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Research Article

Factors associated with malnutrition in demented and non-demented elderly residing in the community of Korea: a cross-sectional descriptive and analytical study

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Objectives: This study aimed to investigate and compare factors associated with malnutrition according to the presence or absence of dementia in community-dwelling elderly people.

Methods: Needs assessment data from 311 long-term care insurance (LTCI) recipients (dementia group 203; non-dementia group 108) that participated in the second pilot program of the integrated care model in community care settings under the Korean LTCI system were used. Descriptive statistical analysis, independent *t*-test or Fisher's exact test were conducted on the sociodemographic characteristics, health and functional status, and nutritional status of the dementia and non-dementia groups. Logistic regression analysis was conducted to identify factors associated with malnutrition in the dementia and non-dementia groups.

Results: Malnutrition occurred in 33.5% and 26.9% of participants in the dementia and non-dementia groups, respectively. In the dementia group, living with family rather than living alone (odds ratio [OR]: 3.81; 95% confidence interval [CI]: 1.50–9.66; $P = 0.031$), increase in Korean Activities of Daily Living (K-ADL) score (OR: 1.35; 95% CI: 1.17–1.55; $P < 0.001$), and increase in the Neuropsychiatric Inventory-Questionnaire score (OR: 1.02; 95% CI: 1.01–1.03; $P = 0.005$) were associated with a higher risk of malnutrition. In the non-dementia group, the risk of malnutrition increased as the K-ADL score increased (OR: 1.20; 95% CI: 1.04–1.39; $P = 0.011$) and in the depressed group (OR: 2.84; 95% CI: 1.04–7.74; $P = 0.042$).

Conclusion: The study results confirmed the necessity of nutritional management for community-dwelling LTCI recipients. When developing a nutritional management program, considering the differences in factors related to malnutrition between the dementia and non-dementia groups is important. This study proposes policies for improving the LTCI system in terms of nutritional management and the utilization of community resources.

Keywords: malnutrition; long-term care; dementia; aged

INTRODUCTION

The rapid aging of the population significantly affects the prevalence of dementia. The prevalence of dementia has increased from 8.4% in 2008 [1] to 10.4% by the end of 2021 [2]. Malnutrition is one of the most serious health issues among older adults with dementia as it affects their physical and mental health and can even be a major cause of mortality [3, 4]. Additionally, dementia impairs the ability to perform essential tasks required for food intake, leading to eating behavior disorders, such as refusal to open the mouth, spitting out food, or inability to swallow [5]. Different malnutrition patterns have been observed with dementia progression. In the early stages, weight loss and reduced food intake are common; however, as dementia symptoms progress, various problems related to food intake emerge, such as increased or decreased food intake, changes in meal frequency, and alterations in dietary habits [6].

Numerous studies have reported malnutrition among older adults with dementia. Most studies have examined the prevalence of malnutrition and related factors in older adults with dementia residing in nursing homes or long-term care facilities [3, 6-9]. In a study by Meijers *et al.* [7] of 75,399 care home residents aged 65 years and older, the proportion of malnutrition in the dementia group was significantly higher (20.5%) than that in the non-dementia group (15.2%). Korean studies on malnutrition among older adults with dementia receiving long-term care have largely focused on those living in institutional settings. According to Hyun & Oh [3], among 140 elderly individuals with dementia residing in three nursing facilities in Chungnam, the proportion of high-risk malnutrition was high at 60.0% (84 individuals), which was related to sex, long-term care grade, physical function, eating behavior disorders, and cognitive function. Bae *et al.* [6] confirmed that older women with dementia in long-term care facilities in Incheon had significantly lower intake levels of key nutrients, including energy, carbohydrates, fats, and proteins, than those in older women with dementia who used day and night care facilities. This emphasizes the need for systematic nutritional management in welfare facilities for older adults. Thus, most studies on malnutrition in older adults with dementia receiving long-term care have been conducted in institutional settings, with relatively little research on those residing in the community.

According to the 2022 Long-Term Care Survey, among 4,423 long-term care insurance (LTCI) beneficiaries, 54.4% had dementia [10]. Examining the proportion of dementia across different types of LTCI services, 82.1% of nursing home residents, 80.7% of residents in shared living homes, 71.2% of day and night care users, and 42.0% of home-visit care users reported having dementia. Although the dementia rate among LTCI recipients residing in the community is lower than that in nursing homes, it remains high at 42.0% to 71.2%, underscoring the need for attention to their nutritional and meal management [10].

Recently, many countries of the Organization for Economic Co-operation and Development have implemented community-based care models to enable individuals with dementia to live independently within their communities for as long as possible [11]. These models help older adults with dementia to remain in their homes and maintain social relationships through community interactions. Various countries have set policy directions to promote community care and delay institutionalization in those with dementia. Korea's 4th Comprehensive Plan for Dementia Management (2021–2025) also emphasizes enabling patients with dementia to remain comfortable in familiar surroundings, with various initiatives introduced to support this objective [12]. To support older adults with dementia receiving long-term care while living at home, maintaining their health and functional status is essential.

Nutritional issues are an important factor affecting the quality of life, not only for older adults with dementia but also for those without dementia receiving long-term care [13, 14]. Studies examining the nutritional status of LTCI recipients residing in the community demonstrate that malnutrition prevalence varies from 16.7% to 45.3% [15, 16]. Given these findings, to support aging in place for elderly individuals receiving long-term care, policies need to be developed to help them maintain a proper nutritional status. As older adults with and without dementia differ in their communication ability, cognitive function, and behavioral issues [17], it is necessary to examine the factors associated with malnutrition status in each group to develop effective nutrition manage-

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ment policies.

This study aimed to explore factors associated with malnutrition in community-dwelling older adults with and without dementia who receive long-term care. These findings provide a basis for developing nutrition management policies tailored to LTCI beneficiaries living at home.

The specific research objectives are as follows: First, we aimed to identify the nutritional status of community-dwelling older adults with and without dementia who were LTCI recipients according to their sociodemographic characteristics, health, and functional status. Second, we aimed to identify the factors related to malnutrition in these groups.

METHODS

Ethics statement

Written informed consent was obtained from all participants. The study protocol was approved by the Institutional Review Board of National Health Insurance Services (approval number: 연-2021-HR-06-054).

1. Study design

This cross-sectional descriptive and analytical study aimed to identify nutritional status based on sociodemographic characteristics and health and functional status, including identifying factors related to malnutrition in older adults with and without dementia receiving long-term care in community settings. This study was in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines (https://www.strobe-statement.org/).

2. Study subjects and period

The study subjects were all home care beneficiaries who applied for integrated home care services from October 2021 to December 15, 2021 and completed a comprehensive needs assessment at 11 institutions participating in the Integrated Home Care Service Pilot Project II using convenience sampling. Eleven institutions are located in Seoul, Gyeonggi-do, Gangwon-do, Gyeongsangnam-do, Gyeongsangbuk-do, Busan, Jeju-do, Chungcheongnam-do, and Jeollabuk-do. A total of 314 home care beneficiaries completed a needs assessment at each institution. Of these, 311 were included in the final analysis, after excluding three participants whose height and weight could not be measured because they were bedridden. Of the 311 participants, there were 203 older adults with dementia, and 108 had no dementia.

3. Data collection

This study used data from the "Evaluation of the integrated care model in community care settings under Korean long term care insurance system" [18]. Case managers (social workers or nurses) participating in integrated home care agencies conducted the survey using needs assessment records. The surveys were conducted through one-on-one interviews either at home or at an agency. The survey period was from October 1, 2021 to February 4, 2022.

4. Survey instruments

The survey instrument used was a needs assessment record for the comprehensive evaluation of home care beneficiaries collected in the "Evaluation of the integrated care model in community care settings under Korean long term care insurance system" [18]. In this study, the variables used are as follows: Dementia status was defined as responding "yes" to dementia in the disease characteristics domain of the needs assessment record under the item for diseases or symptoms lasting 3 months or longer.

The general characteristic variables included sex, age, long-term care grade, education level, household type, comorbidities, daily living patterns, and falls. Sex was coded as "male = 0," "female = 1," and age was categorized as "under 75 = 0," "75 to under 85 = 1," "85 and over = 2." Long-term care grade was categorized as "grade 1–2 = 1," "grade 3 = 2," "grade 4 = 3," "grade 5 = 4," and education level was categorized as "less than elementary school graduation = 0," "elementary school graduation to less than middle school graduation = 1," "middle school graduation to less than high school graduation = 2," "high school graduation or higher = 3." Household type was categorized as "living with family (living with children or other family members) = 1," "elderly couple (living with spouse) = 2," "living alone = 3." Comorbidities such as stroke (cerebral infarction), Parkinson's

disease, depression, hypertension, and diabetes were coded as "absent = 0," "present = 1." Daily living patterns were categorized as "spends most of the day in bed or lying down = 1," "spends most of the day sitting = 2," and "lives while engaging in appropriate activities = 3." Fall experience in the past 3 months was coded as "no = 0" and "yes = 1."

Nutritional status was assessed using the Mini-Nutritional Assessment (MNA) score. The Korean version of the MNA, developed by the Swiss Nestlé Research Institute and the University Hospital of Tours, France, was translated by Lee [19]. The MNA consists of 18 items on physical measurements and dietary habits, with a score range of 0–33 points. Nutritional status was classified as malnourished for scores below 17, at risk of malnutrition for scores 17–23.5, and normal nutritional status for scores 24 and above. In this study, the analysis was conducted by dividing into two groups: "normal + at risk of malnutrition" and "malnourished."

Functional status variables included Korean Activities of Daily Living (K-ADL), Korean Instrumental Activities of Daily Living (K-IADL), Korean Mini Mental State Examination-2 (K-MMSE-2), Short Form of Geriatric Depression Scale-Korean version (SGDS-K), and Neuropsychiatric Inventory-Questionnaire (NPI-Q) scores. The K-ADL tool developed by Won *et al.* [20] measures seven items, including dressing, face washing, bathing, eating, transferring, toileting, and continence, on a scale from "completely independent = 1 point" to "completely dependent = 3 points." The score range was 7–21 points, with higher scores indicating a lower functional status. The Cronbach's α coefficient of the tool at the time of development was 0.937, and in this study, it was 0.901. The K-IADL tool, developed by Won *et al.* [21], consists of 10 items. Seven items, including grooming, housework, meal preparation, laundry, short-distance outings, money management, and taking medication, were measured on a scale from "completely independent = 1 point" to "completely dependent = 3 points." Three items, including using transportation, shopping, and using the telephone, had an additional 4-point scale of "cannot do at all = 4 points." For four items, including housework, meal preparation, laundry, and money management, zero points were given for "does not perform." The score range is 6–33 points, with higher scores indicating a higher dependence on daily living. The Cronbach's α coefficient of the tool at the time of development was 0.935, and in this study, it was 0.916. The K-MMSE-2 developed by Kang *et al.* [22] was used, utilizing a standard test form (blue form). The test items consisted of three items for memory registration: five for temporal orientation, five for spatial orientation, three for memory recall, five for attention and calculation, five for language, and one for drawing, with a score range of 0–30 points. Lower scores indicated decreased cognitive function. The Cronbach's α coefficient of the tool at the time of development was 0.680, and in this study, it was 0.923. The SGDS-K used by Cho *et al.* [23] includes 15 questions on emotional discomfort, negative thoughts, physical weakness, cognitive dysfunction, and decreased social interest and activity. Each item was measured as "yes = 1 point," "no = 0 point," with a score range of 0–15 points. Higher scores indicate more severe depressive symptoms. In this study, scores were categorized as "normal" for < 6 points and "depressive symptoms present" for 6 points or more [24]. The Cronbach's α coefficient of the tool at the time of development was 0.890, and in this study, it was 0.909. The NPI-Q developed by Kaufer *et al.* [25] and translated into Korean by the Korean Association for Geriatric Psychiatry [26] was used in this study. The NPI-Q surveys the severity of symptoms and family burden of 12 neuropsychiatric behaviors over the past month, targeting families of patients with dementia. For each neuropsychiatric behavior, severity was measured as "no severity = 0 points," "mild = 1 point," "moderate = 2 points," and "severe = 3 points," and burden was measured on a 5-point scale from "very mild = 1 point" to "very severe = 5 points." The total score was calculated by multiplying the severity and burden with a score range of 0–180 points. Higher scores indicated more severe neuropsychiatric behaviors. The Cronbach's α coefficient was 0.884.

Health status variables included the number of medications taken, number of nursing treatments, medical use in the past 3 months, and subjective health status. The number of medications taken was the total number of medications (prescription and over-the-counter drugs) taken in the past 3 days, excluding medications taken without a doctor's prescription. The number of

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nursing treatments was calculated by assigning "not provided = 0" and "provided = 1" for 12 items, including tracheostomy care, suctioning, oxygen therapy, pressure ulcer care, tube feeding, pain management, urinary management, ostomy care, dialysis care, diabetic foot care, enema, and insulin therapy [27]. In the past 3 months, medical use was assessed by whether the participant had experienced an acute hospital admission, emergency room visit, outpatient clinic visit, or family member visit on behalf of the participant. The frequency was categorized as "not used = 0" if the frequency was 0 and "used = 1" if the frequency was 1 or more. Subjective health status was surveyed on a 5-point scale from "very good = 1" to "very poor = 5" and categorized as "good (very good + good)," "moderate," and "poor (poor + very poor)" [28].

5. Statistical analysis

First, a descriptive statistical analysis was conducted to evaluate the frequency, percentage, mean, and standard deviation to understand the socio-demographic characteristics, health, functional status, and nutritional status of the study participants. Second, independent *t*-tests or Fisher's exact tests were conducted to determine differences in nutritional status according to general characteristics, health, and functional status. Third, to identify factors related to malnutrition in both groups of older adults with and without dementia, logistic regression analysis was performed by assigning "0" for normal or at risk of malnutrition and "1" for malnourishment. Variables that showed a statistically significant relationship with nutritional status in the univariate analysis of socio-demographic, health, and functional status characteristics for each group of older adults with and without dementia were selected using the stepwise method. The independent variables used in the final analysis model included the household type; living pattern; K-ADL, SGDS-K, and NPI-Q for the dementia group; and K-ADL, SGDS-K, and K-MMSE-2 for the non-dementia group. Sex and age were adjusted for in the final analyses. Statistical analyses were conducted using SAS 9.4 (SAS Institute).

RESULTS

1. General characteristics and nutritional status

This study analyzed the nutritional status of 311 participants categorized into older adults with dementia (n = 203) and without dementia (n = 108) (Table 1). Among those with dementia, 6.9% had a good nutritional status, 59.6% were at risk of malnutrition, and 33.5% were malnourished. Among those without dementia, 15.7% had good nutritional status, 57.4% were at risk of malnutrition, and 26.9% were malnourished.

The prevalence of malnutrition was higher among female in both groups (38.6% in those with dementia and 28.1% in those without dementia); however, this difference was only statistically significant in the dementia group ($P = 0.006$). Regarding age, the highest malnutrition rate (34.9%) was observed in the 75–84 year age group for those with dementia, while for those without dementia, it was the highest in the 85+ year age group ($P = 0.025$, $P = 0.044$). In both groups, malnutrition rates increased with higher long-term care grades ($P < 0.001$ and $P = 0.001$, respectively). Education levels demonstrated different patterns; among those with dementia, the highest malnutrition rate (41.9%) was in those with less than elementary school education ($P = 0.038$), whereas for those without dementia, it was the highest (30.8%) among middle school graduates ($P = 0.005$).

In terms of family structure, those living with their families had the highest malnutrition rates in both groups (47.9% and 28.1%, respectively); however, this was statistically significant only in the dementia group ($P = 0.001$). Living style was significant only for the dementia group, with those spending most of the day in bed showing higher malnutrition rates (54.1%; $P < 0.001$). Falls in the past 3 months were associated with higher malnutrition rates (48.4%) in the dementia group ($P = 0.028$).

2. Health, functional status, and nutritional status

Analysis of health and functional status (Table 2) indicated that both groups had significantly higher K-ADL scores (indicating lower functionality) in the malnourished group than in those with a good nutritional status or those at risk of malnutrition ($P < 0.001$ for the dementia group, $P = 0.005$ for the non-dementia group). Similar patterns were noted for the K-IADL scores ($P <$

Table 1. Nutritional status by general characteristics of the study participants

Variable	Dementia (n = 203)		x^2	*P*-value	Non-dementia (n = 108)		x^2	*P*-value
	Normal or at risk of malnutrition	Malnutrition			Normal or at risk of malnutrition	Malnutrition		
Total	135 (66.5)	68 (33.5)	-	-	79 (73.1)	29 (26.9)	-	-
Sex			5.98	0.006			0.39	0.194
Male	46 (79.2)	12 (20.7)			15 (78.9)	4 (21.1)		
Female	89 (61.4)	56 (38.6)			64 (71.9)	25 (28.1)		
Age (year)			-	0.025[1)]			-	0.044[1)]
< 75	9 (75.0)	3 (25.0)			8 (80.0)	2 (20.0)		
75–84	54 (65.1)	29 (34.9)			33 (75.0)	11 (25.0)		
≥ 85	72 (66.7)	36 (33.3)			38 (70.4)	16 (29.6)		
Long-term care grade			27.18	< 0.001			-	0.001[1)]
Grades 1–2	1 (9.1)	10 (90.9)			1 (25.0)	3 (75.0)		
Grade 3	27 (56.3)	21 (43.8)			26 (65.0)	14 (35.0)		
Grade 4	64 (68.1)	30 (31.9)			47 (79.7)	12 (20.3)		
Grade 5	43 (86.0)	7 (14.0)			5 (100)	0 (0.0)		
Education			8.42	0.038			-	0.005[1)]
Less than elementary school graduation	61 (58.1)	44 (41.9)			41 (69.5)	18 (30.5)		
Elementary school graduation	43 (79.6)	11 (20.4)			22 (84.6)	4 (15.4)		
Middle school graduation	11 (78.6)	3 (21.4)			9 (69.2)	4 (30.8)		
More than high school graduation	20 (66.7)	10 (33.3)			7 (70.0)	3 (30.0)		
Family structure			13.54	0.001			0.24	0.887
Living with family	37 (52.1)	34 (47.9)			23 (71.9)	9 (28.1)		
Living with a spouse only	33 (64.7)	18 (35.3)			17 (77.3)	5 (22.7)		
Living alone	65 (80.2)	16 (19.8)			39 (72.2)	15 (27.8)		
Disease								
Stroke (paralysis, cerebral infarction)			0.12	0.139			1.63	0.098
Yes	25 (64.1)	14 (35.9)			20 (83.3)	4 (16.7)		
No	110 (67.1)	54 (32.9)			59 (70.2)	25 (29.8)		
Parkinson's disease			0.62	0.176			-	0.256[1)]
Yes	11 (61.1)	7 (38.9)			10 (76.9)	3 (23.1)		
No	124 (67.0)	61 (33.0)			69 (72.6)	26 (27.4)		
High blood pressure			0.31	0.102			6.86	0.006
Yes	77 (68.1)	36 (31.9)			49 (83.1)	10 (17.0)		
No	58 (64.4)	32 (35.6)			29 (60.4)	19 (39.6)		
Diabetes			0.81	0.091			0.67	0.195
Yes	30 (61.2)	19 (38.8)			17 (70.8)	7 (29.2)		
No	105 (68.2)	49 (31.8)			61 (73.5)	22 (26.5)		
Style of living			33.22	< 0.001			3.45	0.178
Spending nearly all day in bed	28 (45.9)	33 (54.1)			19 (67.9)	9 (32.1)		
Spending many hours a day sitting on a chair	52 (62.7)	31 (37.4)			35 (68.6)	16 (31.4)		
Spending a day doing daily activities	55 (94.8)	3 (5.2)			25 (86.2)	4 (13.8)		
Falls in the past 3 months			3.64	0.028			0.05	0.203
Yes	16 (51.6)	15 (48.4)			18 (75.0)	6 (25.0)		
No	119 (69.2)	53 (30.8)			61 (72.6)	23 (27.4)		

n (%).
[1)]Fisher's exact test.

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Table 2. Nutritional status by health and functional status of the study participants

Variable	Dementia (n = 203)		x^2/t	*P*-value	Non-dementia (n = 108)		x^2/t	*P*-value
	Normal or at risk of malnutrition	Malnutrition			Normal or at risk of malnutrition	Malnutrition		
Physical function								
K-ADL	11.8 ± 3.0	15.6 ± 3.1	−8.58	< 0.001	11.2 ± 3.3	13.7 ± 4.1	−3.00	0.005
K-IADL	20.5 ± 5.1	25.2 ± 5.3	−6.12	< 0.001	19.3 ± 4.6	21.6 ± 5.4	−2.17	0.032
Depression			6.71	0.005			8.91	0.002
≥ 6 points (feeling depressed)	37 (54.4)	31 (45.6)			29 (59.2)	20 (40.8)		
< 6 points (normal)	98 (72.6)	37 (27.4)			50 (84.7)	9 (15.3)		
K-MMSE-2[1)]	15.7 ± 6.2	12.1 ± 5.7	3.66	0.001	20.4 ± 5.9	16.8 ± 6.2	2.73	0.008
NPI-Q	16.8 ± 23.5	34.9 ± 34.9	−3.86	0.001	-	-	-	-
No. of medications	5.3 ± 3.6	5.4 ± 3.6	−0.22	0.830	5.1 ± 3.6	4.9 ± 5.3	0.20	0.845
No. of nursing treatments[1)]	0.9 ± 0.6	1.1 ± 0.8	−2.01	0.047	0.9 ± 0.4	1.3 ± 0.8	−2.30	0.028
Medical use in the past 3 months								
Acute hospital admission			-	0.102[2)]			-	0.319[2)]
Yes	4 (44.4)	5 (55.6)			4 (66.7)	2 (33.3)		
No	131 (67.5)	63 (32.5)			75 (73.5)	27 (26.5)		
Emergency room visit			-	0.040[2)]			-	0.233[2)]
Yes	1 (20.0)	4 (80.0)			2 (50.0)	2 (50.0)		
No	134 (67.7)	64 (32.3)			77 (74.0)	27 (26.0)		
Out-patient clinic visit			0.03	0.863			2.15	0.143
Yes	89 (66.9)	44 (33.1)			53 (77.9)	15 (22.1)		
No	46 (65.7)	24 (34.3)			26 (84.4)	14 (35.0)		
Instead of the recipients, family members' out-patient clinic visit			0.16	0.691			2.92	0.088
Yes	40 (64.5)	22 (35.5)			27 (84.4)	5 (15.6)		
No	95 (67.4)	46 (32.6)			52 (68.4)	24 (31.6)		
Subjective health status[3)]			17.88	0.001			5.69	0.058
Good	29 (96.7)	1 (3.3)			11 (91.7)	1 (8.3)		
Average	49 (70.0)	21 (30.0)			23 (79.3)	6 (20.7)		
Bad	27 (51.9)	25 (48.1)			34 (61.8)	21 (38.2)		

n (%) or Mean ± SD.
K-ADL, Korean Activities of Daily Living; K-IADL, Korean Instrumental Activities of Daily Living; K-MMSE-2, Korean Mini Mental State Examination-2; NPI-Q, Neuropsychiatric Inventory-Questionnaire.
[1)]Exclude nonresponse 22 persons (n = 289).
[2)]Fisher's exact test.
[3)]Exclude nonresponse 1 person (n = 310).

0.001, $P = 0.032$). Depression (SGDS-K score ≥ 6) was associated with higher malnutrition rates in both groups ($P = 0.005$, $P = 0.002$).

Cognitive function (K-MMSE-2) scores were significantly lower in the malnourished subgroup of both groups ($P = 0.001$ and $P = 0.008$, respectively). Neuropsychiatric symptoms (NPI-Q) were significantly higher in the malnourished subgroup, but only in those with dementia ($P = 0.001$).

In the past 2 weeks, the number of nursing interventions was significantly higher in the malnourished subgroups in both groups ($P = 0.047$, $P = 0.028$). Emergency room visits in the past 3 months were associated with nutritional status only in the dementia group ($P = 0.040$). Subjective health status was significantly related to nutritional status only in the dementia group ($P = 0.001$), with poorer perceived health associated with higher malnutrition rates.

3. Factors associated with malnutrition in community-dwelling older adults with and without dementia

Logistic regression model (Table 3) indicated that family structure, K-ADL, and NPI-Q scores were significantly associated with malnutrition in older adults with dementia. Those living with family were 3.81 times more likely to be malnourished than those living alone (P = 0.031). Each point increase in the K-ADL score was associated with a 1.35 times higher risk of malnutrition (P < 0.001), and each point increase in the NPI-Q score was associated with a 1.02 times higher risk of malnutrition (P = 0.005). For older adults without dementia, K-ADL and SGDS-K scores were significant factors. Each point increase in the K-ADL score was associated with a 1.20 times higher risk of malnutrition (P = 0.011). Those with depression (SGDS-K score ≥ 6) were 2.84 times more likely to be malnourished than those without depression (P = 0.042).

DISCUSSION

This study aimed to examine the nutritional status and associated factors among community-dwelling older adults with and without dementia who are recipients of LTCI to provide foundational data for developing nutritional management policies for home care recipients.

The study findings revealed that 33.5% of elderly individuals with dementia and 26.9% of those without dementia who received long-term care in community settings were malnourished. While the paucity of domestic research reporting malnutrition rates based on dementia status renders comparative discussions challenging, our findings and those of other studies underscore the critical need for nutritional management among long-term care recipients residing in communities. Yoon *et al.* [16] reported that 43.5% of long-term care recipients using home visit services were malnourished. Bang & Kim [29] found that the average Nutrition Quotient for the Elderly score for individuals with mild dementia using day care centers was 38.78, which is categorized as "low." Additionally, Cho *et al.* [15] utilized the MNA on 4,872 long-term care recipients in 2022 and reported that 16.7% of them were malnourished. Collectively, these findings highlight the importance of nutritional management in community LTCI recipients. Consequently, there is a pressing need to develop and implement more proactive nutritional management policies not only for elderly care facilities but also for long-term care recipients in community settings.

Multivariate analysis showed that household composition, activities of daily living (ADL), and neuropsychiatric symptoms were significantly associated with mal-

Table 3. Factors associated with malnutrition in demented and non-demented elderly residing in the community

Variable	Dementia (n = 203)	*P*-value	Non-dementia (n = 108)	*P*-value
Family structure				
Living with family	3.81 (1.50–9.66)	0.031	-	-
Living with a spouse only	2.33 (0.82–6.63)	0.710	-	-
Living alone	Ref.			
Style of living				
Spending nearly all day in bed	5.35 (1.26–22.67)	0.074	-	-
Spending many hours a day sitting on a chair	4.93 (1.26–19.36)	0.090	-	-
Spending a day doing daily activities	Ref.			
K-ADL	1.35 (1.17–1.55)	< 0.001	1.20 (1.04–1.39)	0.011
Depression				
≥ 6 points (feeling depressed)	2.20 (0.97–4.99)	0.060	2.84 (1.04–7.74)	0.042
< 6 points (normal)	Ref.		Ref.	
K-MMSE-2	-	-	0.94 (0.87–1.02)	0.162
NPI-Q	1.02 (1.01–1.03)	0.005	-	-

Adjusted odds ratio (95% confidence interval).
K-ADL, Korean Activities of Daily Living; K-MMSE-2, Korean-Mini Mental State Examination-2; NPI-Q, Korean Neuropsychiatric Inventory Questionnaire adjusted by sex and age group.

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nutrition among older adults with dementia. For those without dementia, ADL and depression were significant factors. These findings corroborate with those of previous domestic and international studies [3, 4, 7, 14, 30] that identified ADL and depression as critical factors for malnutrition in older adults. Functional limitations can hinder the ability of older adults to maintain a healthy diet, making them more vulnerable to inadequate nutritional intake and management [31]. Recent research in Japan has demonstrated a link between higher dietary vitamin C intake and lower depression symptoms in older adults [32]. Vitamin C is known to regulate catecholaminergic activity, reduce stress reactivity, anxiety, and prolactin secretion, improve vascular function, and decrease oxytocin secretion [33].

While household composition was not identified as a relevant factor for the non-dementia-afflicted elderly, the finding of this study that elderly individuals with dementia living with family members, such as sons or daughters, have a significantly higher risk of malnutrition (3.81-fold higher) than those living alone warrants careful consideration. This result contrasts with the findings of Yim & Lee [34], who reported significantly higher rates of poor nutritional intake among elderly individuals aged 65 years or older living alone in community settings. Although the LTCI system does not consider household composition when determining the types of home care benefits, many government or local authority-run elderly health and welfare services utilize living alone or as an elderly couple, along with income level, as the primary criteria for eligibility [35]. Consequently, elderly individuals who do not live alone or as elderly couples may be excluded from essential daily living support services such as free meal assistance and dietary support. Thus, nutritional support and other nutritional management services for elderly individuals in community-based long-term care, especially those with dementia, should be provided, regardless of household composition. This study found that 90.3% of elderly individuals with dementia living with family members resided with adult children such as sons, daughters, or sons. Given these findings, older adults with dementia living with adult children who are actively engaged in socioeconomic activities may require more proactive support. However, this study was cross-sectional; therefore, we could not determine whether elderly individuals began living with their adult children due to poor nutritional status, highlighting a limitation in establishing a causal relationship. Furthermore, we confirmed that managing neuropsychiatric symptoms is crucial for preventing malnutrition and maintaining adequate nutritional status among elderly individuals with dementia, as opposed to elderly individuals without dementia. This aligns with previous research indicating that dementia can lead to eating behavior disorders [5], which in turn contribute to malnutrition [3]. Conversely, this study found no significant association between cognitive function and malnutrition among elderly individuals with and without dementia, which differs from previous research on institutionalized elderly individuals with dementia [3]. In this study, the average cognitive function scores of elderly individuals with dementia corresponded to severe cognitive impairment, regardless of nutritional status, suggesting that the severity of neuropsychiatric symptoms, rather than cognitive function, may influence malnutrition. Although previous studies have reported that elderly individuals in communities with impaired cognitive function have poorer nutritional status and intake than those with normal cognitive function [36, 37], these findings primarily identify correlations or group differences, limiting the ability to explain the independent association between cognitive function and malnutrition. In this study, while univariate analysis indicated a significant association between cognitive function scores and nutritional status among the elderly without dementia, multivariate logistic regression analysis, considering various characteristics of the participants, showed that declines in physical and psychological functioning, such as daily living performance and depression, were more strongly related to malnutrition than cognitive function.

In contrast to previous studies [7, 34] that reported female sex, advanced age, and low educational level as factors related to poor nutritional intake in the general older adult population, our study found no independent associations between these characteristics and malnutrition status in either the dementia or non-dementia group. While univariate analysis demonstrated statistically significant differences in malnutrition rates based on general characteristics such as sex, age (75

and older), and education level, these factors lost statistical significance in the multivariate logistic regression analysis when considering ADL, depression, cognitive function, and neuropsychiatric symptoms. These results indicate that strategies to prevent and manage malnutrition in community-dwelling older adults receiving LTCI should address their physical, psychological, and cognitive functional status rather than focus solely on general demographic characteristics as in the general older population.

Furthermore, our study found no statistically significant associations between malnutrition and disease characteristics, medical service utilization, or subjective health status in community-dwelling older adults with or without dementia. While the limited domestic research renders it challenging to fully discuss these findings, our results differ from those of a previous study [30] that identified subjective health status as a significant factor in nutritional risk among older adults receiving home-delivered meals at community welfare centers. However, our findings align with those of previous research [3], which reported no association between the number of medications and malnutrition status in institutionalized patients with dementia. The KANAGAWA-AICHI Disabled Elderly Cohort study in Japan [14] found significant associations between malnutrition in community-dwelling older adults with disabilities and factors such as cognitive impairment, ADL, use of home medical care and home help services, recent hospitalizations, and dysphagia.

Based on these research findings, we propose the following policy recommendations for the nutritional management of community-dwelling older adults with and without dementia who are receiving LTCI: First, we incorporate systematic nutritional assessment and management into long-term care planning for home care recipients, along with evaluations of physical function, emotional state, and cognitive function. Given the high rates of malnutrition in both the dementia and non-dementia groups, nutrition should be considered a core aspect of care, regardless of dementia status. Although current evaluations of home care institutions encourage annual needs assessments, including nutritional status [38], the lack of specific nutritional assessment tools and malnutrition diagnostic guidelines limits effective nutritional management planning. Collaborative efforts from academic, practical, and policy sectors are necessary to develop and implement applicable nutritional assessment tools.

Second, it is necessary to consider placing nutrition management specialists in home care institutions. Currently, in these institutions, there are no mandatory staffing requirements for dietitians. Kwon *et al.* [39] found that 85.1% of day care centers lacked dietitians compared to 53.2% of home welfare facilities for the elderly [40]. However, it is noteworthy that 106 out of 710 daycare centers (14.1%) that were not required to employ dietitians did so voluntarily. It would be valuable to examine the reasons for hiring dietitians including their employment status and working conditions to derive relevant insights. Additionally, nutrition management specialists should be employed in home-based services, such as home-visit care and home-visit nursing.

Furthermore, it is important to establish a connection between daycare centers and other home-based long-term care institutions without dietitians and Social Welfare Meal Service Management Support Centers. These centers regularly visit small social welfare facilities with fewer than 50 individuals and no dietitians to assist with the hygiene management of meal preparation facilities, provide tailored meal plans and cooking methods according to health conditions, and offer nutritional education. This ensures that vulnerable populations, such as the elderly and individuals with disabilities, receive safe, nutritionally balanced meals [41].

In 2023, the Ministry of Food and Drug Safety established 68 Social Welfare Meal Service Management Support Centers nationwide following the implementation of the "Act on Supporting Meal Safety in Social Welfare Facilities" and plans to expand them to all local districts by 2026. It is recommended that a system be created in which home-based long-term care institutions can provide professional meal and nutrition management services through the support and collaboration of Social Welfare Meal Service Management Support Centers installed at the district level, even if dietitians are not on site.

Third, developing new services for nutritional management of home care recipients is necessary. Currently, there are no dedicated benefits related to meals or

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nutrition for home care recipients in the LTCI system. Consequently, the 2022 Long-Term Care Survey [10] found that families caring for home care recipients identified "meal and nutrition management services" as a critical additional service for supporting community living, consistent with the 2019 survey [42]. The need for these services was higher among male family caregivers, recipients aged 80 and above, and those with LTCI grades 3 and below. Surveys of home care recipients using home-visit care services indicate a need for dietary management, condition-appropriate meals, nutritional counseling, and nutrition education [16]. In Japan, the LTCI system offers a home care benefit called "home care management guidance" for nutritional management, which involves home visits by professionals to assess an individual's physical and mental condition and provide care management and guidance [43]. The development of similar meals and nutrition management services tailored for community-dwelling older adults with and without dementia should be considered.

Fourth, it is necessary to establish a system that allows LTCI recipients to access nutrition-related community health and welfare services. Current elderly care services provide meal management as part of daily life support services, and free meal services are available for low-income, homebound elderly individuals at risk of skipping meals [35]. However, these services primarily target low-income groups and elderly living alone, while LTCI recipients are excluded because of potential overlap. Expanding eligibility to include older adults who need meal management services could provide a broader safety net, with costs allocated based on an individual's financial capacity.

Limitations

This study has some limitations. First, as the study was conducted on recipients registered in the Integrated Home Care Service Pilot Project II using non-random sampling, the generalizability of the results remains limited. Second, the study did not include variables related to oral health, mastication, or swallowing, which are closely linked to the nutritional status of LTCI recipients. Addressing malnutrition in older adults receiving LTCI is essential for maintaining their health and functional status, as well as for ensuring the sustainability of the LTCI system. Future research should utilize representative sampling designs and include a wider range of variables to identify the factors associated with malnutrition in community-dwelling older adults receiving LTCI.

Conclusion

This study highlights the need for nutritional management among community-dwelling older adults receiving LTCI services regardless of their dementia status. Based on the research findings, we propose the following recommendations: inclusion of nutritional management as a core component in the case management for LTCI home care recipients, placement of nutrition management specialists within home care institutions or establishment of linkages with social welfare meal management support centers, development of new LTCI services dedicated to meal and nutrition management, and establishment of systems enabling LTCI home care recipients to access community health and welfare services focused on nutrition.

CONFLICT OF INTEREST

There are no financial or other issues that might lead to a conflict of interest.

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DATA AVAILABILITY

The participants in this study did not provide written consent for their data to be shared publicly; therefore, due to the sensitive nature of the research, supporting data are not available.

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