ORIGINAL ARTICLE

Mental and Physical Functions of Residents of Special Elderly Nursing Homes Providing Functional Recovery Care;
Relationships between Food Types and Mobility/Cognitive Function

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ABSTRACT

This study examined the relationships between the mental/physical functions of residents of special elderly nursing homes providing functional recovery care and food types. On comparing residents based on food types, the grades of care required were lower, and the levels of independence based on the activities of daily living (ADL) Independence Scales for Older People with Disabilities/Dementia were higher in the regular food compared with the special food and percutaneous endoscopic gastrostomy (PEG) tube feeding groups. Furthermore, the daily fluid and dietary intakes were higher, the time spent out of bed each day was longer, and the levels of in/outdoor mobility independence, rates of in/outdoor mobility aid use, and rates of being able to communicate and recognize situations were also higher in the regular food group. The results clarified the relationships among food types, mobility, and cognitive function in older people requiring care. They also demonstrated that the mental and physical functions of those consuming regular food are higher, suggesting the importance of promoting regular food consumption in nutrition care for older people.

＜Key-words＞

Functional recovery care, special elderly nursing homes, food type, mobility, cognitive function

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I. Introduction

The share of older people aged 65 or over in the total global population (aging rate) increased from 5.1% in 1950 to 8.3% in 2015, and it is estimated to reach 18.1% in 2060. The World Health Organization (WHO) published the WHO Guideline on Integrated Care for Older People (ICOPE)[1] in 2017, defining "mobility loss", "malnutrition", "visual impairment", "hearing loss", "cognitive impairment", "depressive symptoms", "urinary incontinence", "risk of falls", and "caregiver support" as 9 elements of integrated care for older people.

In 2005, when the Long-term Care Insurance Act was initially revised, Japan's care system became more prevention-focused, placing importance on improvements in motor function, nutrition, and oral function. However, reports on the outcomes of the new prevention-focused care system[2,3] revealed that older people requiring nutritional improvement still account for 30%, and malnutrition among these people remains unsolved. The effectiveness and reliability of nutritional assessment using a simple inventory (Mini Nutritional Assessment Short-Form: MNA-SF), including nutritional intervention and nutrition education, were confirmed in a previous study[4], but methods for nutritional improvement are yet to be established[5]. The authors clarified various challenges, including poor awareness of nutritional improvement among long-term care insurance service providers[6], an association between a poor nutritional status and mental/physical dysfunction in care-dependent older people[7], and lack of nutrition education for care managers[8], and identified factors responsible for the difficulty of improving malnutrition in older people. They also reported the necessity of organic collaboration based on standardized assessment and ICT use for more effective nutritional improvement[9].

The purpose of the present study was to clarify the relationships between the mental/physical functions of residents of special elderly nursing homes providing functional recovery care and food types, based on the hypothesis that food types influence the mental/physical functions of older people requiring care. Special elderly nursing homes are defined as facilities for older people requiring care to lead their daily lives with care/assistance in bathing, toileting, and eating, and assistance in other everyday activities, rehabilitation, health management, and long-term care[10]. In the present study, foods were classified into 3 types: regular food, special food, and percutaneous endoscopic gastrostomy (PEG) tube feeding. As representative mental/physical functions, the study focused on mobility and cognitive function. The authors focused on food types and mental/physical functions, as malnutrition was shown to be responsible for declines in the mental/physical functions of older people, and an association between serum albumin (Alb) levels as a nutrition indicator and food types was suggested in a previous study[7]. In this paper, "functional recovery care" refers to care that aims to enhance the mental and physical functions of care-dependent older people through 4 basic care approaches, covering <hydration>, <nutrition>, <excretion>, and <exercise>[11].

II. Subjects and Methods

1. Study and Procedures

1) Study Design

A quantitative, descriptive study.

2) Study Period

From April 1, 2019, to March 31, 2020.

3) Subjects

A total of 1,000 residents of 14 special elderly nursing homes participating in functional recovery care workshops with one of the authors as a lecturer.

The special elderly nursing homes involved in the study were practicing the basic care approaches after learning the theory of functional recovery care through a course, consisting of 6 workshops/year that were held with one of the authors as a lecturer. Fourteen special elderly nursing homes in Aichi Prefecture participated in the 6 workshops, practiced functional recovery care for all of their residents, and reported changes in the mental/physical functions of residents as scores for the authors to examine the effects based on the idea that by involving these special elderly nursing homes, it would be possible to identify factors influencing the mental/physical functions of older people requiring care.

4) Study Items

The age, sex, care grade, and levels of independence based on the ADL Independence Scales for Older People with Disabilities (J: being able to walk outdoors, A: being able to walk indoors, B: using wheelchairs, C: being bedridden) / Dementia (I: being able to perform most ADLs, II: requiring observation, III: requiring partial assistance, IV: requiring full assistance, M: having severe symptoms and requiring specialized care) were investigated as basic attributes. Additionally, the food type (regular food, special food, PEG tube feeding) and the fluid intake/day, dietary intake/day, and time spent out of bed/day were examined as basic care parameters. Mobility independence was evaluated based on the ability to move in/outdoors and status of in/outdoor mobility aid use, while cognitive function was assessed based on the abilities to communicate, understand routines, state one's own name/age, remember recent events, and understand seasons/places.

5) Ethical Considerations

After obtaining consent from the workshop organizer and managers of the study facilities, research information was made available to the public by opting out, and the principle of voluntary participation was ensured by providing subjects with the

opportunity to decline participation. The study was approved by the Ethics Committee of the institution some of the authors belong to (approval number: 1-06).

2. Data Collection

Data regarding the study items were extracted from those submitted in May 2019 during the workshops held with one of the authors as a lecturer.

3. Data Analysis

After simple tabulation, the relationships between food types and basic attributes, basic care parameters, mobility, and cognitive function were analyzed using the chi-square test or the Kruskal-Wallis test. Statistical analysis was performed using IBM SPSS Statistics 26.0, with the significance level set at $p<0.05$.

III. Results

1. Basic Attributes and food types (Table 1)

The mean age was 85.9±7.8. There were 227 (22.7%) males and 773 (77.3%) females. The mean care grade was 3.7±0.99. The level of independence based on the ADL Independence Scale for Older People with Disabilities was as follows: J1: 3 (0.3%), J2: 16 (1.6%), A1: 94 (9.4%), A2: 215 (21.5%), B1: 211 (21.1%), B2: 320 (32.0%), C1: 51 (5.1%), and C2: 90 (9.0%). The level of independence based on the ADL Independence Scale for Older People with Dementia was as follows: independent: 14 (1.4%), I: 40 (4.0%), IIa: 60, IIb: 140 (14.0%), IIIa: 422 (42.2%), IIIb: 92 (9.2%), IV: 179 (17.9%), and M: 53 (5.3%). The food type was regular in 775 (77.5%), special in 181 (18.1%), and PEG tube feeding in 44 (4.4%). Residents with worsening complications were excluded.

<Table 1> Basic attributes and food types

Age			85.9±7.8
Sex	Male	227	22.7%
	Female	773	77.3%
Care grade	Currently applying	6	0.6%
	Grade 1	22	2.2%
	Grade 2	49	4.9%
	Grade 3	350	35.0%
	Grade 4	335	33.5%
	Grade 5	238	23.8%
Level of independence based on the ADL Independence Scale for Older People with Disabilities	J1	3	0.3%
	J2	16	1.6%
	A1	94	9.4%
	A2	215	21.5%
	B1	211	21.1%
	B2	320	32.0%
	C1	51	5.1%
	C2	90	9.0%
Level of independence based on the ADL Independence Scale for Older People with Dementia	Independent	14	1.4%
	I	40	4.0%
	II a	60	6.0%
	II b	140	14.0%
	III a	422	42.2%
	III b	92	9.2%
	IV	179	17.9%
	M	53	5.3%
Food type	Regular	775	77.5%
	Special	181	18.1%
	PEG tube feeding	44	4.4%

2. Relationship between food types and basic attributes (Table 2)

The food types in each sex were as follows: regular: male: 195 (25.2%) and female: 580 (74.8%); special: male: 27 (14.9%) and female: 154 (85.1%); and PEG tube feeding: male: 5 (11.4%) and female: 39 (88.6%).

The food types at each care grade were as follows: regular: currently applying: 5 (0.6%), grade 1: 22 (2.8%), 2: 48 (6.2%), 3: 318 (41.0%), 4: 242 (31.2%), and 5: 140 (18.1%); special: currently applying: 0 (0.0%), grade 1: 0 (0.0%), 2: 1 (0.6%), 3: 31 (17.1%), 4: 76 (42.0%),

and 5: 73 (40.3%); and PEG tube feeding: currently applying: 1 (2.3%), grade 1: 0 (0.0%), 2: 0 (0.0%), 3: 1 (2.3%), 4: 17 (38.6%), and 5: 25 (56.8%). The rate of residents requiring low grades of care was significantly higher in the regular food compared with the other groups.

The food types at each level of independence based on the ADL Independence Scale for Older People with Disabilities were as follows: regular: J1: 3 (0.4%), J2: 15 (1.9%), A1: 89 (11.5%), A2: 198 (25.5%), B1: 175 (22.6%), B2: 230 (29.7%), C1: 25 (3.2%), and C2: 40 (5.2%); special: J1: 0 (0.0%), J2: 1 (0.6%), A1: 4 (2.2%), A2: 15 (8.3%), B1: 36 (19.9%), B2: 76 (42.0%), C1: 21 (11.6%), and C2: 28 (15.5%); and PEG tube feeding: J1: 0 (0.0%), J2: 0 (0.0%), A1: 1 (2.3%), A2: 2 (4.5%), B1: 0 (0.0%), B2: 14 (31.8%), C1: 5 (11.4%), and C2: 22 (50.0%). The rate of residents with high levels of independence based on this scale was significantly higher in the regular food compared with the other groups.

The food types at each level of independence based on the ADL Independence Scale for Older People with Dementia were as follows: regular: independent: 14 (1.8%), I: 39 (5.0%), IIa: 56 (7.2%), IIb: 124 (16.0%), IIIa: 345 (44.5%), IV: 99 (12.8%), and M: 27 (3.5%); special: independent: 0 (0.0%), I: 1 (0.6%), IIa: 4 (2.2%), IIb: 16 (8.8%), IIIa: 66 (36.5%), IIIb: 16 (8.8%), IV: 63 (34.8%), and M: 15 (8.3%); and PEG tube feeding: independent: 0 (0.0%), I: 0 (0.0%), IIa: 0 (0.0%), IIb: 0 (0.0%), IIIa: 11 (25.0%), IIIb: 5 (11.4%), IV: 17 (38.6%), and M: 11 (25.0%). The rate of residents with high levels of independence based on this scale was significantly higher in the regular food compared with the other groups.

<Table 2> Relationship between food types and basic attributes

		Regular		Special		PEG tube feeding		P-value	
		n	%	n	%	n	%		
Sex	Male	195	25.5%	27	14.9%	5	11.4%	0.002	**
	Female	580	74.5%	154	85.1%	39	88.6%		
Care grade	Currently applying	5	0.6%	0	0.0%	1	2.3%		
	Grade 1	22	2.8%	0	0.0%	0	0.0%		
	Grade 2	48	6.2%	1	0.6%	0	0.0%	<0.001	***
	Grade 3	318	41.0%	31	17.1%	1	2.3%		
	Grade 4	242	31.2%	76	42.0%	17	38.6%		
	Grade 5	140	18.1%	73	40.3%	25	56.8%		
Level of independence based on the ADL Independence Scale for Older People with Disabilities	J1	3	0.4%	0	0.0%	0	0.0%		
	J2	15	1.9%	1	0.6%	0	0.0%		
	A1	89	11.5%	4	2.2%	1	2.3%		
	A2	198	25.5%	15	8.3%	2	4.5%	<0.001	***
	B1	175	22.6%	36	19.9%	0	0.0%		
	B2	230	29.7%	76	42.0%	14	31.8%		
	C1	25	3.2%	21	11.6%	5	11.4%		
	C2	40	5.2%	28	15.5%	22	50.0%		
Level of independence based on the ADL Independence Scale for Older People with Dementia	Independent	14	1.8%	0	0.0%	0	0.0%		
	I	39	5.0%	1	0.6%	0	0.0%		
	II a	56	7.2%	4	2.2%	0	0.0%		
	II b	124	16.0%	16	8.8%	0	0.0%		
	III a	345	44.5%	66	36.5%	11	25.0%	<0.001	***
	III b	71	9.2%	16	8.8%	5	11.4%		
	IV	99	12.8%	63	34.8%	17	38.6%		
	M	27	3.5%	15	8.3%	11	25.0%		

chi-square test, *: P<0.05, ** : P<0.001, ***: P<0.001

3. Relationship between food types and basic care parameters (Table 3)

The basic care parameter values of each food-type-based group were as follows: mean fluid intake/day (mL): regular: 1,446.1±361.9, special: 1,250.8±340.0, and PEG tube feeding: 1,040.8±511.5; mean dietary intake/day (Kcal): regular: 1,414.5±245.2, special: 1,225.4±266.3, and PEG tube feeding: 990.0±268.3; and mean time spent out of bed/day (minutes): regular: 675.4±198.6, special: 533.2±242.0, and PEG tube feeding: 236.0±236.3. The daily fluid and dietary intakes were significantly higher, and the time spent out of bed each day was significantly longer in the regular food compared with the other groups.

<Table 3> Relationship between food types and basic care parameters

	Food type												P-value	
	Regular				Special				PEG tube feeding					
	n	Median	25%	75%	n	Median	25%	75%	n	Median	25%	75%		
Fluid intake/day (mL)	775	1500	1219	1650	181	1300	1000	1500	44	965	600	1398.2	<0.001	***
Dietary intake/day (Kcal)	775	1450	1303	1583	181	1250	1100	1450	44	900	800	1200	<0.001	***
Time spent out of bed/day (minutes)	775	720	600	800	181	600	360	720	44	120	60	345	<0.001	***

Kruskal Wallis test, *:P<0.05, **: P<0.01, ***: P<0.001

4. Relationships between food types and indoor mobility/indoor mobility aid use (Table 4)

The indoor mobility of each food-type-based group was as follows: regular: independent: 189 (24.4%), requiring observation: 164 (21.2%), requiring partial assistance: 166 (21.4%), requiring full assistance: 251 (32.4%), and unable to move: 5 (0.6%); special: independent: 4 (2.2%), requiring observation: 12 (6.6%), requiring partial assistance: 19 (10.5%), requiring full assistance: 145 (80.1%), and unable to move: 1 (0.6%); and PEG tube feeding: independent: 0 (0.0%), requiring observation: 2 (4.5%), requiring partial assistance: 0 (0.0%), requiring full assistance: 41 (93.2%), and unable to move: 1 (2.3%). The rate of residents who were independent, requiring observation, or requiring partial assistance to move indoors was significantly higher in the regular food compared with the other groups.

The frequency of wheelchair-use to move indoors in each food-type-based group was as follows: regular: never: 246 (31.7%), sometimes: 144 (18.6%), and always: 385 (49.7%); special: never: 8 (4.4%), sometimes: 14 (7.7%), and always: 159 (87.8%); and PEG tube feeding: never: 2 (4.5%), sometimes: 2 (4.5%), and always: 40 (90.9%). The rate of residents never or sometimes using wheelchairs to move indoors was significantly higher in the regular food compared with the other groups.

Human

Services

The status of indoor mobility aid use in each food-type-based group was as follows: regular: using walkers: 168 (21.7%), using wheeled walker: 775 (100.0%), using 4-prong canes: 6 (0.8%), using T-shaped handle canes: 29 (3.7%), and requiring assistance to walk: 246 (31.7%); special: using walkers: 12 (6.6%), using wheeled walker: 181 (100.0%), using 4-prong canes: 1 (0.6%), using T-shaped handle canes: 0 (0.0%), and requiring assistance to walk: 30 (16.6%); and PEG tube feeding: using walkers: 2 (4.5%), using wheeled walker: 44 (100.0%), using 4-prong canes: 0 (0.0%), using T-shaped handle canes: 0 (0.0%), and requiring assistance to walk: 8 (18.2%). The rate of residents using walkers/T-shaped handle canes or requiring assistance to walk indoors was significantly higher in the regular food compared with the other groups.

<Table 4> Relationships between food types and indoor mobility/indoor mobility aid use

| | | Food type | | | | | | | |
| | | Regular | | Special | | PEG tube feeding | | P-value | |
		n	%	n	%	n	%		
Indoor mobility	Independent	189	24.4%	4	2.2%	0	0.0%		
	Requiring observation	164	21.2%	12	6.6%	2	4.5%		
	Partial assistance	166	21.4%	19	10.5%	0	0.0%	<0.001	***
	Full assistance	251	32.4%	145	80.1%	41	93.2%		
	Unable to move	5	0.6%	1	0.6%	1	2.3%		
Wheelchair-use to move indoors	Never	246	31.7%	8	4.4%	2	4.5%		
	Sometimes	144	18.6%	14	7.7%	2	4.5%	<0.001	***
	Always	385	49.7%	159	87.8%	40	90.9%		
Using walkers	Yes	168	21.7%	12	6.6%	2	4.5%	<0.001	***
Using wheeled walker	Yes	775	100.0%	181	100.0%	44	100.0%	-	
Using 4-prong canes	Yes	6	0.8%	1	0.6%	0	0.0%	0.807	
Using T-shaped handle canes	Yes	29	3.7%	0	0.0%	0	0.0%	0.013	*
Requiring assistance to walk	Yes	246	31.7%	30	16.6%	8	18.2%	<0.001	***

chi-square test, *: P<0.05, **: P<0.01, ***: P<0.001

5. Relationships between food types and outdoor mobility/outdoor mobility aid use (Table 5)

The outdoor mobility of each food-type-based group was as follows: regular: independent: 26 (3.4%), requiring observation: 77 (9.9%), requiring partial assistance: 61 (7.9%), requiring full assistance: 299 (38.6%), and unable to move: 312 (40.3%); special: independent: 0 (0.0%), requiring observation: 5 (2.8%), requiring partial assistance: 6

(3.3%), requiring full assistance: 104 (57.5%), and unable to move: 66 (36.5%); and PEG tube feeding: independent: 0 (0.0%), requiring observation: 0 (0.0%), requiring partial assistance: 0 (0.0%), requiring full assistance: 28 (63.6%), and unable to move: 16 (36.4%). The rate of residents who were independent, requiring observation, or requiring partial assistance to move outdoors was significantly higher in the regular food compared with the other groups.

The frequency of wheelchair-use to move outdoors in each food-type-based group was as follows: regular: never: 263 (33.9%), sometimes: 67 (8.6%), and always: 445 (57.4%); special: never: 28 (15.5%), sometimes: 3 (1.7%), and always: 150 (82.9%); and PEG tube feeding: never: 11 (25.0%), sometimes: 4 (9.1%), and always: 29 (65.9%). The rate of residents never using wheelchairs to move outdoors was significantly higher in the regular food compared with the other groups.

The status of outdoor mobility aid use in each food-type-based group was as follows: regular: using walkers: 29 (23.7%), using wheeled walker: 41 (5.3%), using 4-prong canes: 4 (0.5%), and using T-shaped handle canes: 19 (2.5%): special: using walkers: 12 (6.6%), using wheeled walker: 4 (2.2%), using 4-prong canes: 1 (0.6%), and using T-shaped handle canes: 1 (0.6%); and PEG tube feeding: using walkers: 0 (0.0%), using wheeled walker: 0 (0.0%), using 4-prong canes: 0 (0.0%), and using T-shaped handle canes: 0 (0.0%). The rate of residents using walkers to walk outdoors was significantly higher in the regular food compared with the other groups.

<Table 5> Relationships between food types and outdoor mobility/outdoor mobility aid use

| | | Food type | | | | | | | |
| | | Regular | | Special | | PEG tube feeding | | | |
		n	%	n	%	n	%	P-value	
Outdoor mobility	Independent	26	3.4%	0	0.0%	0	0.0%		
	Requiring observation	77	9.9%	5	2.8%	0	0.0%		
	Partial assistance	61	7.9%	6	3.3%	0	0.0%	<0.001	***
	Full assistance	299	38.6%	104	57.5%	28	63.6%		
	Unable to move	312	40.3%	66	36.5%	16	36.4%		
Wheelchair-use to move outdoors	Never	263	33.9%	28	15.5%	11	25.0%		
	Sometimes	67	8.6%	3	1.7%	4	9.1%	<0.001	***
	Always	445	57.4%	150	82.9%	29	65.9%		
Using walkers	Yes	29	3.7%	1	0.6%	0	0.0%	0.038	*
Using wheeled walker	Yes	41	5.3%	4	2.2%	0	0.0%	0.067	
Using 4-prong canes	Yes	4	0.5%	1	0.6%	0	0.0%	0.889	
Using T-shaped handle canes	Yes	19	2.5%	1	0.6%	0	0.0%	0.162	

chi-square test, *: P<0.05, **: P<0.01, ***: P<0.001

6. Relationships between food types and cognitive function (Table 6)

Each food-type-based group's ability to communicate was as follows: regular: always able: 501 (64.4%), sometimes able: 165 (21.3%), hardly able: 50 (6.5%), and unable: 59 (7.6%); special: always able: 49 (27.1%), sometimes able: 53 (29.3%), hardly able: 27 (14.9%), and unable: 52 (28.7%); and PEG tube feeding: always able: 2 (4.5%), sometimes able: 9 (20.5%), hardly able: 7 (15.9%), and unable: 26 (59.1%). The rate of residents who were able to communicate was significantly in the regular food compared with the other groups.

Each food-type-based group's ability to recognize situations was as follows: regular: understanding routines: always able: 362 (46.7%), stating one's own age: always able: 274 (35.4%), remembering recent events: always able: 361 (46.6%), stating one's own name: always able: 642 (82.8%), understanding seasons: always able: 335 (43.2%), and understanding places: always able: 368 (47.5%); special: understanding routines: always able: 27 (14.9%), stating one's own age: always able: 25 (13.8%), remembering recent events: always able: 25 (13.8%), stating one's own name: always able: 105 (58.0%), understanding seasons: always able: 21 (11.6%), and understanding places: always able: 30 (16.6%); and PEG tube feeding: understanding routines: always able: 2 (4.5%), stating one's own age: always able: 0 (0.0%), remembering recent events: always able: 2 (4.5%), stating one's own name: always able: 8 (18.2%), understanding seasons: always able: 1 (2.3%), and understanding places: always able: 3 (6.8%). The rate of resindents who were able to recognize situations was significantly higher in the regular food compared with the other groups.

<Table 6> Relationships between food types and cognitive function

		Food type							
		Regular		Special		PEG tube feeding			
		n	%	n	%	n	%	P-value	
Ability to communicate	Always able	501	64.6%	49	27.1%	2	4.5%		
	Sometimes able	165	21.3%	53	29.3%	9	20.5%	<0.001	***
	Hardly able	50	6.5%	27	14.9%	7	15.9%		
	Unable	59	7.6%	52	28.7%	26	59.1%		
Understanding routines	Able	362	46.7%	27	14.9%	2	4.5%	<0.001	***
Stating one's own age	Able	274	35.4%	25	13.8%	0	0%	<0.001	***
Remembering recent events	Able	361	46.6%	25	13.8%	2	4.5%	<0.001	***
Stating one's own name	Able	642	82.8%	105	58.0%	8	18.2%	<0.001	***
Understanding seasons	Able	335	43.2%	21	11.6%	1	2.3%	<0.001	***
Understanding places	Able	368	47.5%	30	16.6%	3	6.8%	<0.001	***

chi-square test, *: P<0.05, **: P<0.01, ***: P<0.001

IV. Discussion

   The 14 special elderly nursing homes involved in the present study were practicing basic care approaches after learning the theory of functional recovery care. According to data released by the Ministry of Health, Labour and Welfare in October 2019, there are 10,502 special elderly nursing homes in Japan. The number of those using these facilities is 619,600, and the mean grade of care required by them is 3.95[12]. The mean grade of care required by residents of the study facilities was 3.7±0.99, indicating that their levels of independence were relatively high. Functional recovery care to help people regain independence is based on theories and called "evidence-based care" in Japan. When care fees were revised in FY2021, additional fees for systems to promote evidence-based care were newly defined, and facilities providing effective functional recovery care for users to regain independence began to receive remuneration[13]. The present study clarified the relationships between food types and basic attributes, basic care parameters, mobility, and cognitive function in residents of facilities practicing these basic care approaches.

   On analyzing the relationships between food types and basic attributes, the grades of care required were lower, and the levels of independence based on the ADL Independence Scales for Older People with Disabilities/Dementia were higher in the regular food compared with the other groups, demonstrating that the mental and physical functions of those consuming regular food are higher. Furthermore, on analyzing the relationships between food types and basic care parameters, the daily fluid and dietary intakes were higher, and the time spent out of bed each day was longer in the regular food group, attributing the higher mental and physical functions of residents consuming regular food to the basic care approaches. Concerning the approaches, Takeuchi noted: "There are 4 basic approaches to care for older people. By appropriately performing these approaches, it is possible to help these people regain independence in most activities of daily living"[11]. As for the relationships between food types and ADL independence, a previous study examined factors influencing the feasibility of returning home as a goal of health service facilities for the elderly, and reported that the energy intake was the most influencing factor. Specifically, a daily energy intake of 1,400 Kcal or higher, regular food consumption, and independence in nocturnal excretion were shown to contribute to the feasibility of returning home[14]. In another study comparing support for residents of health service facilities for the elderly to return home between groups achieving and not achieving this goal, the energy intake, time spent out of bed, and nocturnal urinary incontinence rate strongly influenced the feasibility of returning home, highlighting the importance of nutritional support for functional recovery[15]. Furthermore, in a study analyzing factors contributing to independence in excretion among residents of special elderly nursing homes providing functional recovery care, there was a strong correlation between food types and such independence[16].

   On analyzing the relationships between food types and mobility in the present study,

both the level of in/outdoor mobility independence and rate of in/outdoor mobility aid use were higher in the regular food compared with the other groups. Similarly, on analyzing the relationships between food types and cognitive function, the rate of residents who were able to communicate and recognize situations was higher in the regular food group. Thus, the mobility and cognitive function of those consuming regular food were also higher. In a study conducted by one of the authors to examine the mobility and cognitive function of older people, serum albumin (Alb) levels influenced <walking in/outdoors>, <ascending/descending stairs>, <memory>, <orientation>, and <judgment> in older people living in residences for the elderly[17]. Alb levels also have a strong positive correlation with food types[7]. Similarly to these previous studies, the present study also clarified the relationships among food types, mobility, and cognitive function. It was confirmed that regular food consumption and a favorable nutritional status are positive factors for the mobility and cognitive function of older people requiring care. The hypothesis of the present study was proven correct, as the regular food group's nutritional status, such as energy intake, was maintained/improved, contributing to the maintenance/improvement of their mental/physical function. The basic care approaches covering <hydration>, <nutrition>, <excretion>, and <activity>, which had also been effective in care to improve dementia symptoms in a previous study[18], were shown to be necessary to maintain/improve cognitive function.

On comparing the regular food, special food, and PEG tube feeding groups, the care grade was lower, and the levels of independence based on the ADL Independence Scale for Older People with Disabilities/Dementia were higher in the regular food group. Furthermore, the daily fluid and dietary intakes were higher, the time spent out of bed each day was longer, and the levels of in/outdoor mobility independence, rates of in/outdoor mobility aid use, and rates of being able to communicate and recognize situations were also higher in this group. The results of the present study clarified the relationships among food types, mobility, and cognitive function in older people requiring care. They also demonstrated that the mental and physical functions of those consuming regular food are higher as a result of maintaining favorable nutritional conditions, suggesting the importance of promoting regular food consumption in nutrition care for older people.

Acknowledgment

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