



## Albumin, hemoglobin, body mass index, cognitive and functional performance in elderly persons living in nursing homes

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### ABSTRACT

The aim of this study is to produce the relation between cognitive and functional performance and some biochemical parameters in elderly population. So, we searched for the correlation between the activities of daily living (ADL), mini-mental state examination (MMSE) and body weight, age, hemoglobin, albumin, serum sodium level of 180 elderly people in five nursing homes. Face-to-face interviews and questionnaires were applied to evaluate ADL. To evaluate the cognitive function we used the MMSE. The average age of 180 people contacted was  $71.5 \pm 5.1$  ( $\pm$ S.D.), ranging 65–91 years; 112 of them were women (62.2%), 68 were men (37.8%). Of these elderly people, 25% had no medically diagnosed illnesses, whereas 17 of them (9.4%) were bedridden. There was a positive correlation between ADL and hemoglobin, albumin, body weight, cognitive function parameters and a negative one with age and serum sodium. There was a positive correlation between cognitive functions and hemoglobin, body weight, ADL and a negative one with serum sodium. Hemoglobin concentrations indicating anemia were observed in 30% of subjects, 3.9% of them had hyponatremia and 26.7% displayed a hypernatremia. There was a positive correlation between cognitive and physical function scores and hemoglobin, albumin levels in elderly patients. These results suggest that restoration of hemoglobin and albumin levels could improve cognitive and physical functional status in the elderly population.

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### 1. Introduction

It is known that certain difficulties in performing the daily life activities appear with aging. One of the most important developments in the last century was the increase of life expectancy. Today, elderly people constitute 14.3% of developed countries. According to the WHO estimations, elderly people are expected to constitute 30–40% of the society by 2025–2050 (Lloyd-Sherlock, 2000). The increase of the elderly population in Turkey is also evident. For example, the ratio of people of 65 years of age or above was 4.3% in 1990, it reached 5.9% in 1998 (Ministry of Health, 1999). The main objective of the preventive health services offered to the elderly people is to improve their quality of life (QoL), allowing independent living and preventing the handicaps. The basis of the preventive health services is the identification of risk factors for dependency and the possible reduction of these risk

factors. To this end, a comprehensive evaluation is required (Samuel, 2002; Stuck et al., 2002).

Functional ability, which includes physical and cognitive functions, is the ability to perform the activities of daily living (ADL) without support and is the primary factor that determines independence and overall QoL in older adults (Skelton et al., 1994).

In the elderly population, anemia is a risk factor for cardiovascular health and early death, contributes to fatigue, and negatively impacts on cognitive function, physical function, and the QoL, and serves as a marker of increased vulnerability. But evidence of this subject is limited. Anemia is reported to be observed in 50% of residents of long term care facilities, with prevalence of 21% in females and 16% in males over the age of 65 (Gabrilove, 2005). Based on the above-cited lines of evidence, the primary aim of the present study was to examine the correlation between cognitive function and ADL, serum hemoglobin, albumin, sodium levels, body weight and age. The secondary aim of the present study was to examine the correlation between ADL and mini-mental state examination (MMSE), serum hemoglobin, albumin, sodium levels, body weight and age.

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## 2. Subjects and methods

A sectional study was undertaken in five nursing homes in Istanbul which fall within the research area of Gulhane Military Medical Academy, Haydarpaşa Training Hospital. We could contact 210 of these elderly people and 180 of them entered the study. ADL questionnaire and MMSE questionnaire were also applied to elderly people in form of face-to-face interviews at their homes.

### 2.1. Eligibility criteria

Inclusion criteria were: older than age of 65 years; consent to participate, no hearing loss. Exclusion criteria were: more than two red blood cell transfusions in the last 4 weeks period prior to study entry, or any transfusion in the 2 weeks period prior to study entry; patients with severe cognitive impairment, i.e., patients with MMSE score <10; patients who are to be defined “frail” according to comprehensive geriatric assessment.

### 2.2. ADL

As a measurement of functional dependence, ability to perform ADL was assessed using the six-item (bathing, dressing, toileting, transfer, continence, feeding) ADL questionnaire of Katz and Stroud (1989). The responses to the ADL index for the six activities ranged from 0 to 2, (0 = dependent in the activities, 1 = partial dependence in the activities, and 2 = independent in the activities). Those who received help from others in the execution of these activities were labeled as “dependent”, those who received partial aid during the execution of these activities were labeled as “partially dependent”, and those who did not receive any help in their daily activities were labeled as “independent” individuals.

### 2.3. MMSE

To evaluate the cognitive function we used the MMSE (Folstein et al., 1975), which is a brief, quantitative measure of cognitive status in adults. A score of 18 corresponds to severe cognitive impairment, of 19–23 moderate cognitive impairment, and of >24 was considered as the normal cognitive status.

### 2.4. Blood nutritional parameters

All blood parameters were analyzed according to standard protocol in the Chemical Pathology and Hematology Laboratories at Gulhane Military Medical Academy, Haydarpaşa Training Hospital, both of which operate a rigorous quality control program. Fasting blood samples were drawn from all consenting subjects using the vacutainer method. Anemia was diagnosed according to WHO criteria (<13 and 12 g/dl for men and women, respectively).

### 2.5. Anthropometric measurements

BMI was calculated as weight (kg) divided by height (m) squared and classified according to WHO (1997). The interviewed elderly people were also asked, if they had any medically diagnosed chronic diseases. Ethical approval: Procedures in this study were in accordance with the Helsinki Declaration of 1975.

### 2.6. Statistical analyses

All analyses were carried out using the SPSS Version 10.0. Data collected were computer-evaluated.  $\chi^2$  and Student's *t*-tests were used to compare proportion and mean differences in female or male persons. The correlation between MMSE scores and ADL,

**Table 1**

Distribution of the sociodemographic features in the study group, %, or mean  $\pm$  S.D.

Parameters	
Number of patients	180
Sex	
Male	37.8
Female	62.2
Age (years)	71.5 $\pm$ 5.1
Marital status	
Married	70
Single	2
Widow	28
Education status	
Illiterate	6
Primary–secondary graduate	62
High school	32
Social security	
No	9
Yes	91

serum hemoglobin, albumin, sodium levels, body weight and age was performed using the Spearman's rank correlation test.

## 3. Results

The gender distribution of our study pool was 112 women (62.2%) and 68 men (37.8%), making a total of 180 people. The average age was 71.5  $\pm$  5.1 years (range: 65–91 years). Socio-demographic characteristics of this pool are shown in Table 1.

### 3.1. Anthropometric data

About 9.6% of the women were obese, and an additional 23.1% were of overweight. Most of the men (56%) had a BMI in the desirable category for health, whereas 28.8% were in overweight or obese. Almost 9% of men, and a few women (18%), had a BMI of 18.5 kg/m<sup>2</sup> (i.e., in underweight).

### 3.2. Biochemical and hematological status, and the ADL and MMSE scores

Serum albumin concentration of 35 g/l and more was found in 89.9% of the study subjects. Hemoglobin concentrations indicating anemia were observed in 35.3% and 37.5% of female and male subjects, respectively. Hyponatremia was found in 3.9% of subjects, and 26.7% of subjects had hypernatremia. Almost 25% of the elderly people had no medically diagnosed chronic disease, while the 3 most frequently occurring chronic diseases were identified as hypertension (32%), rheumatism-related diseases (25%) and diabetes mellitus (18%).

In the dependency scores, the ADL identified eating, transfer, toileting as the most outstanding items. The further distributions of the ADL scores are shown in Table 2.

There was a significant difference between male and female groups for hemoglobin, albumin, age, weight, MMSE and ADL parameters. Baseline characteristics of the study population are shown in Table 3.

The Spearman's rank correlation test showed a statistically significant positive correlation between MMSE scores and hemoglobin levels, BMI, ADL; negative correlation with sodium level and no statistical significant correlation between albumin and age. The Spearman's rank correlation test showed a statistically significant positive correlation between ADL scores and hemoglobin levels, BMI, MMSE, albumin levels and no statistically significant negative correlation with age and sodium.

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