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Malnutrition is associated with dementia severity and geriatric syndromes in patients with Alzheimer disease

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Background/aim: Malnutrition is associated with increased morbidity and mortality in patients with Alzheimer disease (AD). In this study, we aimed to screen for malnutrition and geriatric syndromes and seek their associations in patients with AD.

Materials and methods: The Mini Mental State Examination (MMSE), Mini Nutritional Assessment (MNA), Katz Activities of Daily Living (ADL), and Lawton Instrumental Activities of Daily Living (IADL) tests were applied. Mean daily oral fluid intake was assessed according to patients' and relatives' declarations.

Results: Seventy-six patients with a mean age of 79 ± 7.4 years were included. Most of the patients had mild or moderate dementia. Malnutrition was associated with increased rates of hospitalization and falls, dysphagia, insomnia, agitation, delusions, hallucinations, immobility, and incontinence. A daily fluid intake of <1100 mL was associated with malnutrition risk. Multivariate linear regression analysis revealed independent correlations of lower MNA score with lower ADL score, lower daily oral fluid intake, lower MMSE score, and female sex.

Conclusion: Dependency, inadequate fluid intake, advanced dementia stage, and female sex were independently associated with malnutrition. Malnutrition also seemed to be associated with sleep disturbances, psychological problems, immobility, falls, and increased hospitalization risk in these patients. Daily oral fluid intake may be a practical tool in the screening of malnutrition.

Key words: Alzheimer disease, malnutrition, dependency

1. Introduction

Alzheimer disease (AD) is the most common cause of dementia. Even the early stage of AD is associated with certain micronutrient deficiencies and a worse nutritional state compared to healthy subjects (1). Furthermore, weight loss is associated with a rapid cognitive decline in community-dwelling patients with AD (2). Malnutrition may be associated with changes in eating behavior, food intake control, and appetite in patients with dementia (3,4). Poor nutrition is also associated with worse cognition and functionality in these patients (5). Malnutrition is associated with poorer prognosis and adverse health problems in patients with dementia (2,6). Although the association of malnutrition with dementia is a well-known issue, studies involving community-dwelling AD patients from different populations are scarce. There is a need for studies in different populations to further investigate the factors underlying malnutrition in patients with dementia (7). In this study, we aimed to screen community-dwelling AD patients for malnutrition and geriatric syndromes and to determine clinical factors associated with malnutrition in these patients.

2. Materials and methods

Consecutive AD patients who were admitted to our outpatient neurology clinics were enrolled. Inclusion criteria were the presence of a diagnosis of possible or probable AD and an age of 65 years or older. Exclusion criteria were significant kidney dysfunction (a creatinine level of >1.5 mg/dL), comorbidities other than dementia (like malignancy) that may be associated with malnutrition, and an established diagnosis of malnutrition under treatment. Demographic data were recorded and anthropometric measurements were performed. Body mass index (BMI) was calculated as weight divided by height squared. The Mini Mental State Examination (MMSE) was used for the assessment of cognitive functions and dementia staging. A MMSE score of 20–25 was considered as mild, 10–19 as

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moderate, and <10 as severe dementia. Nutritional state was assessed with the full version of the Mini Nutritional Assessment (MNA) tool. MNA levels of >23.5 were considered as normal, 17–23.5 as malnutrition risk, and <17 as malnutrition (8). Information was obtained from the primary caregiver whenever the patient was incapable of replying to certain questions. Mean daily fluid intake (DFI) volumes were estimated by patients' and/or their caregivers' declarations. Katz Activities of Daily Living (ADL) and Lawton Instrumental Activities of Daily Living (IADL) scales were used to assess levels of dependency.

Categorical data were compared by chi-square test. The Student t-test and ANOVA test were used to compare continuous variables between groups. The Pearson test was used for correlation analyses. Receiver operator characteristics (ROC) curve analysis was used to determine the DFI level associated with malnutrition risk. Multivariate linear regression analysis using age, sex, DFI, basic ADL, and MMSE scores was performed to determine factors independently associated with lower MNA scores. A correlation coefficient of 0.1–0.3 was considered as weak, 0.3–0.5 as moderate, and >0.5 as strong correlation. A two-sided P-value of <0.05 was considered as statistically significant.

3. Results

Seventy-six patients (24 males and 52 females) with a mean age of 79 ± 7.4 were enrolled in this study. Twenty-nine had mild, 36 had moderate, and 11 had severe dementia. The rates of malnutrition and malnutrition risk were 32.89% and 48.68%, respectively. Comparison of nutritional groups is shown in the Table. Cognitive function, dementia stage, level of dependency, and DFI were worse in poorer nutritional states. There was no association between the declared time of onset of dementia symptoms and nutritional state. Although BMI significantly

Table. Comparison of nutritional state groups.

	Normal (n = 14)	MR (n = 37)	MN (n = 25)	P
Sex (n / % females)	7 / 50	27 / 73	18 / 72	0.26
Age (years)	77.2 ± 7.3	79.3 ± 6.8	79.4 ± 8.3	0.6
MMSE score	19.7 ± 3.5	16.8 ± 5.3	11.2 ± 7.4	<0.001
DS (% mild / moderate / severe)	71.4 / 28.6 / 0	40.5 / 54.1 / 5.4	12 / 48 / 40	<0.001
Daily fluid intake (mL)	1678.6 ± 723.4	1008.1 ± 486.7	892 ± 453.6	<0.001
Basic ADL	9.6 ± 3.7	7.9 ± 3.5	3.9 ± 4.7	<0.001
Instrumental ADL	3.7 ± 4.2	2.5 ± 4.5	1.6 ± 3.4	0.3
Body mass index (kg/m^2)	26.8 ± 3.1	25.2 ± 4.2	22.7 ± 3.2	0.003
Waist circumference (cm)	102.4 ± 9.6	97.5 ± 13.2	88.5 ± 11.2	0.001
Duration of dementia (years)	3.7 ± 3.4	3.8 ± 2.9	4.3 ± 3.1	0.8
History of hospitalization (%)	0	5.6	29.2	0.007
History of fall (%)	0	13.5	32	0.028
Normal swallow function (%)	100	94.6	64	0.012
Normal sleep (%)	78.6	43.2	28	0.04
Agitation (% SL / FR)	0 / 0	24.3 / 5.4	28 / 28	0.007
Delusions (% SL / FR)	0 / 0	10.8 / 0	28 / 8	0.03
Hallucinations (% SL / FR)	21.4 / 0	21.6 / 0	32 / 24	0.005
Mobile* (%)	64.3	48.6	36	0.15
Normal continence (%)	78.6	54.3	32	0.08

MR: Malnutrition risk, MN: malnutrition, MMSE: Mini Mental State Examination, DS: dementia stage, ADL: activities of daily living, BMI: body mass index, SL: seldom, FR: frequent.
*Indicates being able to go outside the home independently.

decreased as nutritional state worsened, the mean BMI of the malnutrition group was 22.7. Malnutrition was also associated with increased rates of hospitalization and falls during the last year, dysphagia, insomnia, agitation, delusions, hallucinations, incontinence, and immobility. There were significant correlations between MNA score and ADL ($r = 0.53$, $P < 0.001$), MMSE score ($r = 0.52$, $P < 0.001$), and DFI ($r = 0.42$, $P < 0.001$). ROC curve analysis suggested that a DFI of <1100 mL was associated with malnutrition risk or malnutrition (area under the curve: 0.79, $P = 0.001$, sensitivity: 79%, specificity: 57.1%). Multivariate linear regression analysis showed that lower basic ADL ($t = 2.7$, $P = 0.009$, 95% CI 0.1–0.7), lower DFI ($t = 2.3$, $P = 0.023$, 95% CI 0–0.004), lower MMSE score ($t = 2.2$, $P = 0.033$, 95% CI 0.02–0.4), and female sex ($t = 1.7$, $P = 0.086$, 95% CI –0.29 to 4.3) were independently associated with a lower MNA score.

4. Discussion

We detected a rather high rate of malnutrition and malnutrition risk in the community-dwelling dementia patients applying to our outpatient neurology clinic. Malnutrition was found to be associated with dependency in basic ADL, worse cognitive functions, lower DFI, and female sex. Malnutrition seemed to be related to geriatric syndromes, neuropsychiatric problems, and increased risk of falls and hospitalization. DFI seemed to give practical information about the risk of malnutrition.

The rate of malnutrition and malnutrition risk is very high in patients with dementia. It is reported that the onset of poor nutrition may be even before classical symptoms of dementia (1,2). It is crucial to screen these patients for malnutrition because poor nutrition is associated not only with a faster progression of dementia but also with adverse health problems (2,6,9,10). The MNA test is generally used to assess malnutrition in outpatient elderly (8). Recent studies also utilized the MNA test cross-sectionally and longitudinally in patients with dementia (1,6,9,10). The reported rate of malnutrition among community-dwelling AD patients varies between 0% and 23.2% in different populations (7,9,11–13). However, the rate of malnutrition was higher in our study compared to these previously published studies. Of note, the previous studies regarding malnutrition in community-dwelling dementia patients are from developed countries. To our knowledge, no previous study specifically investigated the rate of malnutrition in community-dwelling dementia patients from Turkey or other developing countries. In the present study, we have also observed a significant association between the MNA score and clinical variables.

The pathogenesis of malnutrition in patients with dementia is complex and may be associated with changes in eating behavior, food intake control, and appetite due to early involvement of the temporal cortex (3–5). Poor nutrition is reported to be associated with worse cognitive, functional, and behavioral profiles in patients with dementia (5). There is a need for interventional studies to establish the effect of nutritional support on these outcomes (10).

DFI is assessed in the MNA test in a categorical manner. It is reported that nursing home residents may have a high prevalence of inadequate fluid intake when assessed using 3-day food and fluid intake records (14). Another longitudinal study sought the effect of DFI on all-cause and cardiovascular mortality and kidney functions but did not find a significant effect on any of these outcomes (15). However, the lowest daily fluid intake corresponded to <2000 mL in this study. Notably, to date, no study primarily investigated the effect of DFI on clinical outcomes in patients with dementia.

Limitations of our study include the cross-sectional design and limited sample size. Although malnutrition was associated with many poor health problems, we cannot draw cause-effect relationships because the rate of severe dementia was also more common in the group with malnutrition. Studies regarding community-dwelling dementia patients from Turkey are also lacking, and thus we could not compare our results with similar studies.

Malnutrition seems to be associated with dependence, neuropsychiatric problems, and geriatric syndromes in patients with AD. There is a need for interventional studies to investigate the effect of nutrition on these outcomes. Examination of DFI is simple and may provide valuable information about the risk of malnutrition in these patients. Screening for malnutrition is crucial in these patients.

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