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Indices of Undernutrition in the Care-dependent Elderly

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ABSTRACT

Undernutrition is a factor associated with care dependency in the elderly. Undernutrition means the state that a nutrient necessary to live healthfully can't take in. This study examined the nutritional status and mental/physical functions of the care-dependent elderly living in facilities and home covered by long-term care insurance to clarify factors influencing their nutritional status, as well as indices for the early identification of undernutrition among them. I analyzed it about the Alb level and BMI to become indices of undernutrition in this study. Data regarding the actual status of 529 care-dependent elderly individuals, 369 (69.8%) residents of Long-term Care Insurance-covered facilities (facility group), and 160 (30.2%) living at home (home group), were obtained in 9 arbitrarily selected areas. Care dependency was frequently marked in the facility group, while it was generally mild in the home group. Regarding the nutritional status, there were no differences in the BMI between the groups, but the Alb level was lower in the former. The Alb level was also significantly correlated with 4 factors: BMI, mode of feeding, dietary intake, and ability to walk. On detailed analysis, decreases in the Alb level were associated with altered modes of feeding and a reduced ability to walk in the facility group, and a decreased dietary intake in the home group. These results support the feasibility of predicting decreases in the Alb level by clarifying altered modes of feeding and a reduced ability to walk among those with marked care dependency, and by detecting decreases in the dietary intake among those with mild care dependency even when the Alb level is unclear. The factors identified in this study may be new indices for the identification of undernutrition in the care-dependent elderly.

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Ⅰ. Background

Undernutrition is a factor associated with care dependency in the elderly. Undernutrition means the state that a nutrient necessary to live healthfully can't take in. When the Long-term Care Insurance Act was revised in 2006, measures to prevent the development and progression of care dependency, such as plans to resolve undernutrition, were adopted. However, in a study to comprehensively evaluate and analyze the outcomes of care prevention projects conducted in 2008, nutritional improvement was still necessary for approximately 30% of specific elderly individuals who may possibly become care-dependent and those requiring assistance[1]. Furthermore, according to the Report of a Survey on the Dietary and Nutritional Statuses of the Elderly Receiving Long-term Home Care 2012, the prevalence of undernutrition among the elderly receiving long-term home care, based on the MNA-SF (Mini Nutritional Assessment-Short Form) score and BMI, was approximately 30%[2]. These findings indicate that undernutrition remains in the elderly, requiring improved approaches to resolve it as countermeasures against the development and progression of care dependency.

Under these circumstances, we conducted an awareness survey in 2014, involving those providing Long-term Care Insurance services (n=641) and focusing on the nutritional status of the care-dependent elderly. Both those providing home and facility care services showed poor awareness of this issue, as they rarely clarify their clients' BMI or serum albumin (Alb) levels as indices of the nutritional status (Table 1)[5].

Table 1: Care staff awareness of the undernutrition management of elderly individuals needing long-term care: Comparisons by service type (n=641)

	All		Most		A few		None	
	In-home	Facility	Home	Facility	Home	Facility	Home	Facility
BMI	6.2%	9.6%	19.1%	24.8%	57.3%	44.2%	17.3%	21.4%
Alb	0.0%	4.6%	7.6%	23.1%	56.4%	38.5%	36.0%	33.9%

In some previous studies, altered modes of feeding were shown to influence the nutrient intake[3], and the cognitive and physical functions of the care-dependent elderly were correlated with the nutritional status[4]. However, none of them examined indices for the early identification of undernutrition in consideration of the above-mentioned poor awareness of the nutritional status of the care-dependent elderly among those providing care services.

Therefore, the present study examined the nutritional status and mental/physical functions of the care-dependent elderly living in facilities and home covered by long-term care insurance to clarify factors influencing their nutritional status, as well as indices for the early identification of undernutrition among them. I analyzed it about the Alb level and BMI to become indices of undernutrition in this study.

The study may have significance in providing a basis for preventing the development and progression of care dependency in not only Japan, in which the proportion of those aged 60 or over will reach 32.0% of the total population in 2050 (UN report, 2013)[6], but also other countries that are similarly facing population aging, such as Germany, Italy, and Sweden. The results may also contribute to the reduction of social insurance costs.

Ⅱ. Objective

The present study examined the nutritional status and mental/physical functions of the care-dependent elderly living in facilities and home covered by long-term care insurance to clarify factors influencing their nutritional status, as well as indices for the early identification of undernutrition among them.

Ⅲ. Methods

1. Design
A quantitative, descriptive study (to clarify the actual status).

2. Subjects
The care-dependent elderly living in Long-term Care Insurance-covered facilities and at home.

3. Period
Between April 2014 and March 2015.

4. Study items
Sex, age, type of service, Long-term Care Grade, Degree of ADL Independence of the Elderly with Disabilities, Degree of ADL Independence of the Elderly with Dementia, BMI, serum albumin (Alb) level, daily dietary intake, mode of feeding, ability to walk, dental status, and presence/absence of choking.

5. Methods of data collection and analysis
A questionnaire survey was conducted to clarify the actual status, involving those providing the Long-term Care Insurance services and asking them to provide data and other materials regarding their care-dependent elderly clients. Their responses were analyzed to clarify factors influencing the nutritional status of the care-dependent elderly, using SPSS Ver. 22.0 as statistical analysis software.

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Ⅳ． **Ethical considerations**

Prior to the study, the heads of target facilities or home care service stations were provided with explanations regarding the following items: ensuring anonymity to prevent the identification of individuals; encoding data for analysis and limiting their use to the present study; and utilizing the results only for social benefit through presentations at academic meetings or publication in scientific journals. Care service providers who consented were asked to provide data and other materials regarding their care-dependent elderly clients as their responses to the questionnaire. The study was conducted with the approval of the Ethics Committee of the Juntendo University Faculty of Health Sciences and Nursing (approval number: 25003).

Ⅴ． **Results**

Data regarding the actual status of 529 care-dependent elderly individuals, 369 (69.8%) residents of Long-term Care Insurance-covered facilities (facility group), and 160 (30.2%) living at home (home group) were obtained in 9 arbitrarily selected areas (Hokkaido, Aomori, Iwate, Tokyo, Aichi, Gifu, Fukui, Kochi, and Miyazaki). As their basic attributes, the facility group consisted of 86 (23.3%) males and 283 (76.7%) females, while the home group consisted of 50 (31.2%) males and 110 (68.8%) females. The mean ages were 85.19±7.62 and 84.42±7.69, respectively, and the mean Long-term Care Grades were 3.47±1.24 and 2.81±1.40, respectively. The Degree of ADL Independence of the Elderly with Disabilities was as follows: facility: J1: 5 (1.4%), J2: 11 (3.0%), A1: 56 (15.3%), A2: 82 (22.4%), B1: 57 (15.6%), B2: 105 (28.7%), C1: 12 (3.3%), and C2: 38 (10.4%); and home: J1: 17 (11.3%), J2: 5 (3.3%), A1: 37 (24.7%), A2: 31 (20.7%), B1: 18 (12.0%), B2: 29 (19.3%), C1: 4 (2.7%), and C2: 9 (6.0%). The Degree of ADL Independence of the Elderly with Dementia was as follows: facility: I: 35 (9.6%), IIa: 31 (8.5%), IIb: 77 (21.0%), IIIa: 125 (34.2%), IIIb: 28 (7.7%), IV: 61 (16.7%), and M: 9 (2.5%); and home: I: 35 (23.3%), IIa: 10 (6.7%), IIb: 44 (29.3%), IIIa: 34 (22.7%), IIIb: 12 (8.0%), IV: 11 (7.3%), and M: 4 (2.7%). In short, care dependency was frequently marked in the facility group, while it was generally mild in the home group (Table 2).

Table 2: Basic Attributes of the Care-dependent Elderly (n=529)

		In-home	Facility
Sex	Male	23.3%	31.2%
	Female	76.7%	68.8%
Age (Mean±SD)		85.19±7.62,year	84.42±7.69,year
Level of requiring nursing care (Mean±SD)		3.47±1.23	2.81±1.40
Levels of Living Independence of the Elderly with Disabilities	J1	1.4%	11.3%
	J2	3.0%	3.3%
	A1	15.3%	24.7%
	A2	22.4%	20.7%
	B1	15.6%	12.0%
	B2	28.7%	19.3%
	C1	3.3%	2.7%
	C2	10.4%	6.0%
Levels of Living Independence of the Elderly with Dementia	I	9.6%	23.3%
	IIa	8.5%	6.7%
	IIb	21.0%	29.3%
	IIIa	34.2%	22.7%
	IIIb	7.7%	8.0%
	IV	16.7%	7.3%
	M	2.5%	2.7%

J1,J2:Walk level　　B1,B2:Chair Level　　C1,C2:Bed level

On comparison of nutrition-related items, the mean BMI was 21.23±3.90 and 21.22±3.86 kg/m² in the facility and home groups, respectively, revealing no differences. In contrast, the mean Alb levels were 3.62±0.42 and 3.82±0.46 g/dL, respectively; the level was lower in the former. The mean dietary intakes were 1,327.27±244.44 and 1,389.06±317.32 kcal, respectively; the volume was also lower in the former. The mode of feeding in the facility group was regular: 189 (51.8%), chopped food: 46 (12.6%), paste food: 112 (30.7%), and tube feeding: 18 (4.9%). In the home group, it was regular: 120 (76.9%), chopped food: 25 (16.0%), paste food: 7 (4.5%), and tube feeding: 4 (2.6%); altered modes of feeding were observed more frequently in the former. The ability to walk was as follows: facility: walking independently: 63 (17.1%), requiring monitoring: 35 (9.5%), requiring partial assistance: 53 (14.4%), and using a wheelchair: 218 (59.1%); and home: walking independently: 44 (27.5%), requiring monitoring: 26 (16.3%), requiring partial assistance: 40 (25.0%), and using a wheelchair: 50 (31.3%); wheelchair users accounted for the majority in both groups, but their proportion was higher in the facility group. The dental status was as follows: facility: natural teeth: 129 (35.1%), using dentures: 183 (49.9%), and not using dentures due to poor fit: 55 (15.0%); and home: natural teeth: 41 (25.6%), using dentures: 100 (62.5%), and not using dentures due to poor fit: 19 (11.9%); the natural tooth rate was higher in the facility group, although the difference was non-significant when including those using dentures. The presence/absence of choking was as follows: facility: absent: 243 (68.3%), once or twice a day: 56 (15.7%), once or twice during each meal: 53 (14.9%), and every bite: 4 (1.1%); and home: absent: 119 (74.8%), once or twice a day: 24 (15.1%), once or twice during each meal: 13 (8.2%), and every bite: 3 (1.9%); choking was rare in both groups, but a slightly decreased oral function was observed more frequently in the facility group (Table 3).

Table 3: Nutritional Status, Ability to Walk, and Oral Function of the Care-dependent Elderly (n=529)

		Home	Facility
BMI (Mean±SD)		21.23±3.90,kg/m2	21.21±3.86,kg/m2
Alb (Mean±SD)		3.62±0.42,g/dl	3.82±0.46,g/dl
Dietary intake (Mean±SD)		1327.27±244.44,kcal	1389.06±317.32,kcal
Mode of feeding	Regular food	51.8%	76.9%
	Chopped food	12.6%	16.0%
	Paste food	30.7%	4.5%
	Tube feeding	4.9%	2.6%
Ability to walk	Walking independently	17.1%	27.5%
	Requiring monitoring	9.5%	16.3%
	Requiring partial assistance	14.4%	25.0%
	Using a wheelchair	59.1%	31.3%
Dental conditions	Natural teeth	35.1%	25.6%
	Using dentures	49.9%	62.5%
	Not using dentures due to poor fit	15.0%	11.9%
Susceptibility to choking/aspiration	Absent	68.3%	74.8%
	Once or twice a day	15.7%	15.1%
	Once or twice during each meal	14.9%	8.2%
	Every bite	1.1%	1.9%

On analyzing the correlation of the Alb level as an index of the nutritional status with each factor using Spearman's ρ, it was significantly correlated with the mode of feeding, dietary intake, and ability to walk in the facility group, and with the BMI, dietary intake, and ability to walk in the home group (Table 4).

Table 4: Correlations among the Alb Level and 4 Factors (Spearman's ρ)

		BMI	Mode of feeding	Dietary intake	Ability to walk
Alb	Home (N=295)	.188 **	-.423 **	.242 **	-.325 **
	Facility (N=77)	.473 **	-.149	.496 **	-.288 *

* $p < .05$, ** $p < .01$

Furthermore, the following regression equations were obtained through multiple regression analysis (using the forced entry method) for these 4 factors:

Facility: Alb level = -0.136 × [mode of feeding] - 0.071 × [ability to walk] - 0.002 × [BMI] + 0.001 × [dietary intake] + 4.137 (Table 5).

Table 5: Results of Multiple Regression Analysis with the Alb Level of the Facility Group as a Dependent

	Standardizing coefficient
BMI	-.021
Mode of feeding	-.347***
Dietary intake	.001
Ability to walk	-.199**
Multiple correlation coefficient	.467***
Coefficient of determination	.218***

** : p<.01   *** : p<.001

Home: Alb level ＝ 0.001 × [dietary intake] ＋ 0.022 × [BMI] － 0.048 × [ability to walk] ＋ 0.046 × [mode of feeding] ＋ 2.617 (Table 6).

Table 6: Results of Multiple Regression Analysis with the Alb Level of the In-home Group as a Dependent Variable

	Standardizing coefficient
BMI	.165
Mode of feeding	.060
Dietary intake	.318*
Ability to walk	-.118
Multiple correlation coefficient	.468**
Coefficient of determination	.219**

＊：$p<.05$　　　　＊＊：$p<.01$

A decreased Alb level was associated with altered modes of feeding and a reduced ability to walk in the facility group, and a decreased dietary intake in the home group.

VI．Discussion

The present study examined the nutritional status and mental/physical functions of the care-dependent elderly living in facilities and home covered by long-term care insurance. Analysis of their Long-term Care Grades, Degrees of ADL Independence of the Elderly with Disabilities, and Degrees of ADL Independence of the Elderly with Dementia revealed that care dependency was frequently marked among the former and generally mild among the latter. Regarding the nutritional status, although there were no differences in the BMI between the facility and home groups, the Alb level was lower in the former. The Alb level was also correlated with the dietary intake and mode of feeding, as the dietary intake was lower, and regular food was used less frequently in the facility group. Based on these results, the nutritional status of the elderly with marked care dependency may have declined due to a decreased dietary intake and altered modes of feeding. Decreases in the energy intake due to a soft diet were also noted in some previous studies[3]. Furthermore, in the facility group, the rate of wheelchair use as an index of the ability to walk was higher, in addition to an increased incidence of choking, indicating a decreased oral function. These results suggest that the elderly with marked care dependency also faced decreases in the ability to walk and oral function, resulting in an impaired nutritional status. In previous studies, declines in the nutritional status were associated with a decreased ADL level and cognitive function of the care-dependent elderly[4]. Regarding the cognitive function and nutrition, the latter was shown to be a factor associated with decreases in the former, highlighting the necessity of nutritional care, in a study examining methods of education for the families of patients with dementia[7].

In the present study, 4 factors, the BMI, mode of feeding, dietary intake, and ability to

walk, were correlated with the Alb level as an index of the nutritional status. On detailed analysis, a decreased Alb level was associated with altered modes of feeding and a reduced ability to walk in the facility group, and a decreased dietary intake in the home group. In the facility group in which marked care dependency was observed, a soft diet to compensate for a decreased oral function may have led to an impaired nutritional status, resulting in an impaired ability to walk. In contrast, in the home group in which care dependency was generally mild, and normal oral and physical functions were maintained, only a decreased dietary intake may have influenced the nutritional status. These results may be useful to address the poor awareness of the nutritional status of the care-dependent elderly among those providing Long-term Care Insurance services[5], and support the feasibility of predicting decreases in the Alb level by clarifying altered modes of feeding and a reduced ability to walk among those with marked care dependency and by detecting decreases in the dietary intake among those with mild care dependency even when the Alb level is unclear. The factors identified in the study may be new indices for the identification of undernutrition in the care-dependent elderly.

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