

Retrospective Study

Cognitive training for elderly patients with early Alzheimer's disease in the Qinghai-Tibet Plateau: A pilot study

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Abstract

BACKGROUND

Alzheimer's disease (AD) influences the social and economic quality of life of older adult patients and their families.

AIM

To explore the efficacy of cognitive training in clinical nursing for patients with early AD residing in the plateau area.

METHODS

This pilot study was conducted in patients with early AD treated in the Geriatric Department of the Qinghai Provincial People's Hospital between August 2019 and March 2021. The patients were divided into a cognitive training group and a conventional nursing group using the random number table method. Patients in the conventional nursing group received conventional nursing, whereas the patients in the cognitive training group received the new nursing intervention. The mini-mental state examination (MMSE) and activities of daily living (ADL) scales were used to compare the cognitive ability and daily activities, respectively, between the two groups before and after the intervention.

RESULTS

Sixty patients were enrolled in this study, with 30 patients in the cognitive training group and conventional nursing group, respectively. The MMSE and ADL scores were significantly higher in the cognitive training group than in the conventional nursing group after the intervention (MMSE: 25.11 ± 2.02 vs 22.26 ± 1.23 , $P = 0.032$; ADL: 68.72 ± 4.86 vs 60.16 ± 2.27 , $P = 0.018$).

CONCLUSION

The application of cognitive training in clinical nursing for patients with early AD could improve both their cognitive ability and ADL. This method could be applied in clinical practice to manage cognitive dysfunction in patients with early AD.

Key Words: Alzheimer's disease; Cognitive dysfunction; Cognitive neuroscience; Neurodegenerative diseases; Nursing

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Core Tip: Alzheimer's disease (AD) is the most common cause of cognitive dysfunction in the elderly. Cognitive training in clinical nursing could improve both the cognitive ability and activities of daily living for patients with early AD. This study integrated six original cognitive rehabilitation tools, including episodic memory, executive function, working memory, processing speed, speech ability and reasoning judgment, into a comprehensive training platform in the plateau area, carried out a standardized intervention for pre-clinical AD patients, and verified the effectiveness of the intervention through cognitive behavior, daily living ability and other indicators. This localized cognitive rehabilitation program and multi-dimensional efficacy evaluation method have important innovative significance.

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INTRODUCTION

Alzheimer's disease (AD) is a slowly progressing, irreversible neurodegenerative disease[1]. The major manifestations of this disease include a decline in cognitive ability, neuropsychiatric symptoms, and a decrease in activities of daily living (ADL). AD is the most common cause of cognitive dysfunction in the elderly, and the stage of dementia can range from years to decades. Drug therapies have little effect after the appearance of clinical manifestations[2,3]. The inevitable disease progression to dementia results in a heavy burden for both the medical system and society[4].

Extensive research has been carried out on interventions to delay cognitive dysfunction and dementia in early AD during the last five years. Studies have demonstrated the efficacy of cognitive intervention for the maintenance and enhancement of cognitive abilities in both neurologically healthy older adults and patients with early AD[5,6]. Zhu *et al*[7] demonstrated that cognitive training such as mental nursing, memory training, orientation training, exercises for intellect, training of logical thinking ability, finger movement training and training of ADL could significantly improve the cognitive ability of patients. Chen *et al*[8] found that the cognitive functions in patients with mild cognitive impairment (MCI) in a community were improved after 1-year of interventional therapy such as regular education, memory training, healthy living habits, and psychological therapy.

However, standardized methods and processes of cognitive intervention are still unavailable. In the present study, we aimed to evaluate the efficacy of a scientific, systematic, and multidimensional cognitive training by integrating six cognitive domains, including episodic memory, executive function, working memory, attention processing, verbal ability, and inferring capability, in the nursing of older patients with early AD in China. This method is based on the theories of cognitive neuroscience and cognitive psychology, the main cognitive areas that are damaged during AD progression, and the clinical manifestations and features of cognitive impairment in patients.

MATERIALS AND METHODS

Subjects

The present study was conducted in consecutive patients with early AD treated in the Geriatric Department of the Qinghai Provincial People's Hospital between August 2019 and March 2021. The inclusion criteria were as follows: (1) Patients with MCI confirmed using the mini-mental state examination (MMSE) scale[9], disease course > 3 mo, and basic comprehension and execution capabilities; (2) Patients aged between 50 and 80 years and those with reported slow memory loss that did not influence the ADL; (3) Patients with slight cognitive impairment according to the clinical dementia rating (CDR) scale (CDR = 0.5)[10]; and (4) Patients habituated to and experienced in using

electronic products, such as smartphones or computers, independently. The MCI criteria in patients with different educational levels are variable, which are as follows: 18–21 points for illiteracy, 21–24 points for primary school, and 25–27 points for middle or high school. Patients with other disease-induced somatopathy, depression, risk factors for stroke, cerebral trauma, drug or alcohol intoxication, or psychiatric diseases were excluded from the study. The included patients were divided into the conventional nursing group and the cognitive training group, with 30 patients in each group, using a random number table. This study was approved by the Ethics Committee of the Qinghai Provincial People's Hospital (IRB_A_0007_2019002, Date: 05-25-2019), and written informed consent was obtained from each patient or their family.

Intervention

To identify the patients with cognitive impairments, a complete clinical cognition assessment comprising basic information and the Alzheimer's Disease Assessment Scale–Cognitive section assessment of all the patients was performed on the Electronic Management Platform for Brain Health by trained medical staff. The patients were then informed of the training items, and the informed consents were signed after they completely understood the study processes.

An application for cognitive rehabilitation training was installed on the smartphone or iPad of the patients in the cognitive training group, a training account was registered, and the detailed methods of rehabilitation training were explained. For training, 1 wk was considered as 1 cycle, in which the patients were scheduled to receive training in six major cognitive areas, including episodic memory, executive function, working memory, attention processing, verbal ability, and inferring capability every other day. Each cycle consisted of four training days and one training of each of the six items using tools for the training of episodic memory, executive function, working memory, attention processing, verbal ability, and inferring capability. Each training session lasted approximately 1 h, and at least 16 h of training was performed for each patient every month. The training strategy was adjusted by trained administrators every month according to the inclusion time and training performances of the patients. A WeChat group was established for brain health cognitive training, uniform management, consequent feedback and communication. Additionally, the trained medical staff also managed the groups, with one worker responsible for 4–5 patients. These medical staff acted as the training assistants for timely surveillance and feedback of the training.

Conventional nursing, which included care of daily living, safety nursing, mental nursing, disease condition observation, and health education, was administered to the patients in the conventional nursing group. For diet nursing, the swallowing and chewing capabilities and oral hygiene status were assessed in all the patients. Then, specific diet guidance was provided according to the comorbidities of these patients. Patients requiring nasogastric feeding were given nursing education on the use of a nasogastric feeding tube and preventive nursing of complications.

Outcomes

The attending physician who received specific training evaluated the patients before and after 20 wk of cognitive training. The evaluations performed by the physician were as follows: (1) MMSE evaluation: MMSE is the most commonly used screening scale for cognitive impairment of AD because it is convenient and not influenced by age, socioeconomic status, and education levels. The MMSE mainly evaluates the orientation, memory, attention, calculation, recall, and linguistic capabilities on the basis of 11 items, and the maximum score is 30; and (2) ADL evaluation: The ADL scale is mainly used for the evaluation of daily living activities of patients. It comprises 10 items, and the scores range from 0 to 100 points, with points ≤ 40 indicating high dependence, 41–60 indicating moderate dependence, 61–99 indicating slight dependence, and 100 indicating independence.

Statistical analysis

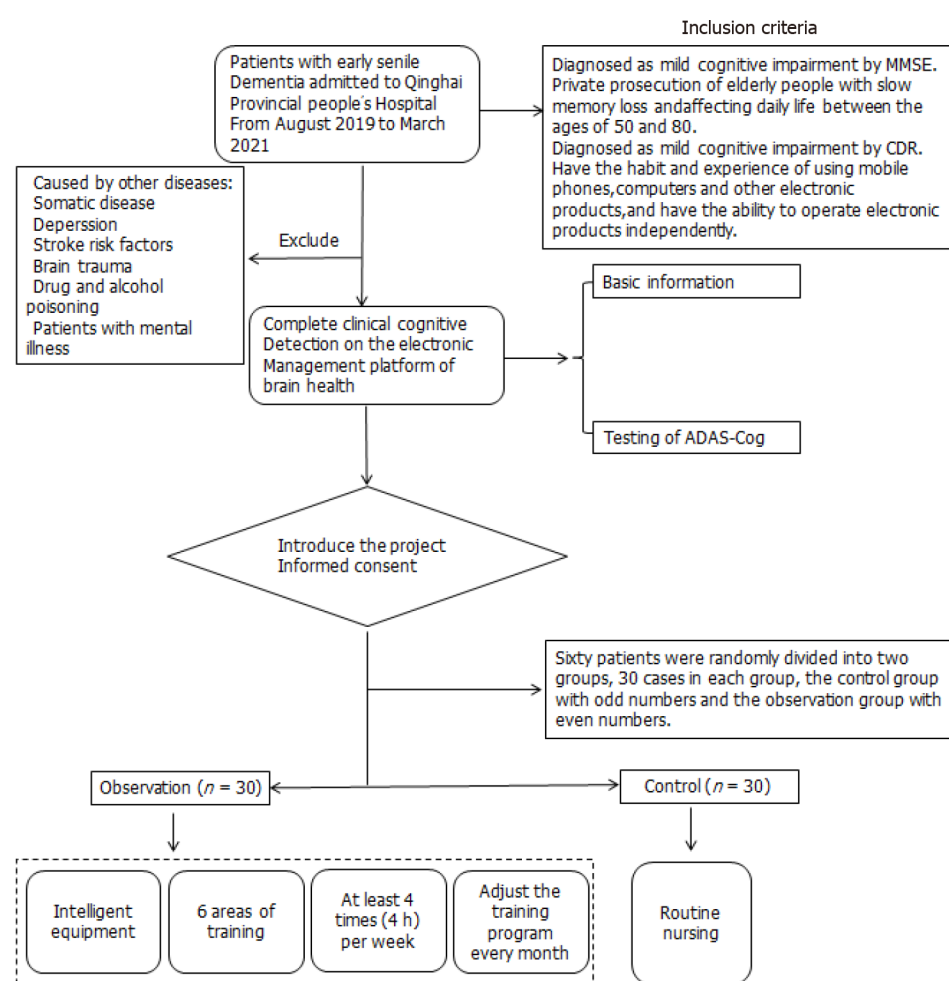
All data were analyzed using SPSS 22.0 software (IBM Corp., Armonk, NY, United States). Quantitative data were expressed as means and standard deviations, and the *t*-test was used to compare differences between the two groups. A *P* value of < 0.05 was considered statistically significant ($n = 60$; the conventional nursing group $n = 30$ and the cognitive training group $n = 30$).

RESULTS

Figure 1 shows the flowchart of patient enrollment. There were 60 patients enrolled in this study, with 30 patients in the cognitive training group and conventional nursing group, respectively. There were 19 men and 11 women in the conventional nursing group, and 16 men and 14 women in the cognitive training group. There was no statistically significant difference in the ages of patients in the cognitive training and conventional nursing groups (63.24 ± 2.62 years, 62.75 ± 2.64 years, respectively, $P = 0.612$). Differences in the baseline characteristics, including sex, education level, and hyperlipidemia, between the two groups were nonsignificant (Table 1).

Table 1 Baseline characteristics of the patients

Characteristics	Cognitive training group (n = 30)	Conventional nursing group (n = 30)	P value
Age (yr)	63.24 ± 2.62	62.75 ± 2.64	0.612
Sex (M/F)	16/14	19/11	0.601
Hypertension	9	7	0.771
Diabetes	11	13	0.792
Hyperlipidemia	7	5	0.714
Educational level			0.584
Illiteracy	4	3	
Primary school	12	16	
Secondary school or above	14	11	



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Figure 1 Flow chart of patient enrollment. CDR: Clinical dementia rating.

The baseline MMSE and ADL scores were not significantly different between the two groups. However, the MMSE and ADL scores were significantly better in the cognitive training group than in the conventional nursing group after the cognitive training intervention (MMSE: 25.11 ± 2.02 vs 22.26 ± 1.23 , $P = 0.032$; ADL: 68.72 ± 4.86 vs 60.16 ± 2.27 , $P = 0.018$) (Table 2).

Table 2 Comparison of cognitive ability and activities of daily living of the patients between the cognitive training and conventional nursing groups after the intervention

Scores (mean $\pm$ SD)	Cognitive training group (n = 30)	Conventional nursing group (n = 30)	P value
MMSE score	25.11 $\pm$ 2.02	22.26 $\pm$ 1.23	0.032
ADL score	68.72 $\pm$ 4.86	60.16 $\pm$ 2.27	0.018

MMSE: Mini-mental state examination; ADL: Activities of daily living.

DISCUSSION

AD is a severe neurodegenerative disorder that mostly affects older adults. Numerous interventions have been applied to postpone cognitive dysfunction and dementia in patients with early AD. To our knowledge, this is the only study reporting the effects of cognitive training in elderly patients with early AD in the Qinghai-Tibet Plateau. The present study aimed to investigate the efficacy of a new interventional method of clinical nursing in patients with early AD using the MMSE and ADL scales. Our results revealed that the MMSE and ADL scores were significantly better in the cognitive training group than in the conventional nursing group after the cognitive training intervention.

Many studies have illustrated the benefits of cognitive rehabilitation for patients with mild and early-stage AD in a clinical setting[11,12]. An exhaustive literature review and meta-analysis reported that cognitive training may be the best strategy for improving cognition in elderly patients with mild to moderate AD[13]. On the other hand, one study found no significant effect of cognitive rehabilitation intervention on ADL, and indicated that it may reflect a lack of transfer between the therapy setting and real life[14]. In our study, we also found that the new interventional method could significantly improve both the cognitive ability and daily life activities of AD patients.

All the patients in the present study were permanent residents of the Qinghai-Tibet Plateau. The patients were asked to complete the MMSE and ADL, which helped to determine the efficacy of the nursing interventions implemented in this study. A meta-analysis on the prevalence of dementia, including AD, in China is the lowest at 3.0%[15]. Specifically, another study of Tibetans in the Qinghai-Tibet Plateau reported that the prevalence of AD in the Tibetan population was lower than that in the general Chinese population[16]. However, no studies have specifically tested the efficacy of nursing cognitive therapy for AD in this population. This study is the first to apply a scientific, systematic, and multi-dimensional cognitive rehabilitation method in the plateau area, and the results could intuitively demonstrate the degree of rehabilitation of the patients. In our study, after the patients received the cognitive training intervention, their cognitive ability and ADL score were significantly better in the cognitive training group than in the conventional nursing group. These results indicated that standardized cognitive training intervention mode for patients with early AD could significantly improve the cognitive ability and quality of life in patients, and decelerate disease progression.

This study also had some limitations. First of all, this was a single-center study, so the generalizability of the findings is not known. Second, only 60 patients were included; thus, additional studies with larger sample sizes are needed to validate our findings.

CONCLUSION

In conclusion, the new interventional method of cognitive rehabilitation training improved both the cognitive ability and ADL in patients with early AD. This nursing intervention is a new nursing approach and can improve cognitive functions in patients such as memory, attention, logical thinking, orientation, and abstract thinking, in addition to conventional nursing, diet and, medication guidance. Therefore, we recommend that this method should be applied in future clinical practice to improve cognitive dysfunction in patients with early AD.

ARTICLE HIGHLIGHTS

Research background

Intervention research on early Alzheimer's disease (AD) has been a hot spot in the study of cognitive impairment and dementia in recent years. With the accelerating pace of global population aging, the attention on all aspects of AD has greatly increased. Based on the principles of cognitive neuroscience and cognitive psychology, according to the relevant cognitive fields and main clinical manifestations of the main damage in the progress of AD, in combination with the characteristics of the cognitive decline

of the elderly in China, an analysis of 60 elderly hospitalized patients with AD and long-term residents of the plateau was carried out. A scientific, systematic and multi-dimensional cognitive rehabilitation training method, which integrates six cognitive fields, namely, situational memory, executive function, working memory, attention processing, speech ability and reasoning judgment, was applied to these early-stage AD patients. Use of the standard cognitive training intervention mode for early-stage AD patients can improve their cognitive ability, improve their quality of life and slow development of the disease, which is of great clinical significance in reducing medical expenses and the economic burden of families and society.

Research motivation

This study integrated original cognitive rehabilitation tools in the six fields of episodic memory, executive function, working memory, processing speed, speech ability and reasoning judgment into an integrated comprehensive training platform to carry out a standardized intervention on pre-clinical AD patients, and verify the effectiveness of the intervention through cognitive behavior, daily living ability and other indicators. This localized intervention training system, scientific cognitive rehabilitation program and multi-dimensional efficacy evaluation has important innovative significance.

Research objectives

Our objective was to explore the effect of clinical nursing cognitive training on early AD patients at high altitude. The new intervention method of cognitive rehabilitation training improved the cognitive ability and daily living ability in early AD patients. This nursing intervention is a new nursing method. In addition to routine nursing, it can also improve patients' cognitive function, diet and drug guidance, memory, attention, logical thinking, orientation and abstract thinking. Therefore, we suggest that this method should be applied in future clinical practice to improve cognitive dysfunction and quality of life in early AD patients.

Research methods

This study included consecutive early AD patients who were treated in the Department of Geriatrics of Qinghai Provincial People's Hospital from August 2019 to March 2021. A prospective randomized controlled trial design was used in this study. Sixty patients were randomly divided into two groups, the cognitive training group and the control group, with 30 patients in each group. The short-term and long-term effects of cognitive rehabilitation training on pre-clinical AD were evaluated during 52 wk of cognitive training intervention and 26 wk of long-term follow-up. All data were analyzed by SPSS 22.0 software (IBM Corp., Armonk, NY, United States). Quantitative data were expressed as mean $\pm$ SD, and the *t*-test was used to compare the differences between the two groups. $P < 0.05$ was considered statistically significant.

Research results

With the development of AD, many advanced cognitive functions such as attention, memory, orientation, language ability, reasoning ability and related functions such as housekeeping, financial management, dressing, bathing and physical activities decrease, resulting in poor prognosis, decreased abilities of daily living, decreased quality of life, increased caregiver burden and medical expenses. In early AD patients, the standard cognitive training intervention mode can improve patients' cognitive ability, improve their quality of life, slow development of the disease, reduce medical costs, and reduce the economic burden on society and families.

Research conclusion

This study showed that the online rehabilitation training method is simple and easy to operate, and has the training integral function, which can improve the training interest and compliance of patients. A summary of current knowledge provided by this study was used to establish a cognitive rehabilitation training platform, using at least 20 sets of rehabilitation training tools covering the six cognitive domains of episodic memory, executive function, working memory, processing speed, speech ability and reasoning judgment. We used a prospective clinical trial design to carry out the intervention on pre-clinical AD patients, establish scientific cognitive training process specifications, and develop clinical cognitive and other multi-index systems to evaluate the efficacy of cognitive rehabilitation training, and then build a comprehensive and effective cognitive rehabilitation system for pre-clinical AD. The effect of cognitive rehabilitation training was evaluated according to the clinical activities of daily living and neuropsychological scales before and after the intervention. The new scientific, systematic and multi-dimensional cognitive rehabilitation training method was used to assess early AD patients from the plateau area. The results can determine the degree of rehabilitation in patients, and screen patients' cognitive tests according to the brain health management platform, which improves the accuracy of screening in early AD patients. This study found that the management platform can directly monitor the training of patients, which is conducive to tracking and data management. This study showed that cognitive rehabilitation training should be used in clinical practice in the future. The application of modern information-based methods in clinical nursing has resulted in improved work efficiency.

Research perspective

This study was carried out in Qinghai Provincial People's Hospital, with a small sample size and limited analysis. In future research, further standardization of the implementation process of cognitive training should be performed, to reveal the deep-seated brain neural mechanism of training in improving cognition and living ability. This would allow the formulation of more scientific cognitive training programs for different groups, incorporate more comprehensive and quantitative effect evaluation indicators, establish and promote the evaluation system of cognitive training based on neuroimaging indicators, and provide reference for research in this field. The content and form of training can be based on the actual life of patients and their own needs, and consider the application scenarios in different environments such as hospitals, families and nursing homes, in order to better transfer the training and research results to daily life.

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FOOTNOTES

Author contributions: Wang XH contributed to design, acquisition of data, analysis of data, interpretation of data, and drafted the manuscript; Luo MQ critically revised the manuscript; and all authors read and approved the final manuscript.

Institutional review board statement: This study was approved by the Ethics Committee of the Qinghai Provincial People's Hospital.

Informed consent statement: Written informed consent was obtained from the patients or their families.

Conflict-of-interest statement: The authors declare that they have no conflicts of interest.

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