

# Evaluation of Correlation between Cognitive Impairment and Tooth Loss- Research Protocol

JAHNAVI PURNA GORRIPATI<sup>1</sup>, SUREKHA DUBEY GODBOLE<sup>2</sup>



## ABSTRACT

**Introduction:** Cognitive impairment has been linked with aging, neurobiological, psychological, and social factors. Studies have generally quoted “that older adults usually present with some form of cognitive impairment. Mild cognitive impairment is a state representing the intermediate phase between normal aging dementia and is also termed predementia syndrome. Recent evidence also shows correlation between teeth loss and Alzheimer’s disease, which can cause cognitive impairment.

**Need of the Study:** As there is very little research in the literature regarding the correlation of cognitive impairment with loss of teeth in dentistry, there is a need to check and evaluate the correlation. Thus, this study will assess the correlation between cognitive impairment and tooth loss using a MMSE.

**Aim:** To evaluate the correlation between cognitive impairment and tooth loss using a Mini-Mental State Examination (MMSE).

**Materials and Methods:** The current study is a cross-sectional observational study that will be conducted at Sharad Pawar Dental College and Hospital. Following approval of the Ethical institutional Committee (IEC) and Ethical Approval No: DMIMS (DU)/IEC/2022/779. All the 300 participants between 30-60 years of age who visited the OPD of Department of Prosthodontics, will be included in the study. The inclusion criteria for this study were patients aged between 30-60 years with number tooth loss 2-4, 6-8, partially edentulous, and completely edentulous. Participants suffering from neurological disorders that may lead to cognitive impairments will be excluded from the study. Descriptive statistics will be performed for frequency percentage. Association will be tested using Chi-square analysis to find the significance p-value.

**Keywords:** Functional occlusal unit, Mental health, Neurocognitive diseases

## INTRODUCTION

Neurocognitive Diseases (NCDs) are among those, and it is anticipated that their global effect will grow along with lifespan, from 44 million persons in 2013 to 76 million in 2030 and 131 million by 2050 [1]. Mild cognitive impairment is one of the most prevalent NCDs [2]. The term “predementia syndrome” refers to the condition known as mild cognitive impairment, which stands for the transitional stage between normal aging and dementia [3]. It could develop into dementia stay unchanged, or be restored to normal. Most western research indicates that 10%-15% of mild cognitive impairment cases per year progress to dementia [4]. India recorded a 60-year-old life expectancy of 18.02 years in 2020. This overall aging is anticipated to be accompanied by a sharp rise in mild cognitive impairment prevalence. WHO estimates that there are 50 million individuals with dementia globally, with 10 million new cases being diagnosed each year [5]. According to a survey of senior citizens in South Korea who live in the community, having few teeth left was associated with dementia developing within 2.4 years. [6]

A reduced number of remaining teeth may increase the risk of dementia or cognitive decline in old age, according to systematic reviews and meta-analyses [7,8]. In animal studies, Decreased masticatory activity in aging animals caused by soft food consumption resulted in a loss of spatial memory, reduced learning ability, neuroendocrine alterations, and hippocampus degeneration [9,10]. The idea of a “brain-stomatognathic axis” in connection to geriatric healthcare has been highlighted by recent studies. In light of this, this axis represents the intricate network of communication between the stomatognathic/masticatory system and the cortical and subcortical parts of the brain [11,12].

A loss in cognitive function would be expected to impede normal activities of daily life, such as oral hygiene and dental care [13]. Subjects with fewer teeth suffered slight memory impairment more

frequently than those with more teeth, according to Okamoto N et al., [14]. Oral health concerns, such as periodontal disease [15,16], dental caries [17], difficulties with masticatory function [18,19], and tooth loss, are linked to poor cognitive performance in older adults, according to some cross-sectional and longitudinal research finding. In contrast to people with 20 or more teeth, those with fewer teeth and no dentures had an increased risk of dementia, according to a 4-year prospective cohort study of people aged 65 or older in Japan’s Aichi Prefecture [20]. However, the risk of dementia was not significantly higher in people with fewer teeth who wore dentures. To determine whether improving dietary balance and masticatory performance can stop cognitive deterioration, intervention studies are required.

According to Brennan LJ and Strauss J as everyday functioning declines with age, cognitive impairment in older adults is frequently followed by rapid dental health degradation [21]. Additionally, specific cognitive conditions like apraxia, which interferes with motor planning, may make it more difficult for a person to practice oral hygiene [22] correctly.

To lower the prevalence of cognitive impairment, it is necessary to identify the modifiable predictors and risk factors because there is currently no proven effective therapy for the condition. Interventions are required to prevent and address the issues that the rapid increase in dementia is bringing to the healthcare system [22].

## Study Objectives

- To evaluate the cognitive impairment in a partially edentulous state where 2 to 5, 6 to 8 number of tooth loss is present. (Group-A)
- To evaluate the cognitive impairment in complete tooth loss patients. (Group-B)
- To compare cognitive impairment and tooth loss in group-A and group B.

## REVIEW OF THE LITERATURE

In study conducted by Bergdahl M et al., 487 edentulous participants (59% women, 41 percent males; age M=71.3) were compared to 1,351 people with natural teeth (53 % women, 47 percent men; age M=54.0) [23]. The findings suggest that the cognitive deficit of the edentulous group persists and that functional natural teeth are associated with somewhat intact cognitive performance in later life. According to study conducted by Salthouse TA et al., increasing age is associated with lower cognitive performance even in the age range of 18 to 60-year-old [1]. Some signs of age-related cognitive deterioration appear in healthy, educated, people in their 20s and 30s.

In study conducted by Kaye EK et al., a total of 597 dentate men, from 28 to 70 years, were followed for 32 years [13]. The data show that the chance of cognitive decline in elderly guys increased when more teeth were removed. Periodontal disease and dental caries, two of the most frequent causes of tooth loss, have been related to mental decline. In a study conducted by Ganem A et al., Saudi Arabia's female population between the ages of 40 and 65 was studied (approx. 300 persons) [3]. The number of remaining teeth, education, occupation, stress, and medical history, were all evaluated. To examine cognitive performance, the MMSE was employed, and the results were statistically assessed. The latest study, they concluded, adds to the body of data by suggesting a link between tooth number and hippocampus-dependent cognitive function. In the second half of the investigation, regression analysis found no conclusive association.

In study conducted by Kato H et al., authors wanted to see if there was a link between cognitive function and the number of natural and prosthetic teeth in the elderly Japanese residents [24]. Authors concluded that cognitive ability was significantly associated with the number of natural teeth.

In study conducted by Galindo-Moreno P et al., a study conducted to investigate and find any epidemiological evidence in the association between edentulism and decline in cognition [25]. The data was obtained from two USA National Health Surveys 2014-2017 and NHANES 2005-2018. The number of teeth in the oral cavity is a predictor of status in cognitive decline. This study has stated that cognitive function is likely to decline even when only 8 teeth out of 28. Thus, the prevention of tooth loss has significant importance, not only in oral health but also in cognitive function. Cognitive impairment is observed when loss of molars is present. The early loss of teeth at 45 years of age was associated with cognitive function. So, it is essential to maintain oral health and to promote oral health maintenance in all age groups to minimise cognitive decline.

## MATERIALS AND METHODS

This cross-sectional study will be conducted at Sharad Pawar Dental College and the Hospital. Following approval of the Ethical institutional committee and Ethical approval No: DMIMS (DU)/IEC/2022/779. All 300 individuals who will attend the OPD of the Department of Prosthodontics between the ages of 30 to 60 years will be included in the study, which will run for two years. Participants will be informed about the research and will be provided with an opportunity to provide written consent. Patients between the ages of 30 to 60 years with a number of teeth missing 2-5, 6-8, partial edentulous (loss if teeth more than 16), or complete tooth loss will be eligible for this study. Cognitive impairment may result from participants with neurological diseases hence they will be excluded from the study.

### Sample size calculation:

$$n = Z^2 \cdot p \cdot (1-p) / E^2$$

P=proportion of half dentition (partial tooth loss) with less attention as cognitive function=24.6% [3]

E=Margin of error=5%

$$n = 1.96 \times 0.246 \times (1 - 0.246) / (0.05)^2$$

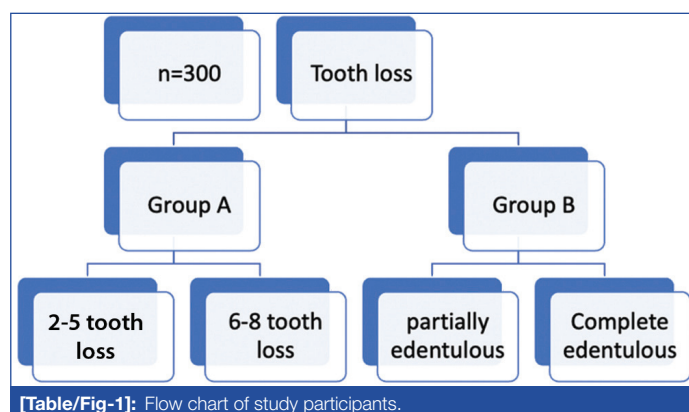
$$= 286 \sim 300$$

$$n = 300$$

The MMSE, a globally accepted cognitive function test, assessed each subject's cognitive function. It consists of assessments of orientation, focus, memory, language, and visual-spatial abilities. A score of 24 to 30 will be categorised as mild, 18 to 23 as moderate, and 0 to 17 as severe impairment [13].

## Study Procedure

- The study will include all patients who present to the OPD with a partially or completely edentulous arch.
- Cognitive assessment using MMSE is evaluated for each person and compared.
- It is helpful to assess patients' cognitive status and observe if any changes are seen.
- A qualified dentist will assess the number of existing teeth to assess tooth loss at the time of the baseline survey. [Table/ Fig-1] shows the study participants. Thus, 300 subjects would be randomly distributed in each group.



## STATISTICAL ANALYSIS

All the results will be calculated using SPSS software. Descriptive statistics will be performed for frequency percentage for qualitative data and mean and standard deviation over quantitative data. Association will be tested using Chi-square analysis to find significances p-value.

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**PARTICULARS OF CONTRIBUTORS:**

1. Postgraduate Student, Department of Prosthodontics and Crown and Bridge, Sharad Pawar Dental College and Hospital, Wardha, Maharashtra, India.
2. Senior Professor, Department of Prosthodontics and Crown and Bridge, Sharad Pawar Dental College and Hospital, Wardha, Maharashtra, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Jahnvi Purna Gorripati,  
Postgraduate Student, Department of Prosthodontics and Crown and Bridge,  
Sharad Pawar Dental College and Hospital, Wardha, Maharashtra, India.  
E-mail: jahnvi.jan6@gmail.com

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