MALNUTRITION IN TURKISH NURSING HOMES: A CORRELATE OF SHORT TERM MORTALITY


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Abstract: Objective: Elderly nursing home residents are under high risk of malnutrition. Early interventions to prevent malnutrition may play a critical role in malnutrition-mortality correlation. This study aimed to obtain insight into the prevalence of malnutrition in nursing homes in the capital city of Turkey and the role of malnutrition in predicting the risk for short-term mortality. Design: This study was conducted in seven different residential care facilities in Ankara. Measurements: Nutritional status was evaluated by Mini Nutritional Assessment-Short Form. Results: The mean age of the 534 participants was 79.46±7.22 years. Nutritional assessment revealed that 15.9% of all older adults suffered from malnutrition and another 53.6% were at risk of malnutrition. The mortality rate for all subjects was 118 (22.1%) over 18 months, which was significantly higher in participants with malnutrition. Conclusions: We noted a high prevalence of malnutrition and a strong correlation of increased mortality with malnutrition in nursing home residents. Given the negative impact of malnutrition on mortality and morbidity, an emphasis should be placed on an effective nutritional policy in nursing homes.

Key words: Malnutrition, mortality, nursing home, elderly.

Introduction

Malnutrition is a serious and frequent condition in older adults. The prevalence of malnutrition is considerably higher (30–60%) in institutionalized elderly (1). A variety of poor dental hygiene, chronic and acute diseases, impaired cognition, and accompanying multimedication may compromise dietary intake and lead to nutritional deficiencies and malnutrition (2). Malnutrition among the older adults is a recognized risk factor to increased incidence of morbidity and even mortality (3).

Elderly nursing home residents seem to have a higher risk of malnutrition (4). Thus, nutritional assessment should be considered in any comprehensive evaluation of older adults in nursing homes (5). Institutionalized elderly are more or less disabled and highly afflicted with functional impairments and diverse health problems that may compromise adequate nutrition – and are thus at high risk of malnutrition. Nursing staff members often do not realize nutritional problems and the need for individualized nutritional care, and as a result, malnutrition remains largely unrecognized, especially in developing countries (6). Several studies have examined the prevalence of malnutrition in institutionalized older adults and reported diverse results.

Screening for malnutrition is an essential measure in the prevention of nutritional problems. Detection of malnutrition can be facilitated by the use of a simple and reliable nutritional screening tool. The Mini Nutritional Assessment- Short Form (MNA-SF) is an easily administered, validated and widely used clinical tool which can be performed in 5 minutes without the need for biochemical testing (7). Prevalence rates provide insight into the magnitude of the problem and help to establish a nutrition policy that takes the limited health care resources into account. When evaluating the role of nutrition in influencing mortality of nursing home residents, it is important to acknowledge that early interventions to prevent malnutrition may play critical role in malnutrition-mortality correlation (4).

This study was therefore performed to obtain insight into the prevalence of malnutrition in nursing homes in the capital city of Turkey and the role of malnutrition assessed by the MNA-SF in predicting the risk for short-term mortality.

Materials and methods

Subjects
This study was conducted in seven different residential care facilities in Ankara, the capital city of Turkey, in a period of 5 months. All residents aged over 65 years staying in one of the selected nursing homes for at least 1 month were considered for enrollment in the study. We excluded residents with clinical evidence of acute infectious diseases or acute worsening of chronic diseases at the time of observation. The residents with a diagnosis of terminal cancer and end-stage liver or renal disease were also excluded. Informed consent was obtained from the residents or their legal guardian. The study was approved by the Hacettepe University Ethical Comitee.

Data collection
Enrolled patients were examined by members of a multidisciplinary team, comprising one geriatrician (medical
Nutritional assessment

The MNA-SF contains 5 items and its maximum score is 14. A MNA-SF score of ≤ 7 is considered as malnourished, and a score between 8 and 11 is identified as at risk for malnutrition. A score of ≥12 on the MNA-SF indicates that the patient is well-nourished. Like MNA, MNA-SF is a valid nutritional screening tool applicable to geriatric patients with the option of using calf circumference when BMI cannot be calculated (7).

We also accounted for the impact of nutritional supplementation on current nutritional status and subsequent mortality by documenting the presence of prescribed artificial nutrition (either via oral supplementation or enteral tube feeding).

Additional data regarding the subject's physical activity and medications were collected through a questionnaire. The ability of an individual to perform basic activities of daily living was measured using the Index of Activities of Daily Living (ADL) (8). The research nurses evaluated the ADL function for every participant based on both interviews and observations.

Anthropometric measurements

A dietician performed all anthropometric measurements and clinical interviews necessary for the assessment of nutritional status. Weight was recorded to the nearest kilograms (kg). Fifteen immobile residents could not be weighed and consequently the BMI couldn’t be calculated. Therefore, instead of BMI, calf circumferences were used to calculate MNA-SF scores in these residents.

Height in meters (m) was estimated from the demi-span (distance from the tip of middle finger to midline of the sternum) of all residents, using the following equations (9):

Males: Height (m) = \{\frac{1.40 \times \text{demi-span (cm)}}{100} + 57.8\}

Females: Height (m) = \{\frac{1.35 \times \text{demi-span (cm)}}{100}\}

The decision to use demi-span for height approximation was made as the majority of the residents had significant spinal deformities or were chairbound, precluding the accurate assessment of standing height. BMI was calculated as weight (kg) divided by height squared (m²). Anthropometric measurements of mid-arm circumference (MAC) and calf circumference were also performed. MAC was measured at the midpoint between the acromion and the olecranon process and recorded to the nearest cm. Calf circumference was measured at the level of the largest circumference of the right calf, to the nearest cm.

Bioelectrical impedance analysis (BIA)

We used an electronic bioelectrical impedance analyser (TANITA TBF-300, Tanita Corporation of America, Inc., Illions, USA) for body composition analysis. This analyser uses a 50-Hz current source with electrodes on each foot to measure impedance to electrical conductivity as it passes through body fluids and calculates Free-Fat Mass (FFM), Fat Mass (FM)-% and FM-kg, lean body mass, fluid mass kg and %, and body density. Measurements were performed without accessories that contain metal (earrings, belts, coins). Whole-body impedance is measured as a foot-hand electrical pathway. Analyser automatically calculates basal metabolic rate using pre-programmed proprietary equations developed by the manufacturer. To ensure normal hydration status for BIA testing, participants were asked to adhere to the following pretest requirements: (a) no vigorous exercise within 12 hours of the test (b) no caffeine or alcohol consumption within 12 hours of the test (c) empty bladder within 30 minutes of the test, (d) no diuretic medications within 7 days of the test (e) no food or drink within 4 hours of the test and (f) no pace-maker and prosthesis. All anthropometric measurements were carried out with the subjects barefoot, wearing only their underwear, and after an overnight fast according to standardized protocols (10). Participants verified adherence to these instructions before testing and 298 of 534 patients were found to be suitable for BIA measurement.

Statistical Analysis

All data were entered into a database and were controlled by a second independent person. Normality in distribution was controlled with Kolmogorov-Smirnov Test for each variable. Descriptive data were presented in frequencies and percentages or means and standard deviations. Chi-square test was used to compare data on nominal level. The Student’s t-test for independent groups was used to compare groups on the level of interval data. To analyze differences within groups ANOVA test was used for normally distributed variables, Kruskal-Wallis test was used for not normally distributed variables. Two-sided values of P < 0.05 were considered as statistically significant. The statistical analyses were performed using SPSS, version 15.0 (SPSS for Windows, SPSS, Chicago).

Results

Within the screened 590 residents, 534 agreed for participation and underwent initial nutritional and functional assessment. The mean±SD age of the participants was 79.46±7.22 years. Women made up the majority of the study
population (n=347; 65.0%). Malnutrition risk was determined in 53.6% and malnutrition was determined in 15.9% of the participants according to MNA-SF assessment. The subjects' characteristics, age, gender, ADL scores, number of drugs, pressure ulcer rates, MAC, and BIA parameters according to the different groups of MNA-SF scores are presented in Table 1. MNA-SF test parameters of patients according to different nutritional status are showed in Table 2.

### Table 1

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Normal (n=163, 30.50%)</th>
<th>Malnutrition Risk (n=286, 53.60%)</th>
<th>Malnutrition (n=85, 15.90%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) (n=534)</td>
<td>77.48±7.20</td>
<td>79.79±7.02</td>
<td>82.08±7.02</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Gender (n=534)</td>
<td></td>
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</tr>
<tr>
<td>Male (n=187, 35%)</td>
<td>71 (38.00 %)</td>
<td>89 (47.60 %)</td>
<td>27 (14.40 %)</td>
<td>0.023</td>
</tr>
<tr>
<td>Female (n=347, 65%)</td>
<td>92 (26.50 %)</td>
<td>197 (56.80 %)</td>
<td>58 (16.70 %)</td>
<td></td>
</tr>
<tr>
<td>ADL (n=532) (median, min-max)</td>
<td>2.00, (0.00-20.00)</td>
<td>9.00, (0.00-20.00)</td>
<td>18.00, (0.00-20.00)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Drug number (n=532)</td>
<td>4.60±3.34</td>
<td>5.15±3.25</td>
<td>5.81±3.65</td>
<td>0.026</td>
</tr>
<tr>
<td>Pressure ulcers (n=532)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Present (n=59, 11.1%)</td>
<td>9 (5.50 %)</td>
<td>26 (9.10 %)</td>
<td>24 (28.60 %)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>• Absent (n=473, 88.9%)</td>
<td>153 (94.40 %)</td>
<td>260 (90.90 %)</td>
<td>60 (71.40 %)</td>
<td></td>
</tr>
<tr>
<td>Mid-arm circumference (cm) (n=457)</td>
<td>27.78±3.72</td>
<td>24.75±4.17</td>
<td>21.53±3.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Basal metabolic rate (n=298) (mean±SD)</td>
<td>1285.69±210.00</td>
<td>1164.72±190.99</td>
<td>1013.20±153.33</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lean body mass (kg) (n=298) (mean±SD)</td>
<td>46.40±8.80</td>
<td>42.73±8.55</td>
<td>37.89±6.35</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fat mass (kg) (n=297) (mean±SD)</td>
<td>23.54±8.70</td>
<td>17.27±7.98</td>
<td>9.37±6.60</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body density (n=278) (mean±SD)</td>
<td>1.09±0.05</td>
<td>1.03±0.02</td>
<td>1.05±0.02</td>
<td>0.641</td>
</tr>
<tr>
<td>Fluid mass (kg) (n=298) (mean±SD)</td>
<td>33.97±6.43</td>
<td>31.35±6.25</td>
<td>27.74±6.65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fat mass percent (%) (n=298) (mean±SD)</td>
<td>32.98±8.15</td>
<td>27.82±8.85</td>
<td>18.39±8.85</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fluid percent (%) (n=278) (mean±SD)</td>
<td>48.61±6.48</td>
<td>52.75±6.96</td>
<td>59.32±6.67</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

ADL: Activities of daily living

FFM (r=0.342, p<0.001), FM (%) (r=0.230, p<0.001), FM (kg) (r=0.307, p<0.001), and fluid mass (kg) (r=0.339, p<0.001) were significantly and positively, fluid mass (%) (r=0.186, p=0.002) was significantly and negatively correlated with MNA-SF score of the residents.

The numbers of residents with and without oral supplementation were 47 (58%) vs. 34 (42%) in malnourished group, 64 (22.7 %) vs. 218 (77.3%) in patients with malnutrition risk and 17 (10.4%) vs 146 (89.6%) in well-nourished patients (p<0.001).

During the 18 months period, 79 residents left the nursing homes; therefore, mortality analysis was performed on 455 participants. The mortality rate for all subjects was 118 (22.1%) over the 18 months study period, which was significantly higher in the participants with malnutrition 34 (40.8%) than the patients with malnutrition risk 68 (24.0%) and the well-nourished patients 16 (9.9%) (Figure 1). FM (%) (26.24±9.88 vs. 30.00±9.18, p=0.014), FM (kg) (16.66±9.53 vs. 19.99±9.00, p=0.027) were significantly higher, fluid mass (%) (53.60±7.19 vs. 50.97±7.27, p=0.028) was significantly lower in patients who were dead at 18th month.

### Table 2

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Normal (n=163, 30.50%)</th>
<th>Malnutrition Risk (n=286, 53.60%)</th>
<th>Malnutrition (n=85, 15.90%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, kg, (n=519) (mean±SD)</td>
<td>69.64±13.47</td>
<td>58.23±12.91</td>
<td>45.98±9.41</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Height, cm, (n=534) (mean±SD)</td>
<td>152.94±11.08</td>
<td>151.85±11.15</td>
<td>150.51±11.77</td>
<td>0.262</td>
</tr>
<tr>
<td>BMI kg/m² (n=519) (mean±SD)</td>
<td>29.80±5.72</td>
<td>25.23±4.88</td>
<td>43.94±7.21</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Calf circumference (cm) (n=452) (mean±SD)</td>
<td>49.54±7.20</td>
<td>37.54±6.95</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mobility (n=534)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>• Mobile (n=362)</td>
<td>150 (92 %)</td>
<td>180 (62.9 %)</td>
<td>32 (37.6 %)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>• Immobile (n=172)</td>
<td>13 (8 %)</td>
<td>106 (37.1 %)</td>
<td>53 (62.4 %)</td>
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</tr>
</tbody>
</table>

The majority of the study population were on oral feeding, with 125 residents (24.3%) taking an oral supplementation. Only 3 residents were requiring tube feeding via nasogastric or percutaneous gastrostomy tubes. Overall, 128 residents (24.3%) were receiving any form of nutritional supplementation which was only 17 (10.4%) in well-nourished elderly, whereas it was 47 (58.0%) in patients with malnutrition (p<0.001) (Figure-2).
This is the first study conducted to examine, in considerable detail, the nutritional status of some nursing home residents in Turkey. We noted a high prevalence of malnutrition and risk of malnutrition in this population and a strong correlation with increased mortality and malnutrition, confirming the need for increased surveillance of nutritional status among nursing home residents. Such findings are not surprising, as previous studies have reported prevalence rates of malnutrition ranging from 10% to 85% in the older adults at long term care facilities (2, 11).

The wide range of malnutrition prevalence in different studies can be explained at least in part by the use of different instruments for nutritional assessment in the geriatric population and by different degrees of dependence, and need of care in different surveys (2, 12, 13). The type of the facility and the geography also affect the findings; the nursing home being in an urban or a large town is independently correlated with the prevalence of malnutrition (10). Our participants were mostly mobile and self-sufficient residents, living at nursing homes in the city center of Ankara, a metropolitan with a population of approximately 4 million, which is the capital city of Turkey.

Malnutrition in the elderly is often associated with functional impairment, disability and impaired health (14, 15). Elderly people tend to have more acute and chronic illnesses and diseases as well as physical disability may lead to decreased food intake. As a consequence of an illness, prescribed drugs are used, and these drugs often have side effects such as dry mouth and loss of appetite (2, 16, 17). A strong correlation between number of medications and malnutrition was found in this study too. In a previous study, it was found that the ADL level at entry determined the progression of malnutrition in the subsequent 3 years (18). Such a relationship between ADL scores and malnutrition in nursing home residents was shown cross-sectionally in our study and this well agrees with the results of previous studies pointing out that ADL has a power to negatively affect nutritional state, which leads to a worse morbidity and mortality. Special nutritional support should thus be provided to elderly individuals to allow them to maintain their ADL levels as well as to improve their overall health condition (18). The functional deficits, that are relevant for the development of malnutrition, can be compensated for - at least partially - by a skilled and ambitious nursing staff which can be achieved by training and monitoring. Each country should arrange such educational programmes locally.

In conclusion, our study identified a high prevalence of malnutrition in the elderly. MNA is specifically developed to evaluate the nutritional status of the elderly and is widely used and accepted today. But its length limits its usefulness for screening. Therefore, MNA-SF has been developed. Correlation between MNA-SF and full MNA version was high in previous studies. It was confirmed that the MNA-SF in its original form is reliable as a nutritional screening tool. Its usage was also validated for the assessment of protein-calorie malnutrition in the nursing home population (4, 20, 21).

In this present study, we found that the BMI of the malnourished elderly was significantly lower than the well-nourished residents. On the other hand, it is very well known that BMI is a poor indicator of body composition in the elderly (22) and weight stability might mask changes in the body compartments due to dehydration or fluid overloading in various conditions (23). Therefore, it is very important to determine body composition as a part of assessing nutritional status, since optimal body composition is a fundamental factor for physical, cognitive, and medical conditions, especially in groups that already have reduced multi-system capacity. We found lower levels of Lean Body Mass, FM, and also Fluid Mass in patients with malnutrition.

It is difficult to avoid some study limitations in such a study. Lack of detailed medical assessment including records of chronic disorders and medications which may have impact on nutritional status and collaboration of anthropometric and clinical measures of nutrition with biochemical indicators such as serum albumin or vitamin levels may be addressed as the main limitation of this study. Another limitation is the design of the study, meaning that data on the nutritional status and patient factors were collected at the same time. Therefore, no causal relationships can be identified. From this study, we can conclude that malnutrition is a common problem and is related with increased all-cause mortality among residents of nursing home. To identify predictive factors for malnutrition in the elderly, longitudinal studies are needed. A better insight into the factors that contribute to malnutrition in the elderly would enable the development of appropriate preventive and treatment strategies and improve the health of older people.
malnutrition in this nursing home population. The diagnosis of malnutrition as defined by MNA-SF is an important predictor of mortality in this population; therefore a systematic early identification and treatment of malnutrition are important. Future research should examine the impact of nutritional intervention on morbidity and mortality of the older adults in the long term care setting in a prospective manner. Given the negative impact of malnutrition on mortality and morbidity, an emphasis should be placed on an effective nutritional policy in nursing home.

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Conflict of Interest: None.

References