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## Original article

# Loss of occlusal support affects the decline in activities of daily living in elderly people receiving home care



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## ABSTRACT

**Purpose:** This study aimed to clarify whether the absence of occlusal support would lead to a decline in the activities of daily living (ADL) in elderly people receiving home care.

**Methods:** The subjects of this study were 322 elderly individual aged 65 and older who were receiving home care during a one-year observation period. The subjects were divided into two groups according to the change in the total score of the Barthel Index (BI) during the prospective cohort study period (the dependent variable): the maintained/improved activities of daily living group, in which the score was unchanged or improved, and the worsened activities of daily living group, in which the score decreased. The relationship between occlusal status (the presence or absence of occlusal support) at the baseline measurement and each BI score change was evaluated in the slightly, moderately and totally dependent ADL subgroups.

**Results:** The number of subjects in the maintained/improved and the worsened ADL groups was 152 and 170, respectively. The baseline characteristics of cognitive function and occlusal support were significantly different between the maintained/improved and the worsened ADL groups ( $p < 0.05$ ). Among the ADL subgroups, significantly reduced scores in mobility and toilet use were observed only in the slightly dependent group ( $p < 0.05$ ).

**Conclusions:** Our results suggest that the loss of occlusal support may be an important factor in the decline of ADL in elderly people receiving home care, especially slightly dependent people.

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## 1. Introduction

The number of elderly people receiving home care from healthcare professionals has increased in Japan with the aging of the population. Many elderly people want to live in their hometowns throughout their lives, and the maintenance of activities of daily living (ADL) is essential to receiving anxiety-free home care. Therefore, we believe that it is important to determine the factors impacting ADL for elderly people receiving home care. Cerebrovascular diseases, nutritional status, cognitive function, and events, such as bone fractures due to falls, tobacco use, and social factors, have been recognized as potentially influential factors [1].

Many studies have reported the strong relationship between the maintenance of occlusal support and nutrition intake [2,3]. Therefore, the loss of occlusal support may lead to malnutrition, resulting in decreased ADL. Moreover, a body sway decrease and gait velocity increase were observed in edentulous subjects after receiving a new denture [4]. Yoshida et al. reported that the frequency of falls in demented patients without occlusal support decreased after prosthodontic treatment [5]. These findings may also indicate that occlusal support maintains ADL by preventing falls.

In this study, we hypothesized that occlusal support affects ADL changes and identified the relationship between the absence of occlusal support and decreased ADL items in elderly people receiving home care in a one-year prospective cohort study.

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## 2. Methods

The registered participants were 511 elderly people receiving home care aged 65 years or older (162 males, 349 females, mean age  $84.2 \pm 7.6$  years) in four Japanese prefectures (Tokyo, Kanagawa, Niigata and Fukuoka). Baseline measurements regarding gender, age, activities of daily living (ADL), cognitive function, underlying diseases, nutritional status, occlusions, and swallowing function were collected in an interview with the caregivers using a reliable examination form. Ten dentists who worked in a specialized oral rehabilitation hospital for more than 3 years evaluated the oral status and swallowing function of the subjects. One year after the initial baseline measurement, their ADL was re-evaluated with the same examination form completed in interviews with the caregivers.

This study was approved by the Ethics Committee of Nippon Dental University (NDU-T2010-14, T2011-23). Informed consent for participation was provided by the subjects or the family members of subjects with substantial cognitive impairment.

### 2.1. ADL

ADL was evaluated with the Barthel Index (BI) [6]. The BI consists of 10 basic items, including feeding, moving from a wheelchair to the bed and back, personal toilet, getting on and off toilet, bathing self, walking on level surface, ascend and descend stairs, dressing, controlling bowels, and controlling bladder. Each item is given a score based on the judgment of

function level. The scores of each item are summed to create a total score. The scores range from 0 to 100. Low scores indicate more dependence for ADL;  $\leq 20$  indicates total dependence; 21–59 indicates moderate dependence; and  $\geq 60$  indicates slight dependence [7].

### 2.2. Cognitive function

Each subject's cognitive function was evaluated based on the Washington University Clinical Dementia Rating (CDR) [8], which is a global standard scale that is used to evaluate the severity of dementia. Scores of 0, 0.5, and  $\geq 1$  corresponded with normal, very mild dementia, and mild to severe dementia, respectively.

### 2.3. Underlying diseases

The underlying diseases were evaluated based on diagnoses made by physicians using the Charlson Comorbidity Index [9], which is a method used in longitudinal studies to classify comorbid conditions that might alter the risk of mortality. The index scores were classified into categories of 0, 1–2, 3–4, and  $\geq 5$  [9].

### 2.4. Nutritional status

Body mass index (BMI) was used to indicate nutrition status because lower BMI is associated with life prognosis, cognitive function and nutrition status in elderly people. BMI was calculated based on height and weight. Subjects with BMI  $< 18.5$  were diagnosed as underweight [10].

### 2.5. Occlusal support

According to the oral examination results, the subjects were classified into two groups according to the presence or absence of at least one occlusal support among 4 premolar and molar regions by natural and denture teeth.

### 2.6. Swallowing function

The subjects were evaluated the swallowing function according to the cervical auscultation method described by Zenner et al. [11] and the water swallowing test [12]. The subjects received a glass of water (3 mL), and their swallowing functions were assessed by cervical auscultation. The subjects who choked, had urgent breathing and/or wheezing at the time of swallowing or needed to swallow several times were diagnosed as having dysphagia.

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## 3. Study design and statistical analysis

The subjects were divided into two groups based on the results comparing the baseline and 1-year follow up ADL measurements into two categories: maintained/improved ADL group (subjects whose total BI scores were unchanged or improved) and worsened ADL group (subjects whose total BI scores were worsened). The baseline characteristics were compared between these two groups using Welch's t-test and the  $\chi^2$  test

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