Research Square

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Initial outpatient clinical characteristics associated with subsequent conversion from mild cognitive impairment to dementia: a retrospective exploratory study

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Abstract

Background

Mild cognitive impairment (MCI) may progress to dementia, and identifying clinical features at the initial visit may help inform early support and prevention. This study aimed to explore initial-visit clinical characteristics associated with subsequent conversion to dementia in patients with MCI.

Methods

This retrospective exploratory study included patients diagnosed with MCI at their initial visit to a university hospital dementia outpatient clinic between 2012 and 2021. Patients were classified into converter and non-converter groups. To reduce potential misclassification related to unequal follow-up duration, only patients whose follow-up exceeded the median time to dementia conversion among converters were included in the non-converter group. Supplementary analyses using alternative definitions of the non-converter group were also conducted to examine the influence of follow-up duration on the findings. Data were obtained from medical records. Groups were compared using the Mann–Whitney U test and Fisher's exact test.

Results

Among 277 patients diagnosed with MCI at the initial visit, 28 converted to dementia during follow-up, with a median time to conversion of 497 days. For the main analysis, 30 patients whose follow-up exceeded this median time were included in the non-converter group. At the initial visit, converters were older, reported fewer subjective memory complaints, and showed lower independence in instrumental activities of daily living (e.g., "cooking and eating" and "money management") than the non-converters. They also had higher Functional Assessment Staging scores and lower Mini-Mental State Examination and Addenbrooke's Cognitive Examination-□ scores, particularly in memory, attention, and verbal fluency. Behavioral and psychological symptoms of dementia did not differ significantly between groups. In supplementary analyses, subjective memory complaints, "cooking and eating", and Functional Assessment Staging scores showed relatively consistent between-group differences.

Conclusions

Some clinical characteristics associated with subsequent conversion to dementia may already be detectable at the initial visit through routinely collected outpatient data. These findings may provide useful information for clinical assessment, follow-up planning, and supportive care in patients with MCI.

Background

Dementia is a growing global public health concern. According to the World Health Organization (WHO), it currently affects approximately 55 million people worldwide, and this number could nearly triple by 2050 [1]. Several modifiable risk factors have been associated with dementia [2], highlighting the importance of early preventive interventions.

Mild cognitive impairment (MCI) is a clinical condition characterized by cognitive decline greater than expected for an individual's age and education level while largely preserving general functional independence and not meeting the criteria for dementia [3, 4]. Initial descriptions of MCI focused primarily on memory impairment [5]; however, the concept has since evolved to include decline across multiple cognitive domains [3, 4]. While MCI may progress to dementia, some individuals remain stable or even improve. Therefore, accurate assessment at the MCI stage and timely intervention may be important for preventing or delaying progression to dementia.

In clinical practice, primary care physicians often refer patients with suspected MCI to specialist dementia clinics or university hospitals for comprehensive cognitive assessment. In particular, university hospitals play an important role in differential diagnosis and detailed evaluation [6]. As tertiary care centers, they generally provide specialized assessment for complex or high-risk cases. Specialist memory clinics, which are often located in university hospitals, are recommended in existing guidelines as key services for the comprehensive assessment and risk evaluation of cognitive disorders [7]. Thus, dementia clinics at university hospitals often receive patients with higher-risk or diagnostically complex presentations.

However, for patients with MCI, those who do not require active intervention often transition to follow-up care within community healthcare services after the initial visit, or return only when symptoms worsen. Patients with MCI may have difficulty maintaining regular clinic attendance, particularly compared with those with mild-to-moderate dementia, and continuous follow-up in specialist clinics can also be challenging [8]. Meanwhile, general practitioners frequently report limited time, training, and confidence in detecting and managing MCI in routine primary care settings, representing an additional barrier to sustained follow-up [9]. Therefore, care models that emphasize ongoing monitoring and management within community and primary care services, with specialist clinics providing consultation and support for complex or uncertain cases, have recently been recommended [10].

Within this clinical framework, accurately assessing patients at the initial visit and providing information on lifestyle modification and community resource utilization may be important for those transitioning from university hospitals to community-based care. Therefore, identifying initial-visit characteristics associated with later conversion to dementia in patients with MCI may be clinically useful for early nursing support and follow-up planning. Accordingly, this study aimed to explore initial-visit clinical characteristics associated with subsequent conversion to dementia in patients with MCI.

Methods

Study design and participants

This retrospective exploratory study included patients diagnosed with MCI at their initial visit to a university hospital dementia outpatient clinic between 2012 and 2021. Those who were diagnosed with conditions other than MCI (e.g., dementia or age-related cognitive changes) at the initial diagnostic evaluation were excluded.

Data collection

Data were collected from medical records. Patients' characteristics were investigated using the following 18 variables: age, sex, follow-up duration, body mass index (BMI), education, medical history (hypertension, dyslipidemia, and diabetes), subjective memory complaints, exercise habits, hobbies, alcohol, smoking, instrumental activities of daily living (IADLs; cooking and eating, toileting, bathing, dressing, and money management), behavioral and psychological symptoms of dementia (BPSD) severity, and neuropsychological test scores (Functional Assessment Staging [FAST], Mini-Mental State Examination [MMSE], Alzheimer's Disease Assessment Scale [ADAS], Addenbrooke's Cognitive Examination-III [ACE-III]).

BPSD

BPSD was assessed using Abe's BPSD score, which includes the following 10 items: wandering in/outside home, eating or toilet problem, delusion or hallucination, offensive and abusive words, day–night reversal, excitation and agitation, apathy and indifference, depressive and gloomy mood, violent force, and high irritability [11]. Each item is rated on a four-point scale ranging from 1 ("rarely") to 4 ("frequently"). In our study, we categorized each item as "No" (score = 1), "Yes" (score = 2–4), and "unknown" (no recorded response).

FAST

Developed by Reisberg et al. in the 1980s, FAST is a functional staging tool evaluating Alzheimer's disease (AD) progression according to declines in memory and daily functioning. It consists of seven stages: 1, normal adult; 2, normal aged adult; 3, compatible with incipient AD; 4, mild AD; 5, moderate AD; 6, moderately severe AD; and 7, severe AD [12]. Stage 3 generally reflects MCI clinical presentation [13].

MMSE

MMSE is a cognitive function test comprising 11 items (time orientation, place orientation, immediate and delayed recall of three words, calculation, object naming, sentence repetition, three-step verbal commands, writing commands, sentence writing, and figure copying), with 30 points as the maximum

possible score [14]. A score of 23 or less indicates suspected dementia, whereas a score of 27 or less indicates suspected MCI.

ADAS-J cog

ADAS is an assessment scale used for evaluating the severity of AD-induced cognitive and noncognitive functional impairment, ranging from mild to severe. This scale has 11 items: word recall task, spoken language ability, language comprehension, word finding difficulty, commands, object/finger naming, constructional praxis, ideational praxis, orientation, word recognition, and test instruction recall. The maximum possible score is 70 points, with higher scores indicating more severe cognitive impairment [15].

ACE-□

The ACE-III assesses 19 activities related to five cognitive domains (attention, memory, verbal fluency, language, and visuospatial function); its maximum possible score is 100 points, with a higher score indicating better function [16].

Statistical analysis

Participants were classified into two groups according to clinical outcomes during follow-up: the non-converter and converter groups. To reduce potential misclassification related to unequal follow-up duration, we restricted non-converters to patients whose follow-up exceeded the median time to dementia diagnosis among converters. Additionally, the influence of follow-up duration on the findings was examined by conducting supplementary analyses using alternative definitions of the non-converter group: (1) all non-converters, and (2) patients whose follow-up exceeded the first or third quartile of time to dementia diagnosis among converters.

Normality was assessed using the Shapiro–Wilk test. Because data were not normally distributed, we used the Mann–Whitney *U* test for continuous variables and Fisher's exact test for categorical variables. All statistical analyses were performed using EZR, and a two-sided p value < 0.05 was considered statistically significant.

Ethics approval

This study used existing information from medical records in a retrospective chart review. To protect patient confidentiality, all the data were de-identified and coded prior to analysis. Given the retrospective nature of the study, the requirement for written informed consent was waived. Information about this study was posted on the hospital's website to provide an opportunity for patients to opt out; contact information was also provided for those who wished to decline participation. The study was approved by the Ethics Review Committee of the Graduate School of Medicine, Chiba University (Approval Number: M10230; approved on May 1, 2024).

This study exclusively used existing information from medical records for a retrospective chart review. To ensure patient anonymity during the analysis, we de-identified and coded all data. Given the study's retrospective nature, written informed consent requirement was waived. Information about this study was posted on the hospital's website to provide an opportunity for patients to opt out; contact information was also provided for those who wished to decline participation. The study was approved by the Ethics Review Committee of the Graduate School of Medicine, Chiba University (Approval Number: M10230; approved on May 1, 2024).

This study used only existing information from medical records and was conducted as a retrospective chart review. To ensure patient anonymity during the analysis, we de-identified and coded all data. Due to the retrospective nature of the study, the requirement for written informed consent was waived. Information about this study was posted on the hospital's website to provide an opportunity for patients to opt out, and contact information was provided for those who wished to decline participation. The study was approved by the Ethics Review Committee of the Graduate School of Medicine, Chiba University (Approval Number: M10230; approved on May 1, 2024).

Results

At the initial visit, 277 patients were diagnosed with MCI, of whom 28 progressed to dementia during follow-up. In the converter group, the median time from initial visit to dementia diagnosis was 497 (range, 248.5–786.0) days. Patients whose follow-up duration exceeded 497 days were included in the non-converter group for the main analysis, resulting in 30 patients (Fig. 1).

[Figure 1 here]

Participant characteristics

Table 1 shows the patients' characteristics at the initial visit, comparing the non-converter and converter groups. The converter group was significantly older and had a significantly lower BMI than the non-converter group. Subjective memory complaints were significantly more frequent in the non-converter group. Furthermore, significantly more participants in the non-converter group were independent in IADLs such as "cooking and eating" and "money management" than those in the converter group.

Table 1
Characteristics at the initial visit in the converter and non-converter groups

Age		**Converter** (***n*** **= 28)**		**Non-converter** (***n*** **= 30)**		***p*** **values**
		75.0	**(72.0–80.3)**	**72.0**	**(66.3–76.5)**	**0.016**
Sex	Male	11	(39.3)	15	(50.0)	0.441
	Female	17	(60.7)	15	(50.0)	
Follow-up duration		497.0	(248.5–786.0)	948.5	(717.5–1,472.5)	**< 0.001**
BMI		20.8	(19.2–22.3)	22.2	(20.4–23.6)	**0.048**
Education (year)		12	(12.0–14.3)	12	(12.0–16.0)	0.159
Medical history						
Hypertension		15	(53.6)	8	(26.7)	0.059
Dyslipidemia		11	(39.3)	11	(36.7)	1.000
Diabetes		7	(25.0)	10	(33.3)	0.570
Subjective memory complaints						**0.003**
	Yes	9	(32.1)	14	(46.7)	
	No	8	(28.6)	0	(0.0)	
	Unknown	11	(39.3)	16	(53.3)	
Social activities	Yes	15	(53.6)	18	(60.0)	0.364
	No	10	(35.7)	6	(20.0)	
	Unknown	3	(10.7)	6	(20.0)	
Exercise habits	Yes	15	(53.6)	18	(60.0)	0.778
	No	9	(32.1)	9	(30.0)	
	Unknown	4	(14.3)	3	(10.0)	
Hobbies	Yes	18	(64.2)	18	(60.0)	1.000
	No	5	(17.9)	4	(13.3)	

Data are presented as *n* (%) or median (interquartile range), as appropriate. Continuous and categorical variables were compared using the Mann–Whitney *U* test and Fisher's exact test, respectively. Bold values indicate $p < 0.05$.

Age		Converter (*n* = 28)		Non-converter (*n* = 30)		*p* values
		75.0	**(72.0–80.3)**	**72.0**	**(66.3–76.5)**	**0.016**
	Unknown	5	(17.9)	8	(26.7)	
Alcohol	Yes	12	(44.4)	12	(40.0)	0.781
	No	12	(44.4)	16	(53.3)	
	Unknown	4	(11.2)	2	(6.7)	
Smoke	Yes	1	(3.6)	6	(20.0)	0.102
	No	25	(89.3)	22	(73.3)	
	Unknown	2	(7.1)	2	(6.7)	
IADL independence						
Cooking and eating		11	(39.3)	24	(80.0)	**0.001**
Toileting		21	(75.0)	24	(80.0)	0.698
Bathing		18	(64.3)	24	(80.0)	0.167
Dressing		23	(82.1)	24	(80.0)	1.000
Money management		13	(46.4)	21	(70.0)	**0.040**

Data are presented as *n* (%) or median (interquartile range), as appropriate. Continuous and categorical variables were compared using the Mann–Whitney *U* test and Fisher's exact test, respectively. Bold values indicate $p < 0.05$.

[Table 1 here]

In the supplementary analyses, the overall direction of the differences was consistent with that of the main analysis, although the variables reaching statistical significance varied depending on the definition of the non-converter group. In the analysis including all non-converters, significant differences were observed for BMI, subjective memory complaints, the IADL items "cooking and eating" and "bathing" (Additional file 1: Table S1). With the first-quartile follow-up threshold, BMI, subjective memory complaints, smoking, "cooking and eating" and "bathing" were significantly different between groups. With the third-quartile threshold, age, follow-up duration, subjective memory complaints, social participation, and "cooking and eating" remained significantly different (Additional file 1: Table S2). Subjective memory complaints and "cooking and eating" remained significant across multiple supplementary analyses.

BPSD severity

Table 2 shows the prevalence and severity of BPSD, comparing the non-converter and converter groups. None of the BPSD items showed significant differences.

Table 2
Prevalence of BPSD at the initial visit in the converter and non-converter groups

Wandering in/outside home	**Converter (*n* = 28)**		**Non-converter (*n* = 30)**		***p* values**
					0.473
Yes	0	(0.0)	0	(0.0)	
No	25	(89.3)	24	(80.0)	
Unknown	3	(10.7)	6	(20.0)	
Eating or toilet problem					0.477
Yes	0	(0.0)	2	(6.7)	
No	25	(89.3)	23	(76.7)	
Unknown	3	(10.7)	5	(16.7)	
Delusion or hallucination					0.640
Yes	4	(14.8)	2	(6.7)	
No	20	(71.4)	22	(73.3)	
Unknown	4	(14.3)	6	(20.0)	
Offensive and abusive words					0.441
Yes	10	(35.7)	15	(50.0)	
No	15	(53.6)	11	(36.7)	
Unknown	3	(10.7)	4	(13.3)	
Day–night reversal					0.830
Yes	4	(14.3)	3	(10.0)	
No	21	(75.0)	22	(73.3)	
Unknown	3	(10.7)	5	(16.7)	
Excitation and agitation					1.000
Yes	4	(13.3)	4	(13.3)	
No	21	(75.0)	22	(73.3)	
Unknown	3	(10.7)	4	(13.3)	
Data are presented as *n* (%). Fisher's exact test. *$p < 0.05$					

Wandering in/outside home	Converter (*n* = 28)		Non-converter (*n* = 30)		*p* values
					0.473
Apathy and indifference					0.934
Yes	14	(50.0)	16	(53.3)	
No	11	(39.3)	10	(33.3)	
Unknown	3	(10.7)	4	(13.3)	
Depressive and gloomy mood					0.632
Yes	9	(32.1)	13	(43.3)	
No	15	(53.6)	13	(43.3)	
Unknown	4	(14.3)	4	(13.3)	
Violent force					1.000
Yes	1	(3.6)	2	(6.7)	
No	23	(82.1)	24	(80.0)	
Unknown	4	(14.3)	4	(13.3)	
High irritability					0.274
Yes	7	(25.0)	13	(43.3)	
No	18	(64.3)	13	(43.3)	
Unknown	3	(10.7)	4	(13.3)	
Data are presented as *n* (%). Fisher's exact test. *$p < 0.05$					

[Table 2 here]

Consistent with the main analysis, none of the BPSD variables differed significantly between groups in the supplementary analyses (Additional file 1: Tables S3 and S4).

Neuropsychological test scores

The neuropsychological test scores in the main analysis are shown in Table 3. FAST and ADAS scores were significantly lower in non-converters, whereas MMSE scores were significantly higher in non-converters. For the ACE-III subdomains of memory, attention, verbal fluency, as well as the total score were significantly higher in non-converters.

Table 3
Neuropsychological test scores at the initial visit in the non-converter and converter groups

FAST		Converter (*n* = 28)		Non-converter (*n* = 30)		*p* value
		3.0	**(2.0–3.0)**	**2.0**	**(1.0–2.0)**	**0.010**
MMSE		26.0	(24.8–27.0)	28.0	(27.0–29.0)	**< 0.001**
ADAS		11.0	(8.0–13.4)	6.7	(5.0–8.7)	**< 0.001**
ACE-III	Memory	11.0	(8.0–15.0)	17.5	(12.8–22.0)	**0.010**
	Language	26.0	(24.0–26.0)	26.0	(25.0–26.0)	0.761
	Visuospatial Function	15.0	(14.0–16.0)	16.0	(13.8–16.0)	0.467
	Attention	15.0	(15.0–17.0)	17.5	(17.0–18.0)	**0.004**
	Verbal fluency	7.0	(7.0–8.0)	10.0	(8.8–12.0)	**0.007**
	Total score	75.0	(71.0–79.0)	84.0	(80.8–91.3)	**0.002**

Data are presented as median (interquartile range). Mann–Whitney U test.

Bold values indicate $p < 0.05$.

In the supplementary analyses, the overall direction of the differences was consistent with that of the main analysis, although the variables reaching statistical significance varied depending on the definition of the non-converter group. In the analysis including all non-converters, FAST scores were significantly lower in non-converters. With the first-quartile follow-up threshold, FAST and ADAS scores were significantly lower, whereas MMSE and the ACE-III attention, verbal fluency, and total scores were significantly higher in non-converters. With the third-quartile threshold, FAST and ADAS scores were significantly lower, whereas MMSE and the ACE-III memory, attention, verbal fluency, and total scores were significantly higher in non-converters (Additional file 1: Tables S5 and S6). FAST remained significant across all supplementary analyses, whereas ADAS, MMSE, and several ACE-III measures showed significant differences only under the quartile-based follow-up thresholds.

Discussion

Using information collected at the initial outpatient visit, this study explored clinical characteristics associated with subsequent conversion to dementia in patients diagnosed with MCI. In the main analysis, the non-converter group was restricted to patients whose follow-up exceeded the median time to dementia diagnosis among converters to reduce potential misclassification related to unequal follow-up duration. Supplementary analyses using alternative definitions of the non-converter group showed generally similar directions of association. These findings suggest that the observed group differences

may reflect clinical characteristics already present at the initial visit rather than being explained solely by differences in follow-up duration.

Regarding the initial-visit characteristics, the converter group was significantly older than the non-converter group in the main analysis. Age has consistently been identified as an important risk factor for dementia progression [17]. In this study, the association with age was not observed when broader definitions of the non-converter group were used, such as including all non-converters or those exceeding only the first-quartile follow-up threshold. One possible explanation is that these broader definitions may have included patients with relatively short follow-up who might later have converted to dementia, thereby attenuating the age difference between groups. This finding suggests that the association with age may become more apparent when the non-converter group is defined more strictly. Furthermore, although the median BMI in the converter group was not particularly low (median: 20.8 [19.2–22.3] kg/m^2), it was significantly lower than that in the non-converter group. Low BMI or weight loss in older age has been associated with an increased risk of developing dementia [18]. Our findings were broadly consistent with this pattern. However, this association was not observed when the non-converter group was restricted using the third-quartile follow-up threshold. BMI can reflect multiple factors beyond cognitive status, including nutritional condition and general physical health. This suggests that the association with BMI may be sensitive to how strictly sustained non-conversion is defined and to the composition of the non-converter group. Because the associations for both age and BMI were not consistent across all supplementary analyses, both findings should be interpreted cautiously.

Subjective memory complaints were significantly more frequent in the non-converter group than in the converter group. Subjective cognitive concerns are often a major reason for seeking evaluation [19], and individuals reporting memory complaints tend to use healthcare services more frequently [20]. Thus, one possible explanation is that subjective memory complaints increase attention to perceived cognitive change and promote help-seeking behavior, including medical consultation. Another possible explanation is reduced insight or self-awareness of cognitive decline in individuals who later converted to dementia. Previous studies have suggested that impaired metacognitive awareness may already be present in patients with MCI who subsequently convert to Alzheimer’s disease, potentially limiting their ability to recognize and report early cognitive changes [21]. In the present study, the higher frequency of subjective memory complaints in the non-converter group may therefore reflect both greater help-seeking behavior and better awareness of cognitive decline. This between-group difference also remained significant across the supplementary analyses, suggesting that subjective memory complaints may represent a relatively robust distinguishing characteristic between converters and non-converters at the initial visit.

In contrast, no significant between-group differences were observed for social activities, hobbies, or exercise habits. Previous studies have suggested that higher levels of physical activity are associated with a reduced risk of cognitive decline and dementia [22], and that multidomain lifestyle interventions, including exercise, diet, and cognitive training, may help maintain cognitive function, particularly among

older adults with subjective memory complaints [23]. However, the present results did not show significant differences in these variables at the initial visit. This may suggest that these behaviors, as assessed at the initial visit, were less clearly associated with group differences than subjective awareness of cognitive change. From a clinical perspective, these findings may have implications for early supportive care in patients with MCI at the initial outpatient visit. For patients who report subjective memory complaints, support may include helping them articulate their perceived symptoms to better understand their condition, recommending personalized and concrete lifestyle modifications to maintain cognitive function, and, when appropriate, introducing relevant social resources. For patients without subjective memory complaints, direct questioning alone may be insufficient because some individuals may already show reduced insight into their condition even at the MCI stage [24]. In such cases, approaches that promote awareness indirectly, such as collaboratively reviewing daily activities rather than providing direct confrontation, may be more appropriate. Recommending dementia-preventive behaviors as part of general health promotion and involving family members or other support networks when appropriate may also be helpful.

Regarding IADLs, independence in “cooking and eating” and “money management” was significantly more frequent in the non-converter group than in the converter group in the main analysis. IADL decline can be observed from the MCI stage, and previous studies have suggested that impairments in complex daily activities may be associated with later progression to dementia [25]. In the present study, the finding for “cooking and eating” was also observed across the supplementary analyses, suggesting that subtle difficulties in this domain may already be present at the initial visit in patients who later converted to dementia. Patients frequently reported specific difficulties related to cooking behaviors, such as having stopped cooking or having a limited variety of meals, whereas appetite and basic eating behaviors were largely preserved. These observations suggest that impairment in “cooking and eating” may reflect early decline in complex functional abilities rather than more global impairment in basic activities. “Money management,” like “cooking and eating,” is also a complex IADL that requires multiple cognitive processes. However, unlike “cooking and eating,” its association was not consistently observed across the supplementary analyses. One possible explanation is that money management may be more strongly influenced by premorbid role distribution, lifestyle, and family support, making it more sensitive to how the non-converter group was defined. In addition, “bathing” showed significant between-group differences in some supplementary analyses. These findings suggest that functional differences may already be present at the initial visit, but the specific IADL items associated with later conversion may vary depending on how the non-converter group was defined. Therefore, the significance of individual IADL items should be interpreted cautiously and regarded as exploratory. Taken together, subtle changes in IADL at the initial visit may warrant careful assessment in patients with MCI.

The severity of BPSD did not differ significantly between the two groups. Previous studies have shown that neuropsychiatric symptoms in MCI are generally mild and less frequent and less severe than in dementia [26]. A recent systematic review and meta-analysis also suggested that the overall severity of neuropsychiatric symptoms in MCI has limited and inconsistent predictive value for progression to dementia [27]. No significant between-group differences in BPSD were observed in the supplementary

analyses either. These findings may reflect the fact that all participants were diagnosed with MCI at the initial visit, when behavioral and psychological symptoms may not yet be sufficiently prominent to distinguish later converters from non-converters. At this stage, subtle declines in neuropsychological performance and complex IADLs may be more informative than overt behavioral changes such as BPSD.

Regarding neuropsychological test scores, the converter group had a significantly higher median FAST score than the non-converter group (3.0 vs. 2.0). According to the FAST classification, stage 2 corresponds to “normal aged adult,” whereas stage 3 is described as “compatible to incipient AD” [12]. Stage 3 is close to the clinical profile of MCI and represents a stage of evident functional decline when performing complex tasks. In the present study, the proportion of participants who were independent in “cooking and eating” or “money management” was also significantly lower in the converter group. These findings may suggest that the converter group had already shown subtle functional decline in complex daily activities at the initial visit. This between-group difference in FAST also remained significant in the supplementary analyses, suggesting that global functional staging at the initial visit may represent a relatively robust distinguishing characteristic between converters and non-converters. Additionally, MMSE scores were higher in the non-converter group than in the converter group (28 vs. 26). Scores around 26 on the MMSE have been regarded as a borderline range indicating early cognitive decline [28]. Therefore, cognitive impairment in the converter group may already have been subtle but detectable at the initial visit. On the ACE-III, the non-converter group scored significantly higher on the total score and on the memory, attention, and verbal fluency subdomains. The ACE-III was originally developed to detect early AD [16]. Therefore, the converter group may have already exhibited neuropsychological patterns characteristic of early AD at the initial visit. However, these between-group differences in MMSE, total ACE-III score, and ACE-III subdomains were not retained in the sensitivity analysis. These findings should therefore be interpreted cautiously and regarded as exploratory.

Overall, the supplementary analyses suggested that not all findings were equally stable across different definitions of the non-converter group. Subjective memory complaints, FAST, and the IADL item “cooking and eating” showed relatively consistent between-group differences across analyses, whereas findings for BMI, other individual IADL items, and some cognitive test measures varied depending on the follow-up definition used. These results suggest that some characteristics observed at the initial visit may represent relatively robust group differences, while others should be interpreted more cautiously as exploratory findings. Taken together, these findings may be consistent with current views of dementia progression, in which changes in subjective awareness and subtle functional or cognitive decline can emerge during the MCI stage before overt dementia becomes clinically apparent [21].

Importantly, the neuropsychological tests examined in this study are routinely used in clinical practice for the assessment of MCI. Thus, a key implication of this study is that information obtained through routine clinical assessments may help inform decisions about closer follow-up and supportive care without increasing testing burden. In particular, subtle changes in complex IADLs, such as cooking behaviors and money management, may be difficult for patients to recognize themselves. Therefore, obtaining information from family members and asking specific questions about daily activities may help detect

subtle functional decline. Integrating neuropsychological test results with IADL information may support early supportive approaches, including lifestyle guidance and referral to social resources, and may also be useful in outpatient nursing assessment.

This study has several limitations. First, it was a retrospective chart review conducted at a single institution, and the available data were limited to information routinely documented in clinical practice. Therefore, the findings may not be fully generalizable to other settings or populations. Second, follow-up duration was limited. Although the non-converter group was restricted to patients whose follow-up exceeded the median time to dementia diagnosis among converters in order to reduce potential misclassification, some patients classified as non-converters may have converted to dementia during longer follow-up. Thus, the non-converter group in the present study may not fully represent long-term stable MCI. Third, this was an exploratory study based primarily on univariate analyses, which limited the ability to adjust fully for potential confounding factors. Therefore, the findings should be interpreted cautiously and regarded as hypothesis-generating. Larger prospective studies with longer follow-up and more comprehensive multivariable analyses are needed. Nevertheless, because all variables were obtained during the routine initial outpatient assessment, the present approach may still be clinically feasible for the early evaluation of patients with MCI and may provide clinically useful information for initial assessment and follow-up planning.

Conclusions

This study compared the initial clinical characteristics of patients diagnosed with MCI who later converted to dementia with those who remained free of dementia during longer follow-up. Significant between-group differences were observed in several initial-visit characteristics, including subjective memory complaints, selected IADL items, and neuropsychological test scores, although some findings were less consistent across supplementary analyses. These results suggest that subtle cognitive and functional differences may already be present at the initial visit in some patients who later converted to dementia. Because these indicators are routinely obtained during outpatient assessment, they may provide clinically useful information for follow-up planning and supportive care without increasing testing burden. In outpatient nursing practice, attention to subjective awareness, changes in complex IADLs, and neuropsychological test performance may support early supportive interventions, including lifestyle guidance and referral to appropriate resources.

Abbreviations

ACE-III	Addenbrooke's Cognitive Examination-III
AD	Alzheimer's disease
ADAS	Alzheimer's Disease Assessment Scale
ADL	Activities of daily living
BMI	Body mass index
BPSD	Behavioral and psychological symptoms of dementia
FAST	Functional Assessment Staging; FAST
IADL	Instrumental activities of daily living
MCI	Mild cognitive impairment
MMSE	Mini-Mental State Examination

Declarations

- **Ethics approval and consent to participate**

The study was conducted in accordance with the principles of the Declaration of Helsinki and ethical approval was obtained from the Ethics Review Committee of the Graduate School of Medicine, Chiba University (Approval Number: M10230, approved on 1 May 2024).

Due to the retrospective nature of the study, the requirement for written informed consent was waived. Information about this study was posted on the hospital's website to provide an opportunity for patients to opt out, and contact information was provided for those who wished to decline participation.

- **Consent for publication**

Not applicable.

- **Availability of data and materials**

The datasets analysed during the current study are not publicly available due to ethical and privacy restrictions related to the use of clinical data, but are available from the corresponding author on reasonable request.

- **Competing interests**

The authors declare that they have no competing interests.

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- **Authors' contributions**

NA, MO, AM and AA conceived and designed the study. NA, MO, and AM acquired the data. NA and MO analyzed and interpreted the data. NA and MO drafted the manuscript. SH and AA supervised the study. All authors read and approved the final manuscript.

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Figures

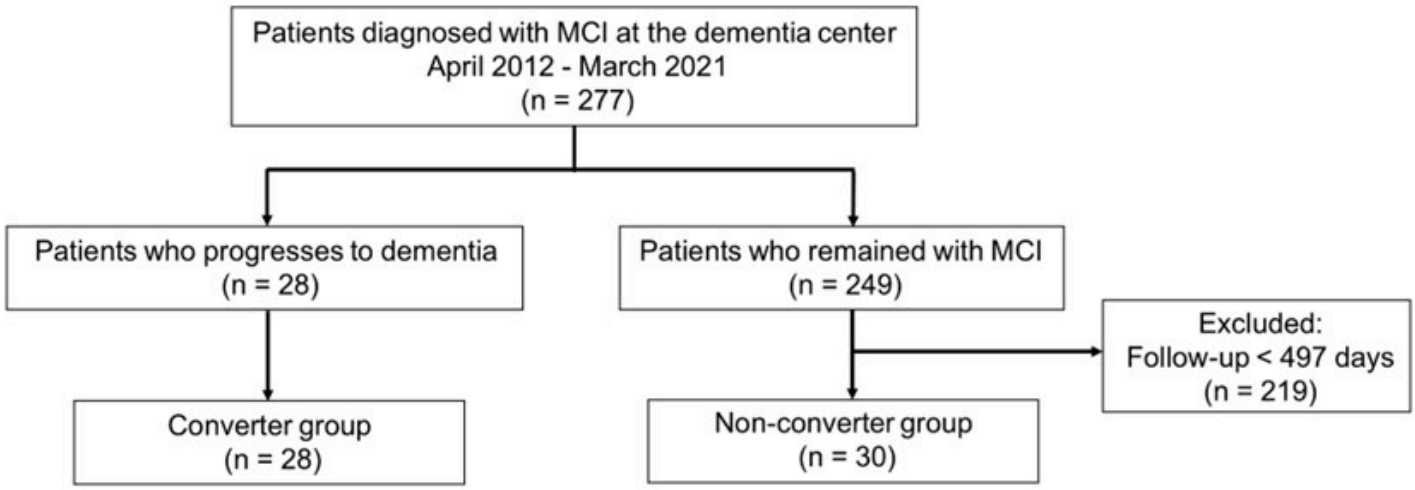


Figure 1

Flow diagram of patient selection

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