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Research Article

Nutritional Assessment and Dietary Intake Status of Home Health Care Patients: A Pilot Cross-Sectional Study

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Abstract

Background: Malnutrition is related not only to a decrease in longevity but also to admission to hospitals or nursing homes. The purpose of this pilot study was to evaluate the nutritional status and dietary intake of home health care patients and to seek a nutritional intervention point to preventing malnutrition.

Methods: Twenty-two home health care patients (9 males and 13 females, mean age 70.3 ± 17.7 years) receiving home-visit nursing care service were included in this study. We assessed their nutritional status (MNA®-SF and anthropometric measurements), nutritional intake (self-administered and photographic diet records), dietary variety (the dietary variety score [DVS]) and activities of daily living (ADL). Patients were classified into three groups as well-nourished (WN), at risk of malnutrition (AR), and malnourished (M) according to the MNA®-SF score. We compared each measurement across the three groups.

Results: Overall, 46.5% and 36.4% of all subjects were classified as M and AR, respectively. Among indicators of nutritional status and nutritional intake, there were significant differences between each group in the MNA®-SF score, anthropometric measurements, ADL, energy intake. AR subjects were not remarkably emaciated; however, their dietary intake was similar to that of WN subjects. The DVS tended to decrease in order from WN to AR and then to M. Additionally, there was a positive correlation between the MNA®-SF score and DVS ($r = 0.682$, $p < 0.01$).

Conclusion: According to the classification of home care patients by the MNA®-SF, 36.4% and 46.5% of home health care patients in this study were considered to be at risk of malnourishment or malnourished, respectively. Additionally, the dietary variety of at-risk patients declined earlier than the change of anthropometric measurements and nutritional intake.

Keywords: Malnutrition; Nutritional assessment; Dietary intake; Dietary variety; Home health care patients; Home-visit nurse

Introduction

Malnutrition causes various adverse events and is related not only to the decreased longevity but also to admission to hospitals or nursing homes [1]. Therefore, it is important to manage the nutrition of home health care patients and to evaluate the risk of malnutrition in order to improve their nutritional status so they can continue home health care.

Recently, the number of home health care patients has been steadily increasing because of the promotion of home health care in Japan [2, 3]. Under the revision of medical treatment fees announced by the Ministry of Health, Labor and Welfare for 2014, "categorization and reinforcement of the functions of medical institutions, medical cooperation, and enhancement of home medical care" [4] became a top priority. Moreover, the management and guidance of fees for visiting pressure ulcer care for home health care patients was created. Under this system, doctors, nurses, and registered dietitians are members of the home health care pressure ulcer countermeasure team. According to the guidelines for the prevention and management of pressure ulcers, nutritional intervention is recommended for the prevention of pressure ulcers in malnourished patients as general management [5]. Thus, it is increasingly becoming more necessary to manage the nutrition of home health care patients.

Nutritional assessment that comprehensively examines nutritional status by using medical history, nutritional history, and anthropometric measurements is essential to appropriate nutritional management [6]. There have been numerous reports on the nutritional status of home health care patients in recent years, [7-10] but there are few reports that refer to the dietary intake of home health care patients [11, 12].

Among dietary survey methods that evaluate dietary intake, the food frequency questionnaire is suitable for assessing long-term average intake [13].

One type of dietary variety survey is the dietary variety score (DVS) that was developed by Kumagai et al [14]. The DVS provides an effective method to understand the dietary intake and dietary habits of the elderly quickly and easily and then use that data to manage the diets of elderly patients [15]. However, there has been no documented use of the DVS in the home health care patient population, so it is not obvious the usefulness of the DVS for them. Because most home health care patients are 65 years or over [2, 3], the DVS may provide a valuable tool for assessing the dietary intake of home health care patients.

The purpose of this pilot study was to evaluate the nutritional status and dietary intake of home health care patients and to seek a nutritional intervention point to prevent malnutrition in that population.

Materials and Methods

Setting and subjects

This cross-sectional study was conducted in one city, Hyogo Prefecture, Japan from October 2013 to December 2013 (3 months). Twenty-two home health care patients receiving home-visit nursing care service were included in this study. This study was conducted in accordance with the Declaration of Helsinki and was approved by the ethics committee of Osaka City University.

Nutritional assessment

We assessed subjects' nutritional status using the Mini Nutritional Assessment-Short Form (MNA®-SF) [16-19]. Patients were classified into three groups as well-nourished (WN) (12-14 points), at risk of malnutrition (AR) (8-11 points), and malnourished (M) (0-7 points) according to the MNA®-SF scores. We compared each measurement among three groups.

Activities of Daily Living (ADL)

ADL was evaluated using the Barthel index [20] (score range, 0-100), which consists of 10 items: feeding, chair/bed transfers, personal hygiene, toilet use, bathing, ambulation, stairs climbing, dressing, bowel control, and bladder control.

Anthropometry

Anthropometric measurements, including arm circumference (AC), triceps skinfold thickness (TSF), and calf circumference (CC), were measured using an Inser-tape (Abbott Japan, Tokyo, Japan), Adipometer (Abbott Japan), and MNA® CC measure (Nestle, Kobe, Japan). Arm muscle circumference (AMC) and arm muscle area (AMA) were calculated with formulas that used AC and TSF. The values of %AC, %TSF, %CC, %AMC, and %AMA were calculated on the basis of the medians determined by the gender and age division of Japanese Anthropometric Reference Date (JARD2001) [21].

Dietary intake status survey

Dietary intake status was evaluated using a dietary intake survey and the dietary variety score (DVS) [14]. The dietary intake survey was conducted using a two-day self-administered and photographic diet records. Nutritional intake was calculated using a nutrient-calculating spreadsheet program, "Excel® Eiyo-kun Ver.6.0" (Kenpakusha, Tokyo, Japan). The DVS is a simple dietary survey method that asks respondents how frequently they consume the 10 main food groups in Japanese meals (fish and shellfish, meat, eggs, milk, soybean products, dark-colored vegetables, seaweeds, fruits, potatoes, and oils). Participants respond with the following answers: "eat almost every day," "eat once every two days," "eat once or twice a week," or "seldom eat," and the total score derives from the sum of the 10 food groups. In the present study, we used two methods to evaluate dietary variety. One of them was a conventional evaluation method developed by Kumagai et al. [14], which assigned 1 point to the response "eat almost every day" and evaluated variety on a scale from 0 point to 10 points. The other was a new evaluation method developed by Fukasaku et al. [15]. This new evaluation method assessed the response "eat almost every day" as 4 points, "eat once every two days" as 3 points, "eat once or twice a week" as 2 points, and "seldom eat" as 1 point (score range, 10-40). We considered that having highly varied diet every day could be burden on the home health patients and it was important to evaluate dietary variety in-

cluding the responses "eat once every two days", "eat once or twice a week" for assessing dietary habits of them. Thus, we also use the new evaluation method.

Statistical analysis

For comparison between independent groups, the Chi-squared test and the Kruskal-Wallis test with post hoc Bonferroni correction were performed. The correlation between the MNA®-SF scores and DVS was analyzed by Spearman's rank correlation coefficient. IBM® SPSS® Statistics 21 software (IBM Japan, Tokyo, Japan) was used for the analysis. A p-value of less than 0.05 was considered indicative of statistical significance.

Results

Subjects' characteristics

Twenty-three home health care patients receiving home-visit nursing care service were enrolled. Of them, one pediatric patient was excluded. Thus, 22 subjects were included in this study. The characteristics of the study subjects are shown in Table 1. The mean age of the subjects was 70.3 ± 17.7 years, and 68.2% of the subjects were aged 65 years or over. In terms of the type of long-term care required, 50.0% of the subjects were Care-Level 3 or higher. Nervous system diseases and dementia comprised the majority of the main illnesses in this population.

Table 1. Subjects' characteristics

		Total (n = 22)
Sex (male / female)		9 / 13
Age (years) [Mean±SD]		70.3±17.7
	65 or over, n (%)	15 (68.2%)
Long-term care Levels	Support Required 1-2	4 (18.2%)
	Care-Levels 1-2	2 (9.1%)
	Care-Levels 3 and more	11 (50.0%)
	Health care insurance	5 (22.7%)
Main illnesses	Nervous system disease	8 (36.3%)
	Dementia	4 (18.2%)
	Endocrine metabolic disease	3 (13.6%)
	Hemodialysis	3 (13.6%)
	Mental disorder	2 (9.1%)
	Respiratory disease	1 (4.5%)
	Digestive disease	1 (4.5%)

Classification by the MNA®-SF

According to the MNA®-SF score, 18.2%, 36.4%, and 46.5% of all subjects were classified as well-nourished (WN), at risk of malnutrition (AR), and malnourished (M), respectively. The characteristics of each group are shown in Table 2. There were significant differences between each group in age, body weight, body mass index (BMI), ADL, and the MNA®-SF score. The Bonferroni post hoc test revealed significant differences between WN and M in body weight (p=0.023), BMI (p=0.031), ADL (p=0.007), and the MNA®-SF score (p<0.001). In addition, there were significant differences between AR and M in age (p=0.037), body weight (p=0.016), ADL (p=0.001), and the MNA®-SF score (p=0.001) and WN and AR in the MNA®-SF score (p=0.002).

Anthropometric measurements

With respect to anthropometric measurements, there were significant differences between each group in %ideal body weight (%IBW), %AC, %TSF, %AMC, and %CC. On the other hand, there were no significant differences between each group in %AMA (Table 3). The Bonferroni post hoc test revealed significant differences between WN and M in %IBW (p=0.031) and %CC (p=0.035). In addition, there were significant differences between AR and M in %AC (p=0.043), %AMC (p=0.011), %CC (p=0.043).

Table 2. Characteristics of each group

		WN	AR	M	p-value
Sex	(male / female)	2 / 2	4 / 4	3 / 7	0.637
Age	(years)	68.8 ± 11	59.3 ± 22	79.8 ± 11	0.037
Height	(cm)	158.6 ± 5.8	160.9 ± 8.1	152.3 ± 9.1	0.193
Body Weight	(kg)	62.6 ± 13	59.2 ± 18	39.9 ± 7.3	0.004
BMI	(kg/m^2)	24.8 ± 4.3	22.8 ± 6.2	17.2 ± 2.8	0.012
ADL	(score)	78.8 ± 24	77.5 ± 20	23.5 ± 31	0.005
MNA® - SF	(score)	12.3 ± 0.5	9.1 ± 1.1	5.2 ± 1.5	< 0.001

Chi-squared test. Kruskal-Wallis test. mean±SD. WN, well nourished; AR, at risk of malnutrition; M, malnourished.

Table 3. Anthropometric measurements.

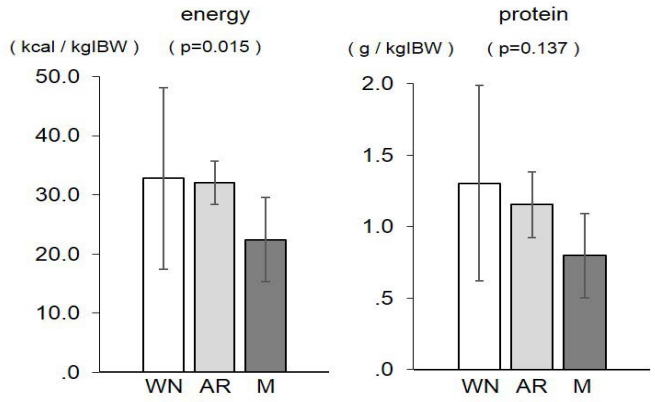
	WN	AR	M	p-value
%IBW	112.9±19.3	103.5±28.1	78.3±12.5	0.012
%AC	108.8±18.9	108.8±18.1	87.6±14.3	0.030
%TSF	111.0±28.3	83.6±65.6	48.9±33.5	0.048
%AMC	110.8±21.5	115.1±12.8	90.5±15.5	0.020
%AMA	126.0±49.0	134.5±29.8	99.1±36.1	0.167
%CC	103.8±15.1	99.9±10.9	83.9±11.4	0.030

Kruskal-Wallis test. mean±SD. IBW, ideal body weight; AC, arm circumference; TSF, triceps skinfolf thickess; AMC, Arm muscle circumference; AMA, arm muscle area; CC, calf circumference; WN, well nourished; AR, at risk of malnutrition; M, malnourished.

Nutritional intake

Energy intake and protein intake were shown in Figure 1. In energy intake, there were significant differences between each group. Additionally, M tended to be less than AR by the Bonferroni post hoc test (p=0.078). On the other hand, although there was no significant difference between each group in protein intake, AR was slightly lower than WN and M was lower than the other two groups (WN: 1.3 ± 0.7 g/kgIBW, AR: 1.2 ±0.2 g/kgIBW, M: 0.8 ± 0.3 g/kgIBW).

Figure 1. Nutritional intake.



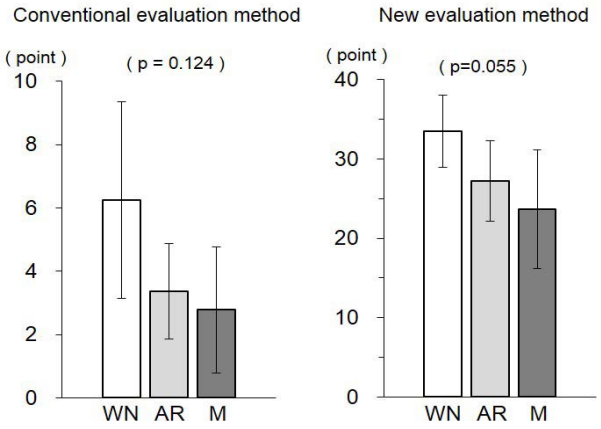
There was significant difference in the energy intake of each group. On the other hand, although there was no significant difference in the protein intake of each group, protein intake decreased in the

following order of nutritional status: well-nourished (WN), at risk of malnutrition (AR), and malnourished (M).

Association between DVS and the MNA®-SF score

According to the conventional evaluation method developed by Kumagai et al., which evaluates dietary variety by assigning either 1 point or 0 point to responses, there was no significant difference in DVS between the groups (Figure 2). However, according to the new evaluation method developed by Hukasaku et al., which assigns points ranging from one to four for each category level, the mean DVS had a tendency to decrease according to nutritional status, as follows: WN, 33.5 ± 4.5 points; AR, 27.3 ± 5.1 points; and M, 23.7 ± 7.5 points (p = 0.055).

Figure 2. Dietary variety score (DVS).



According to the conventional evaluation method, there was no significant difference in the dietary variety score (DVS) of each group. However, according to the new evaluation method, DVS had a tendency to decrease in the following order of nutritional status: WN, AR, and M.

Additionally, the associations between DVS and MNA®-SF scores are shown in Table 4. Positive correlations between DVS and the MNA®-SF scores were recognized by the conventional evaluation method developed by Kumagai et al. (r = 0.567, p < 0.01) and also by the new evaluation method developed by Hukasaku et al. (r = 0.682, p < 0.01).

Table 4. Correlation between DVS and the MNA®-SF score

	r	p-value
Conventional evaluation method	0.567	0.003
New evaluation method	0.682	0.001

Spearman's rank correlation cofficient.

Discussions

It has been reported that approximately 70% of community-dwelling dependent elderly are malnourished or at risk for malnutrition in Japan [9]. In the present study, nearly 40% of home health care patients were considered at risk for malnutrition and nearly 50% were malnourished. Though our result was rather high prevalence compared to the previous study, this difference was thought to be due to the exclusion criteria of subjects. According to the previous study, the patients with serious illness such as cancer, renal failure, heart failure or severe cognitive impairment were excluded to examine the relation of nutritional status with mortality. On the other hand, the purpose of this study was to evaluate the nutritional status, so we included the patients with serious illness.

"At risk" is an indicator that predicts not only malnutrition but also other negative events secondary to malnutrition [22], and according to an observational study, the survival rate of those at risk for malnutrition is significantly lower than that of well-nourished subjects [23]. Therefore, intervention is necessary for those at risk of suffering from malnutrition, but the intervention point is still not clear.

In the present study, we focused on dietary variety as a measure of dietary intake. There are reports that a highly varied diet is associated with better nutritional status and improved physical and cognitive functions in elderly [24-26]. Furthermore, other studies showed that a questionnaire on food variety, dietary diversity, and dietary habits can serve as a useful tool in assessing the adequacy of the diet, nutritional status, and prognosis in elderly [23, 27]. Therefore, dietary variety is considered one of the comprehensive evaluation indexes of dietary intake and dietary habits. The DVS we used in the present study is effective in understanding dietary variety of the Japanese community dwelling people, because it was developed based on the food groups commonly consumed in Japan. According to a previous study using DVS, higher dietary variety is associated with a reduced risk of higher-level functional decline in community dwelling elderly [14]. Additionally, DVS also correlates with sarcopenia and functional capacity in elderly [28, 29]. On the other hand, an exercise and nutritional intervention improved dietary variety in community-dwelling pre-frail elderly [30]. Thus, improving dietary variety may help to prevent a decline in nutritional status and functional capacity in home health care patients.

In this study, patients considered malnourished exhibited decreased ADL, anthropometric measurements, nutritional intake, and DVS compared with participants in the other two groups. On the other hand, ADL, anthropometric measurements, and nutritional intake of at-risk participants were similar to those of well-nourished patients, and there were no salient differences between them. It was difficult to determine at a glance, then, that at-risk subjects were at risk of malnutrition, and thus also difficult to determine whether to intervene to improve their nutritional status. DVS had a tendency to decrease according to nutritional status, from WN to AR to M; however, a significant positive correlation was noted between the MNA®-SF score and DVS. In other words, nutritional status and dietary variety were strongly correlated. Thus, it might be possible to determine the nutritional intervention point for patients at risk of developing malnutrition by evaluating their dietary variety when performing nutritional assessments.

There were some limitations in our study. First, our study consisted of the home health care adult patients receiving home-visit nursing care service and sample size was small, so our results may not apply to all home health care patients.

Furthermore, we could not evaluate interaction effect of illness and malnutrition due to the small sample size. Second, we did not assess financial status, regional food supply, season, disease conditions, chewing ability, or presence and extent of dysphagia and dementia. These are considered as confounding factors of the DVS. Large and diverse samples of home health care patients and further study are recommended to verify the effect of the DVS on the MNA-SF score by multivariate analysis using these confounding factors.

This study suggests that it may be possible to prevent at-risk patients from developing malnutrition by improving their dietary variety, particularly those patients who are not notably emaciated and whose dietary intake is similar to their well-nourished counterparts. It is necessary to prospectively study whether improving the dietary variety of at risk patients contribute to maintaining their nutritional status.

Conclusion

According to the classification of home care patients by the MNA®-SF, 36.4% and 46.5% of home health care patients in this study were considered to be at risk of malnourishment or malnourished, respectively. Additionally, the dietary variety of at-risk patients declined earlier than the change of anthropometric measurements and nutritional intake.

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