Berkhout, Cools, & Houwelingen, 1998). Moreover, feeding strategies should be altered depending on individual need. Thus, determining the factors that are associated with nutritional status may help cognitively impaired individuals achieve adequate nutritional status.

This study identified the presence or absence of a primary caregiver (care status), in addition to concomitant diseases and cognitive impairment, as a significant predictor of nutritional status. Our results found that participants who took care of themselves had better nutritional status. Lin et al. (2010) found lack of feeding assistance and minimal visits by family members to be associated with low food intake in elderly institutionalized men. This differed from our findings on the role function of family members (Lin et al., 2010). The difference may be attributable to differences in study setting, with this study having a higher percentage of elderly participants who were able to take care of themselves. Self-care, as opposed to being regularly cared for by others, may be an indicator of better overall health status.

In addition, our study related tobacco use to poor nutritional status. A possible reason is that individuals who smoke tend to have unhealthy patterns of nutrient intake. In addition, unhealthy dietary habits may aggravate the risks for coronary heart disease and cancer that are associated with smoking (Dallongeville, Marécaux, Fruchart, & Amouyel, 1998). Notably, we also found that men tend to have better nutrition. Previous research has shown that gender differences in food choices, nutrient intake, and responsibility for nutrition management may underpin the relationship between gender and nutrition (Wong, Gucciardie, Li, & Grace, 2005). This finding may be attributable to gender role expectations. Especially in Asian cultures, women are responsible to ensure the nutritional health of family members but often overlook or undervalue their own nutritional needs. Nevertheless, Rist, Miles, and Karin (2012), using the MNA

<p>| TABLE 1.  |
| Factors Associated With Different Nutritional Statuses |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>MNA &lt; 17 (n = 91)</th>
<th>MNA = 17-23.5 (n = 195)</th>
<th>MNA &gt; 23.5 (n = 115)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>.02*</td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>70.3</td>
<td>135</td>
<td>69.2</td>
</tr>
<tr>
<td>Female</td>
<td>27</td>
<td>29.7</td>
<td>60</td>
<td>30.8</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>86.44</td>
<td>84.44</td>
<td>84.36</td>
<td>.02*</td>
</tr>
<tr>
<td>CCI (mean)</td>
<td>2.78</td>
<td>2.62</td>
<td>2.12</td>
<td>.03*</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.01**</td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>16.5</td>
<td>10</td>
<td>5.1</td>
</tr>
<tr>
<td>No</td>
<td>76</td>
<td>83.5</td>
<td>185</td>
<td>94.9</td>
</tr>
<tr>
<td>Caregiver</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Self</td>
<td>24</td>
<td>26.4</td>
<td>76</td>
<td>39.0</td>
</tr>
<tr>
<td>Spouse</td>
<td>18</td>
<td>19.8</td>
<td>40</td>
<td>20.5</td>
</tr>
<tr>
<td>Child</td>
<td>28</td>
<td>30.7</td>
<td>37</td>
<td>19.0</td>
</tr>
<tr>
<td>Nurse or other</td>
<td>21</td>
<td>23.1</td>
<td>42</td>
<td>21.5</td>
</tr>
<tr>
<td>MMSE</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>0–17</td>
<td>57</td>
<td>62.6</td>
<td>60</td>
<td>30.8</td>
</tr>
<tr>
<td>17–23</td>
<td>21</td>
<td>23.1</td>
<td>77</td>
<td>39.5</td>
</tr>
<tr>
<td>24–30</td>
<td>13</td>
<td>14.3</td>
<td>58</td>
<td>29.7</td>
</tr>
<tr>
<td>MMSE (mean)</td>
<td>13.50</td>
<td>19.03</td>
<td>23.6</td>
<td>&lt;.001***</td>
</tr>
</tbody>
</table>

Note. MNA = Mini Nutritional Assessment; CCI = Charlson Comorbidity Index; MMSE = Mini-Mental State Examination.
*p < .05. **p < .01. ***p < .001.

<p>| TABLE 2.  |
| Predictors of Nutritional Status |</p>
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>p</th>
<th>R²</th>
<th>F Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>14.362</td>
<td>&lt;.001</td>
<td>.22</td>
<td>114.737***</td>
</tr>
<tr>
<td>MMSE</td>
<td>0.308</td>
<td>&lt;.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.765</td>
<td>.578</td>
<td>.53</td>
<td>39.661***</td>
</tr>
<tr>
<td>MMSE</td>
<td>0.202</td>
<td>&lt;.001***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCI</td>
<td>−0.222</td>
<td>.023*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiver</td>
<td>−0.429</td>
<td>.019*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. MMSE = Mini-Mental State Examination; CCI = Charlson Comorbidity Index. *p < .05. **p < .01. ***p < .001.
to survey 235 clients aged 65 years and over for malnutrition, found no significant relationship between nutrition risk and gender (Rist et al., 2012). The relationship between gender and risk for malnutrition may differ across countries and deserves further investigation.

Age, gender, underlying diseases, and care status are considered nonmodifiable factors. We may, however, use these data to identify high-risk populations for malnutrition and to develop programs based on the reasons for low food intake as a means to help these populations improve their nutritional status. In addition, healthcare providers should encourage smokers not only to quit smoking but also to improve their nutritional intake habits.

Limitations
All of the samples were recruited from one medical center in an urban area. Thus, the results may not be generalizable to the general population of older adults living in the community, in long-term care, or in other geographic areas. In addition, the data were collected at one point in time, precluding an examination of the change in nutritional status over time. With regard to identifying comorbidities, we used only a summary score of the CCI. Therefore, we were unable to analyze the relative impact on nutritional status of specific diseases. Finally, we excluded those elderly with depression or mental problems from participation, which may have an impact on the results for cognitive status.

Conclusions and Implications for Practice
The elderly who live in acute care settings face a relatively high risk for malnutrition. The factors associated with malnutrition risk in older patients in an acute setting include cognitive status, concomitant diseases, care status, tobacco use, age, and gender. Of these, the presence of concomitant diseases and care status (self-care vs. primary care provided by another) are significant predictors. In the regression model, these two factors, when combined with the MMSE score, accounted for 53% of the total variability in nutritional status. These results provide information to help clinicians identify at-risk populations for malnutrition and develop appropriate nutrition programs to address individual patient needs.

References


臺灣住院高齡患者營養不良與認知及社會心理相關因素探討

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背景
營養不良在住院高齡病患盛行率高。

目的
探討於住院高齡病患之認知功能對營養的影響力，及檢視營養狀態之相關因素。

方法
採橫斷式設計，有401位參加者接受營養及認知功能評估，以線性迴歸分析認知功能及相關因素對營養的影響力。

結果
參與者平均85歲，其中73.6%是男性，參與者平均MMSE分數為19.1 ± 8.0及MNA分數為20.2 ± 5.2。67.1%的參與者有營養狀態不良的風險，22.7%的參與者處於營養不良狀態。認知功能方面，33.1%屬於輕度至中度認知障礙，32.2%屬於重度認知障礙。認知功能對營養狀態之影響有21%的解釋力，若再加上共存疾病與主要照護者，則解釋力上升至53%。

結論
認知狀態、罹病狀況及是否有主要照護者為營養不良的預測因子。藉此結果可提供臨床人員及早發現有營養不良危險的個案，及依個別性需求發展其營養措施。

關鍵詞：營養不良、認知功能、高齡、臺灣。

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