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NUTRITIONAL STATUS OF RESIDENTS IN GROUP-LIVING CARE FOR DEMENTIA

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Abstract: *Background:* The number of group-living home (GLH) in Japan has been increasing in recent years, but little information is available on how many residents living in GLH experience malnutrition. *Objective*: Using the Mini Nutritional Assessment (MNA), we investigated the nutritional status and its relationship to cognition, functional ability, and dietary intake in elderly residents with dementia in small-scale GLH. *Methods*: Subjects were 60 residents with dementia (49 women and 11 men; mean age, 83.6 years) in six GLH in Japan. The MNA, Clinical Dementia Rating (CDR), activities of daily living (ADL) score, and dietary intakes on 3 separate days were examined. *Results:* According to the MNA, subjects were divided into three categories: well-nourished (21.7%), at risk for malnutrition (63.3%), and malnourished (15.0%). By logistic regression analysis after adjustment for age, sex, and CDR, energy intake and protein intake were significantly associated with risk for malnutrition; additionally ADL score, emotional impairment, and feeding dependency were significantly associated with being malnourished. *Conclusion:* This is the first report to investigate the MNA nutritional status and associated factors among GLH residents with dementia in Japan. Many elderly patients with dementia living in GLH were at risk for malnutrition. Although most GLH offer a good living environment for people with dementia, more attention must be focused on early identification of malnutrition in these care settings.

Key words: Dementia, dietary intake, group-living home, Mini Nutritional Assessment.

Introduction

Malnutrition is a frequent complication in the elderly, and poor nutritional status is related to increased morbidity (1). Persons with dementia often suffer from malnutrition (2, 3), but previous studies have focused either on patients in geriatric hospitals or residents in traditional nursing homes (4-6). Currently, there is a trend toward deinstitutionalization from traditional nursing home care for persons with dementia. The group-living home (GLH), a form of assisted accommodations for patients with dementia, was developed in Scandinavian countries in the early 1980s (7). Almost all GLH have one or two units of flats with a common dining room. They can house a maximum of nine residents per unit with a small staff that are trained to care for people with dementia. The GLH provides a home-like environment along with staff who can assist with tasks such as dressing and undressing, cooking, washing, and bathing. Residents with dementia live as independently as possible while receiving assistance with daily activities.

The number of GLH in Japan has been increasing in recent years, with up to 10,076 locations as of August 31, 2009 (http://www.wam.go.jp/). However, little information is available on how many residents living in GLH experience malnutrition. The aim of this study is to investigate the nutritional status of elderly residents with dementia in GLH and its relationship to cognition, functional ability, and dietary intake.

Methods

Subjects

Subjects were 69 elderly residents with dementia living in six different GLH (eight units of flats) in Nara Prefecture, Japan. Of these, 7 residents were unwilling to participate or did not participate in the study due to the wishes of their relatives, and 2 were excluded due to their serious health status. In total, 60 residents (49 women and 11 men; mean age 83.6 ± 7.2 years, range 70 – 96 years)

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agreed to participate. In addition to dementia, subjects suffered from sequelae after stroke (13.3%), hypertension (30.0%), and diabetes mellitus (8.3%). The local ethics committees approved the study protocol, and written consent was obtained from the resident (if possible), their families, or legal representatives (if applicable).

Clinical Dementia Rating (CDR)

Before referral to the GLH, residents had been diagnosed with dementia by a physician and were classified as suffering from probable Alzheimer's disease (n=43, 71.6%), vascular dementia (n=10, 16.7%), or other types of dementia (n=7, 11.7%). The severity of dementia was assessed by the Clinical Dementia Rating (CDR) (8). The CDR total score (0 – 18 points) is derived from six categories: memory, orientation, problem solving, community affairs, involvement at home, and personal care. The CDR scale classifies subjects into questionable (0.5), mild (1), moderate (2), or severe (3) dementia.

Co-morbidity

Co-morbidity was assessed by the Charlson co-morbidity index and determined by review of medical records for a diagnosis of cerebrovascular disease, chronic heart failure, joint disorders, diabetes, chronic pulmonary disease, ulcer disease, chronic renal failure, peripheral vascular disease, liver cirrhosis, and any tumor (9). All items received weights of 1 point, with the exception of any malignancy and hemiplegia, which were weighted as 2 points.

Functional ability

Functional disability was evaluated using a semi-structured observation method, modified from the Gottfries-Brane-Steen (GBS) scale (10), with the assistance of caregiving staff in four areas of basic self-care: dressing and undressing, feeding, mobility, and personal hygiene. Each score ranges from 0 – 6, where 6 is equivalent to totally independency and 0 means severe disability. The activities of daily living (ADL) total scale was the sum of all scores in the four areas (range, 0 – 24).

Mini Nutritional Assessment

Nutritional status was assessed by the Mini Nutritional Assessment (MNA), which consists of a two-step instrument: a short form for screening and a full form for detailed assessment (11). The short form comprises six questions regarding food intake declined over the past 3 months, weight loss during the last 3 months, occurrence of psychological stress or acute disease, mobility, neuropsychological problems, and body mass index (BMI). BMI was defined as weight in kilograms divided by height in meters squared. The maximum possible score on the short form is 14, and scores ≥12 indicate the patient is well-nourished. The caregiving staff helped patients answer the questions when needed, because study participants often had difficulty communicating. If the screening score on the short form was ≤11, the full form was used to provide a detailed nutritional assessment. The full form consists of 12 questions regarding living independently, number of medications, skin problems, number of meals eaten per day, diet information (protein contained in food, vegetable or fruits, water intake, autonomy of feeding), self-perceived nutritional status and health status, and two anthropometric measurements including mid-upper arm circumference (MAC) and calf circumference (CC). The MAC was measured at the midpoint of the arm between the tip of the acromion and the olecranon process, and the CC was measured at the widest part of the undressed calf. Values <21 cm (MAC) and <31 cm (CC) were considered reduced. The anthropometric measurements were made by a well-trained registered dietitian. The maximum possible MNA total score (short form + full form) is 30 points. A total score of less than 17 points is regarded as malnutrition, 17 – 23.5 points indicates a risk for malnutrition, and >23.5 points indicates adequate nutritional status.

Dietary analysis

The energy and nutrient content of served food was determined by a well-trained dietitian who registered food intake for all eating occasions on 3 days (two weekdays and one weekend). The amounts of food delivered and left by the residents at the end of each meal were recorded. Food consumption was converted to nutrient intake using a software program (Excel-eiyokun Ver 5.0; Kenpaku-sha, Tokyo, Japan), with the nutrient composition based on the Standard Tables of Food Composition in Japan (The Council for Science and Technology, Ministry of Education, Culture, Sports, Science, and Technology, Japan). The estimated energy requirement (EER) was calculated using predicted equations recommended by the Food and Nutrition Board of the National Academies' Institute of Medicine and Health Canada (12). The equations used were as follows: EER (for men) = 662 – (9.53 × age) + PA × ((15.91 × BW) + (539.6 × BH)), and EER (for women) = 354 – (6.91 × age) + PA × ((9.36 × BW) + (726 × BH)), where BW indicates the desired body weight in kilograms, BH indicates body height in meters, and PA indicates physical activity. In the present study, the desired body weight was calculated using the age- and gender-specific BMI in the Japanese general population; the risk nadir BMI for lowest mortality is 25.3 kg/m^2 in elderly men and

23.4 kg/m² in elderly women (13). A PA score of 1.00 was used for sedentary subjects (both men and women), a PA of 1.11 was used for low active men, and a PA of 1.12 was used for low active women. Finally, the ratio between energy intake (EI) and EER was calculated.

Other information

Depressive mode was defined as follows: obviously depressed facial expression, evidence of depression in speech and posture as assessed by the observation method modified by the GBS score, and GBS score ≥4 points (10). Emotional impairment (including joy, sorrow, lability and motivation) was also assessed using the modified GBS score and was scored from 0 – 6 points, where 0 is equivalent to normal emotion and 6 represents severe emotional impairment.

Statistical analysis

Data are presented as means ± SD or as percentages. One-way analysis of variance (ANOVA) and the post hoc test (Bonferroni) were used to evaluate MNA status differences. P values <0.05 were considered statistically significant. Logistic regression analysis was used to determine which variables were independently related to malnutrition. All statistical analyses were performed using the SYSTAT statistical package (Systat Software, Inc., San Jose, CA).

Results

Table 1 shows characteristics of subjects. The study population consisted of 11 men and 49 women; male residents were younger than female residents. The residents had stayed in a GLH for a median of 26.0 months (range 1 – 113 months). In total, 30 of 60 subjects (50%) had a CDR score ≥2, indicating moderate to severe cognitive dysfunction, 21 subjects (35%) required assistance with feeding, and 10 subjects (16.7%) were wheelchair bound.

Subjects were divided into three categories based on MNA: well-nourished (n=13, 21.7%), at risk for malnutrition (n=38, 63.3%), and malnourished (n=9, 15.0%) (Table 2). There were no differences in age, sex, Charlson comorbidity index, depressive mode, number of drugs taken, and length of stay in GLH among the three nutritional categories. The CDR score tended to be higher with the severity of nutritional malnutrition status (p=0.049). Emotional impairment score significantly increased as nutritional status worsened (p<0.001). The ADL total score negatively influenced nutritional status (p=0.012). In the ADL subscales, differences were most significant with regard to needing help with feeding (p=0.008). Length of stay in the GLH tended to be longer among subjects with worse nutritional status, but differences did not reach statistical significance (p=0.057).

Table 3 shows anthropometric variables among the three MNA categories. As expected, subjects at risk for malnutrition had a significantly lower body weight, BMI, MAC, and CC compared with well-nourished subjects, and malnourished subjects had a significantly lower body weight, BMI, MAC, and CC values compared with the well-nourished and at-risk groups.

Table 1
Characteristics of subjects

	Total	Male	Female	p
n	60	11	49	
Age (years)	83.6 ± 7.2	79.2 ± 5.7	84.6 ± 7.1	0.014
Body weight (kg)	46.1 ± 9.2	54.4 ± 10.8	44.2 ± 7.8	0.011
BMI (kg/m²)	21.5 ± 3.8	22.2 ± 4.2	21.4 ± 3.7	0.562
Underweight (%)	20.0	18.2	20.4	0.871
CDR	1.63 ± 0.86	1.68 ± 0.85	1.62 ± 0.88	0.837
CDR >= 2(%)	50.0	54.5	49.0	0.753
Charlson index	5.52 ± 1.13	5.18 ± 0.75	5.57 ± 1.19	0.161
Number of drugs taken	4.6 ± 2.6	4.9 ± 3.1	4.5 ± 2.4	0.161
Feeding assistance %	35.0	27.3	36.7	0.556
Need wheelchair %	16.7	9.1	18.4	0.396
Length of stay (mo)	34.8 ± 30.8	33.5 ± 30.9	35.1 ± 31.1	0.879

Data are means +/-SD or %; BMI, body mass index; CDR, clinical dementia rating; GLH, group living home.

Table 2
Dementia score, co-morbidity, and functional ability among Mini Nutritional Assessment categories

	Well-nourished	At risk	Malnourished	p (ANOVA)
n	13	38	9	
Age (years)	82.6 ± 6.9	82.8 ± 7.0	88.6 ± 6.8	0.079
Female (%)	69.2	84.2	88.9	0.416
CDR	1.15 ± 0.63	1.71 ± 0.91	2.00 ± 0.71	0.049
CDR >= 2(%)	30.8	50.0	77.8	0.098
Charlson index	5.31 ± 0.86	5.42 ± 1.08	6.22 ± 1.48	0.119
Depressive mode(%)	0	10.5	22.2	0.238
Emotional impairment	1.10 ± 1.08	1.82 ± 1.35	3.67 ± 1.23 [bc]	<0.001
Number of drugs taken	4.0 ± 2.9	4.7 ± 2.5	4.6 ± 2.4	0.677
Functional ability				
ADL total score	19.9 ± 3.2	16.0 ± 6.7	11.4 ± 8.2 [a]	0.012
Dressing	4.92 ± 1.26	3.71 ± 2.10	2.78 ± 2.28 [a]	0.044
Need help with feed	5.85 ± 0.38	4.95 ± 1.69	3.56 +± 2.35 [b]	0.008
Transfer	5.15 ± 1.41	4.34 ± 1.79	3.22 ± 2.28	0.054
Personal hygiene	4.00 ± 1.53	2.97 ± 1.82	1.89 ± 1.76 [a]	0.026
Length of stay (mo)	26.9± 26.5	36.2 ± 31.7	41.1 ± 34.3	0.057

Data are means +/-SD or %; a. p<0.05 vs. well-nourished; b. p<0.01 vs. well-nourished; c. p<0.01 vs. at risk for malnutrition; CDR, clinical dementia rating; ADL, activity of daily living; GLH, group living home.

Table 4 shows nutritional intake of residents based on nutritional status. Energy and protein intake tended to decrease with the severity of malnutrition, but fat and carbohydrate intakes did not differ among the three MNA categories. Among the well-nourished, at-risk, and malnourished, the number of subjects who reached the optimal energy supply (EI/EER >80%) were 13 (100%), 34 (89.5%) and 8 (88.9%), respectively. For most residents, protein accounted for <15% of their total EI.

Table 3
Anthropometric variables among Mini Nutritional Assessment categories

	Well-nourished	At risk	Malnourished	p (ANOVA)
Height (cm)	145.0 ± 9.1	147.3 ± 9.1	143.7 ± 5.5	0.452
Weight (kg)	54.6 ± 10.0	45.2 ± 7.2 [a]	37.2 ± 4.6 [ab]	<0.001
Underweight (%)	0	15.8	66.7 [ac]	<0.001
BMI (kg/m²)	25.9 ± 3.2	20.9 ± 2.8 [a]	18.0 ± 1.9 [ab]	<0.001
MAC (cm)	26.2 ± 2.2	23.2 ± 2.6 [a]	19.9 ± 1.8 [ac]	<0.001
CC (cm)	34.6 ± 3.7	31.1 ± 2.3 [a]	26.1 ± 2.4 [ac]	<0.001

Data are means +/-SD or %; a. p<0.01 vs. well-nourished; b. p<0.05 vs. at risk for malnutrition; c. p<0.01 vs. at risk for malnutrition; BMI, body mass index; MAC, mid upper arm circumference ; CC, calf circumference; Underweight indicates BMI < 18.5.

Table 4
Nutritional variables among Mini Nutritional Assessment categories

	Well-nourished	At risk	Malnourished	p (ANOVA)
Energy intake (kcal)	1536 ± 143	1417 ± 124 [a]	1367 ± 199 [a]	0.013
EI/EER > 80% (%)	100	89.5	88.9	0.483
Protein (g/d)	51.0 ± 5.6	46.2 ± 5.5 [a]	44.0 ± 8.2 [a]	0.017
Fat (g/d)	37.4 ± 4.4	34.3 ± 4.7	33.6 ± 4.8	0.082
Carbohydrate (g/d)	242 ± 28	225 ±27	214 ± 33	0.065
Protein (%E)	13.3 ± 1.5	13.1 ± 1.6	12.8 ± 1.2	0.753
Fat (%E)	22.0 ± 2.0	21.8 ± 2.5	22.2 ± 1.6	0.886
Carbohydrate (%E)	63.0 ± 2.9	63.4 ± 3.9	62.9 ± 2.6	0.889
Protein energy <15%	84.8	78.7	100	0.322

Data are means +/-SD or %; a. p<0.05 vs. well-nourished; EI, energy intakes; EER, estimated energy requirement.

Table 5
Factors associated with "at risk of malnutrition" (top number) and with "malnutrition" (lower number) by logistic regression analysis

Model *	OR	95%CI	p
Charlson index	1.079	0.458-2.544	0.862
	1.389	0.489-3.945	0.537
ADL total score	0.882	0.693-1.122	0.305
	0.736	0.548-0.990	0.042
Number of drugs taken	1.119	0.860-1.456	0.402
	1.088	0.755-1.568	0.650
Stay in GLH per 1 year prolong	1.007	0.984-1.031	0.539
	1.009	0.976-1.042	0.610
Emotional impairment	2.009	0.773-5.222	0.153
	6.569	1.813-23.808	0.004
Feeding independent	0.461	0.042-4.997	0.524
	0.017	0.001-0.372	0.010
Energy intake per 100 kcal increase	0.456	0.216-0.964	0.040
	0.417	0.170-1.000	0.050
Protein intake per 5g increase	0.284	0.118-0.685	0.005
	0.198	0.069-0.566	0.003

*Age, sex and degree of dementia (CDR) adjusted model; ADL, activity of daily living; GLH, group living home.

Table 5 shows the factors related to malnutrition in the logistic regression analysis. After adjusting for age, sex, and CDR, EI and protein intake were significantly associated with "at risk for malnutrition." In addition, emotional impairment, ADL total score, feeding dependency were significantly associated with malnutrition.

Discussion

The MNA is a simple and well-validated instrument designed for use in the elderly and regarded as the most useful tool for nutritional assessment for frail elderly living in long-term care facilities (14-18). Previous studies have focused on geriatric hospitalized patients, nursing home residents, or service flat residents, and revealed that the proportion of malnutrition in these care settings ranged from 20% to 71% and those at risk for malnutrition ranged from 29% to 59% (14-18). Traditional nursing homes for people with dementia have several shortcomings including depersonalization, passivity, and physical restraints. GLH are expected to be a better alternative to traditional nursing homes. Recently, the number of GLH for subjects with dementia has grown in Japan. This is the first study to evaluate MNA nutritional status in a sample of GLH residents in Japan. Our study showed that malnutrition is a common problem among elderly residents living in GLH; 63.3% of studied subjects were at risk for malnutrition and 15.0% were malnourished. In a study addressing the MNA nutritional status of GLH residents in Sweden, Saletti et al. reported that 57% of residents in GLH were at risk for malnutrition and 38% were malnourished (14). Despite the finding that subjects at risk for malnutrition have been reported to have a higher mortality rate than those with normal nutrition (19), it seems likely that there is a lack of awareness of malnutrition by staff at GLH who receive little training on nutritional issues. Therefore, early identification of residents at risk for malnutrition is important in residential care.

In general, most subjects with dementia lose weight during the progression of their disease, particularly in the advanced stage (2, 3). In the Nottingham Health Profile, Christensson et al. found that EI was the most powerful item to predict risk of malnutrition among the elderly (20). However, whether malnutrition in subjects with dementia is due to reduced food intake is controversial (21). In the present study, mean EIs tended to decrease as nutritional status worsened, but 90% – 100% of subjects had an EI/EER >80%. On the other hand, the protein intake decreased as malnutrition advanced. Older people consume monotonous meals and eat less meat than younger people. These results are similar to another study of nursing home residents with Alzheimer disease who showed shifts in eating patterns toward carbohydrates and away from proteins (22). Inadequate protein intake is related to muscle loss and the development of sarcopenia, and eventually leads to malnourishment.

In a large-scale, cross-sectional study in Finland, malnutrition of aged residents in a nursing home was associated with dementia, functional impairment, longer stay in a nursing home, and difficulty swallowing (16). Other explanations for malnutrition in these settings

include poor nutritional support, multiple illnesses, side effects of drugs, and absence of a dietitian. In the present study, malnutrition appeared significantly related to dementia severity, ADL total score, and nutritional support (need for feeding assistance). In addition, emotional impairment showed a significant association with malnutrition. It has been reported that patients with Alzheimer disease who live alone have an increased risk of malnutrition compared to those living with others (23). For residents in a home care facility, food provision and a pleasing ambience at meal time are important determinants of quality of life. The GLH resembles a typical home-like environment, and most residents take part in family style meals and express enjoyment of meals. They can also participate in mealtime in many ways, including preparing food, setting the table, helping to serve the food, and washing the dishes. Many residents can do something at mealtime and be relatively independent in their functioning. Nijs et al. reported that in Dutch nursing home residents, daily EI was stimulated by 6 months of intervention with receiving of family-style meals (24). Therefore, GLH with family-style meals may result in a more comfortable residential environment compared with other types of institutionalized care. In these small-scale care settings, normal daily life is emphasized and residents are encouraged to participate in the daily household chores.

This study has several limitations. First, depressive mode was not evaluated using a precise test such as the Geriatric Depression Scale. However, the observation method along with the GBS scale used in this study has been reported to be sensitive and valid in assessing subjects with dementia (10). Second, swallowing difficulties, one of the primary reasons for malnutrition, has a close association with dementia. Although we did not examine the degree of swallowing difficulty using valid instruments, only 8 residents in the present study had experienced this difficulty after a stroke. These residents were not observed to have any obvious swallowing difficulties in this study. Third, levels of caregiving staff in each GLH must be considered because lower staffing levels may be associated with malnutrition in a long-term care setting (25). There are also many confounding factors to take into consideration, such as education level of staff, provision of meal choice, and adequate help with eating for residents with disabilities. However, we were not able to document these issues. Finally, a cross-sectional design limits causal interpretation of our results.

In spite of these limitations, this is a first report to investigate the MNA nutritional status and its relationship to cognition, functional ability, and dietary intake in elderly group-home residents with dementia in Japan. Being at risk for malnutrition was very common among elderly with dementia in GLH and was related to low cognition, low functional ability, emotional impairment, and low energy and protein intake. Small, home-like care environments, such as the GLH, may be an effective approach for older people with dementia, but many aspects of these types of residences remain unclear. Future research is needed that focuses on early identification of malnutrition.

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Conflict of interest: The authors do not have any conflicts interest.

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