

# 学位論文の要旨

氏名 池淵 久美

学位論文名 Relationship Between Oral Function and Cognitive Status  
Among Community-dwelling Older Adults:  
An Observational Cross-sectional Study

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著者名 Kumi Ikebuchi, Yuhei Matsuda, Mayu Takeda, Takafumi Abe,  
Kazumichi Tominaga, Hisaaki Saito, Shozo Yano,  
Minoru Isomura, and Takahiro Kanno

## 論文内容の要旨

### INTRODUCTION

The incidence of dementia has been increasing globally, posing a serious public health challenge for aging societies. An international report in 2022 estimated that the number of people with dementia will exceed 55 million globally and is projected to reach 152 million by 2050. The onset of dementia is influenced by a combination of genetic predisposition, chronic diseases, social isolation, and lifestyle factors. Social and lifestyle factors are particularly important modifiable risk factors. Indeed, social isolation and loneliness are independent risk factors for cognitive decline and dementia; reduced social interactions impair neuroplasticity and trigger chronic stress responses. Therefore, strengthening social relationships and promoting social participation are crucial strategies for dementia prevention, contributing to cognitive maintenance and alleviation of loneliness.

Lifestyle habits play a pivotal role in the onset and progression of dementia. Hypertension, obesity, diabetes, physical inactivity, smoking, and unhealthy dietary patterns have been identified as risk factors. Improvements in these lifestyle factors can contribute to the prevention of cognitive decline through neuroinflammation suppression and vascular function enhancement, with interventional studies confirming reductions in dementia risk. Diseases related to cognitive function and lifestyle, such as hypertension, diabetes, and dyslipidemia, are also associated with poor oral function. Decline in masticatory ability and lack of denture use have been linked to hypertension in older adults with tooth loss, and so has the loss of posterior occlusion to an increased risk of cardiovascular diseases.

The relationship between oral and cognitive functions has attracted significant attention. The Japanese Society of Gerodontology proposed the assessment of seven major oral functions in older adults: oral bacterial count, oral dryness, tongue pressure, occlusal force, masticatory function, and swallowing function. Previous studies have suggested that deterioration in oral function influences cognitive decline through mechanisms such as poor nutritional status, systemic inflammation, and reduced social interaction. Masticatory function depends on the number of teeth, occlusal condition, and occlusal force; chewing increases cerebral blood flow and promotes hippocampal neurogenesis. Conversely, tooth loss and ill-fitting dentures are associated with reduced cerebral blood flow and cognitive decline. Oral hygiene status, periodontitis, and oral dryness have also been associated with cognitive impairment.

In Japan, oral hypofunction was officially recognized in 2018 as a condition covered by the National Health Insurance system, emphasizing its role in maintaining both physical and mental health. However, large-scale investigations evaluating multiple domains of oral function are limited. Therefore, this study aimed to investigate the association between various oral functions and cognitive status in community-dwelling older adults, hypothesizing that higher oral function would be related to better cognitive performance.

## **MATERIALS AND METHODS**

The study protocol was approved by the Research Ethics Committee of Shimane University (approval number 20220723-1).

The study targeted residents of Shimane Prefecture aged 75 years and older who received oral health and general health checkups between April 2020 and March 2022. After excluding individuals with missing data, 4,338 participants were included in the final analysis.

We collected general background data (age, sex, body mass index, lower leg circumference, and smoking status), oral health status (number of remaining teeth, periodontal tissue status, masticatory function, articulation, swallowing function, oral hygiene status, and subjective oral dryness). All assessments were performed by dentists and dental hygienists. Social participation and cognitive status were obtained from standardized questionnaires used nationwide. Cognitive function was evaluated using two items: (1) "Have others pointed out your forgetfulness?" and (2) "Do you sometimes fail to recall today's date?"

Descriptive statistics were calculated as means and percentages for each variable. Univariate and multivariate analyses were performed using logistic regression. The objective variable was cognitive function, and the explanatory variables were factors strongly associated with oral disease based on prior research were identified and used to select explanatory variables for the multivariate model.

## **RESULTS AND DISCUSSION**

The final analysis included 4,338 participants (mean age 79.5 years, 44.0% male). Of these, 14.1% reported forgetfulness and 23.0% reported inaccurate date recall. In the forgetfulness

group, participants were older, had fewer teeth, worse periodontal status, poorer masticatory and swallowing function, and poorer oral hygiene. They were also less likely to go out weekly. In the accurate date recall group, similar trends were observed, with associations with oral dryness, diabetes, stroke, and orthopedic diseases.

Multivariate logistic regression showed that forgetfulness was significantly associated with age, sex, lower leg circumference, smoking, masticatory function, swallowing function, oral hygiene, social participation, and orthopedic diseases. For accurate date recall, significant associations were observed with age, lower leg circumference, oral dryness, social participation, diabetes mellitus, and stroke.

These findings suggest that four domains of oral function—mastication, swallowing, oral hygiene, and dryness—are significantly related to subjective cognitive decline. Reduced masticatory function has been shown to decrease cerebral blood flow and cognitive processing speed, while chewing activates the hippocampus and prefrontal cortex. Swallowing dysfunction and poor oral hygiene may contribute to cognitive decline through systemic inflammation and neurodegenerative mechanisms involving periodontal pathogens. Oral dryness, by impairing mastication and social interaction, can lower cognitive reserve.

Non-oral factors such as age, sex, lower leg circumference, smoking, diabetes, stroke, and orthopedic disorders also influenced cognition, consistent with prior studies. Age remains the strongest risk factor, while smaller leg circumference reflects sarcopenia and nutritional deficits associated with cognitive impairment. Smoking induces oxidative stress and vascular damage, and reduced social participation limits cognitive stimulation.

Together, these results reinforce the concept that oral function is intricately linked to cognitive health in older adults. Maintaining oral hygiene, promoting social engagement, and preventing oral dryness may help mitigate cognitive decline. However, the cross-sectional design prevents causal inference. Further longitudinal research is needed to clarify directionality.

## **CONCLUSION**

The results of this study suggest an association between masticatory function, swallowing function, oral hygiene status, and dryness with cognitive function. Oral healthcare providers should develop oral healthcare activities while providing opportunities for the social participation of older adults, such as comprehensive community care, to maintain and promote oral health status and function.