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# Masticatory Functionality, Comorbidities, and Depression in the Elderly Waiting for Dental Care

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## ABSTRACT

**Introduction:** Oral functionality is a concept that has recently been introduced into the scientific debate, with multiple geriatric considerations requiring analysis. Objective: To evaluate the relationship between Masticatory Functionality (MF), comorbidities, and depressive symptoms in adults aged 70 and older.

**Methods:** A cross-sectional analytical study was conducted using data from a sample of older adults awaiting dental care enrolled in the FONIS SA20I00052 project at Hospital El Salvador (Chile). Eligible participants were aged ≥ 70 years, wore deficient dental prostheses, had no severe cognitive impairment, and provided informed consent. Masticatory function was assessed using the Eichner index, while comorbidities and depressive symptoms were evaluated using the Charlson Comorbidity Index and the 5-item Geriatric Depression Scale (5-GDS), respectively. Descriptive statistics and logistic regression models, adjusted for age and sex, were used to explore the associations.

**Results:** The sample included 124 individuals (58.9% women; mean age, 81.2 ± 6.0 years). Most participants were classified as Eichner Class C (75.8%). Depressive symptoms were present in 27.4% of participants, and 57.3% had at least one comorbidity. Logistic regression showed no significant association between Eichner classification and depressive symptoms (OR = 1.79; 95% CI: 0.65–4.92; p = 0.257) or comorbidities (OR = 0.74; 95% CI: 0.31–1.73; p = 0.482).

**Conclusions:** No statistically significant association was observed between masticatory function and either depressive symptoms or comorbidities in this population. These findings contrast with prior evidence and underscore the complexity of interactions between functional and psychological health in older adults.

**Keywords:** Oral Functionality; Carlson's scale; Depression

## INTRODUCTION

The global increase in life expectancy has led to an aging population [1]. At the Latin American level, Chile, Argentina, and Trinidad and Tobago are in an advanced stage of aging, with fertility rates below the replacement level and higher population percentages of the elderly ranging between 15% and 17% [2]. In Chile, according to the 2022 National Socioeconomic Survey (CASEN), the older adult population reached 3,651,538, accounting for 18.4% of the total population. In the country, a person is considered an older adult at the age of 60, out of whom 89.76% are subscribed to the national health system [3].

This demographic shift has contributed to the rise in geriatric syndromes, multifactorial health conditions that occur when the cumulative effects of impairments across multiple systems render older adults vulnerable to situational challenges. These conditions are also referred to as clinical conditions in older adults that do not fit within established disease categories [4]. These syndromes often lead to significant functional and social disabilities [5].

Comorbidity is a complex concept to define. Some describe it as the presence of coexisting or additional diseases related to an initial diagnosis or the condition under study. It is linked to worse health outcomes, more complex clinical management, and higher healthcare costs. It can impact the functional capacity of affected individuals, as well as their overall quality of life and survival. It has also been used to express the notion of disease burden, defined as the total burden of diseases affecting an individual's physiological reserve. In geriatrics, this concept is linked to the impact on the frailty of older adults [6].

Certain conditions commonly cause comorbidity and can occur alongside geriatric syndromes like frailty and malnutrition [7]. Evidence shows that severe tooth loss or deterioration reduces masticatory capacity, impairs nutritional intake, and affects facial appearance, communication, social interaction, and mental health. Tooth loss has been linked to functional declines in daily activities and the progression of multiple diseases [8-10].

A notable link exists between multimorbidity and the presence of fewer than 20 natural teeth in older adults. Health professionals should prioritize the oral health of patients with multimorbidity when managing their chronic conditions and guide them on the proper use of oral care resources in the early stages of their illness [11].

Removable Dental Prostheses (RDPs) play a crucial role in restoring oral function for patients with limited tooth retention. In Chile, a significant number of older adults in the public health system are referred from primary to secondary care for RDP treatment. However, a mismatch between high demand and limited availability often results in long waiting times, during which patients experience reduced oral function due to tooth loss or unsupervised prostheses [12]. Data from the ‘GLOSA 06’ report, issued by the Chilean sub-secretariat of Healthcare Networks, shows that the number of patients awaiting oral rehabilitation increased from 126,083 in 2018 to 132,110 in 2019. However, the subsequent years saw a gradual decrease due to the COVID-19 pandemic, as in 2022, the number of patients waiting for dental prosthetic treatment was 110,894 [13]. This delay usually leaves patients with impaired oral function, severely impacting their quality of life and overall well-being, and can lead to depression [14-16]. Depression is a psychiatric disorder characterized by recurring sadness, anhedonia, loss of appetite, fatigue, insomnia or hypersomnia, feelings of worthlessness, and hypoprosexia. According to the 2017 Census, the prevalence of depressive symptoms in Chile among those aged 65 or older dropped to 11.2% for both sexes, with 4.1% in males and 16.9% in females [17].

There is strong evidence linking depression with tooth loss and cognitive decline and dementia [18,19]. A 2014 review, part of the World Alzheimer's Report, combined 32 studies in a meta-analysis examining how depression impacts the risk of developing dementia. It concluded that depression nearly doubles the risk and may serve as a prodromal factor in dementia development [20]. Previous studies investigating prefrailty have described associations with physical function, nutritional status, and depressive mood, with prefrail older adults reporting low personal satisfaction and low self-esteem [21].

In exploring complex models connecting oral function with overall health, this study aims to evaluate the relationship between Masticatory Function (MF), comorbidities, and depression in severely edentulous individuals over 70 years old who wear dentures and have lost functional capacity. This study is part of a larger project funded by the National Fund for Health Research and Development (FONIS), code SA20I0052, conducted at a public health hospital in Chile.

## METHOD

This was an observational, cross-sectional, and analytical study approved by the Ethics Committee of the East Metropolitan Health Service and the Quality and Safety Unit of Salvador Hospital. The sample included individuals who voluntarily participated in the FONIS SA20I00052 project at the Hospital del Salvador, meeting the following inclusion criteria: being 70 years or older, having defective dentures, undergoing rehabilitation treatment at the service, being recruited from waiting lists after referral from Primary Health Care, not having severe cognitive impairment, and signing informed consent. Cognitive impairment was assessed using the Pfeiffer scale, also known as the Short Portable Mental Status Questionnaire (SPMSQ), a brief tool used to screen for cognitive impairment in individuals aged 65 years and older. Its primary purpose is to quickly and easily identify potential cognitive changes that could indicate dementia. It is administered during the Preventive Medical Examination of the Elderly (EMPAM) in Chilean public health centers.

Upon admission, the Charlson Comorbidity Index and the Shortened Geriatric Depression Scale (5-GDS) were administered, and masticatory function was classified based on the Eichner Index. The Charlson Comorbidity Index is a tool used to estimate 10-year life expectancy according to the patient's age at assessment and their comorbidities. It includes 19 items, each of which has been shown to impact the patient's life expectancy when present. These items are scored as follows: 0-1 points for the absence of comorbidities, 2 points for low comorbidity, and more than 3 points for high comorbidity [22]. The lack of comorbidities indicates a low risk of 10-year mortality related to health conditions. Low comorbidity suggests a relatively low risk of complications and death, while high comorbidity indicates a higher risk of medical complications and mortality in the medium to long term.

The 5-GDS is a commonly used screening tool for depression. It has been translated and validated in multiple languages, including Spanish. It provides a quick way to screen for depression in older adults. It includes five yes-no questions designed to detect depressive symptoms; a score of 2 or higher indicates possible depression and warrants further clinical evaluation [17].

The Eichner index classifies dentition based on the number of Occlusal Support Zones (OSZ), which are formed by contact points from natural teeth or fixed prostheses in the premolar and molar areas. Individuals in group A have

contact in all four OSZs (subcategories A1 to A3); those in group B have contact in 1–3 OSZs (subcategories B1 to B3), or only in the front region (subcategory B4), and those in group C have no occlusal contact (subcategories C1 to C3). This study involved patients with reduced chewing ability, classified as Eichner index B3, B4, C1, C2, and C3 [23]. Patients were recruited by three trained investigators (Fleis' kappa > 0.8). Descriptive statistics summarized the characteristics of the study sample. Continuous variables were reported as means and Standard Deviations (SD) or medians and Interquartile Ranges (IQR), depending on their distribution. Categorical variables were presented as absolute frequencies and percentages. The primary exposure variable was masticatory function, dichotomized using the Eichner classification as Class B (reference group) versus Class C. The dependent variables were the presence of depressive symptoms (5-item Geriatric Depression Scale $\geq$ 2) and comorbidity status, dichotomized as "none" *versus* "one or more" based on the Charlson Comorbidity Index.

Multivariable logistic regression models were used to assess the association between the Eichner classification and each outcome. Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) were calculated, controlling for age and sex as potential confounders. All analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA), with a two-sided p-value <0.05 considered statistically significant.

## RESULTS

A total of 124 older adults participated in the analysis. The average age was 81.2 years (SD = 6.0), with a median of 81.5 years and an interquartile range of 76.0 to 85.0 years. Most participants were female (58.9%, n = 73). According to the 5-item Geriatric Depression Scale (5-GDS), 27.4% (n = 34) screened positive for depressive symptoms. Regarding overall health, 57.3% (n = 71) had at least one comorbidity, as determined by the Charlson Comorbidity Index. Concerning masticatory status, 75.8% (n = 94) were classified as Eichner Class C, while 24.2% (n = 30) were classified as Class B (Table 1). Analyzing the association between comorbidities and masticatory functionality, as evaluated through the Eichner Index, the results show that most of the sample falls into category C, indicating that if any dentition remains, it cannot contribute to mastication, and function depends on the prosthetic device (Figure 1).

Logistic regression analyses were conducted to explore the link between Eichner classification and health outcomes. After adjusting for age and sex, no statistically significant relationship was found between Eichner Class C and depressive symptoms (OR = 1.79; 95% CI: 0.65–4.92; p = 0.257) when compared to Class B. Likewise, there was no significant link between Eichner classification and comorbidity status (OR = 0.74; 95% CI: 0.31–1.73; p = 0.482) (Table 2).

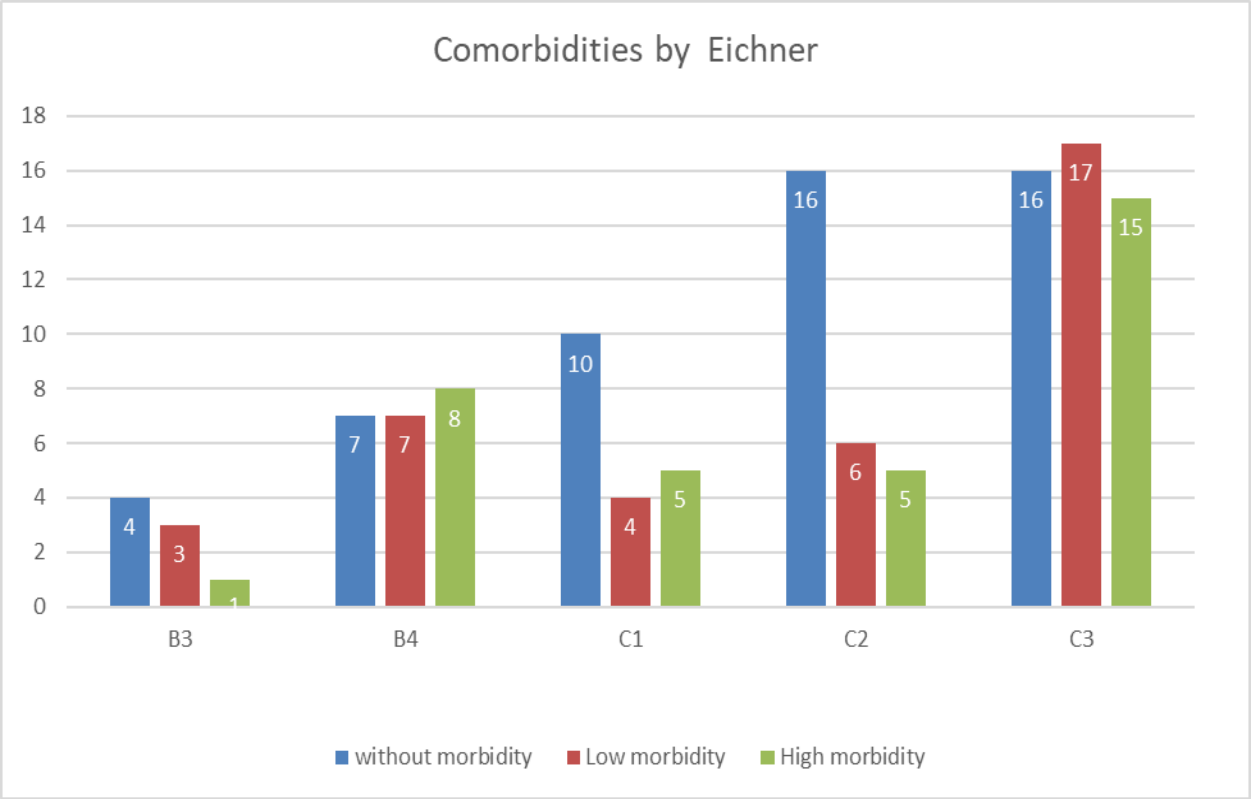


**Figure 1:** Charlson Index distribution according to Eichner Index categories.

**Table 1:** Descriptive Characteristics of the Study Sample (n = 124).

| Variable | Category | n | % |
|---|---|---|---|
| Age | Mean ± SD | — | 81.2 ± 6.0 |
| | Median (IQR) | — | 81.5 (76.0–85.0) |
| Sex | Female | 73 | 58.90% |
| | Male | 51 | 41.10% |
| Depression | Yes | 34 | 27.40% |
| | No | 90 | 72.60% |
| Comorbidities | Yes | 71 | 57.30% |
| | No | 53 | 42.70% |
| Eichner Classification | B | 30 | 24.20% |
| | C | 94 | 75.80% |

**Table 2:** Association between Eichner Classification and Health Outcomes (Adjusted Logistic Regression by Age and Sex).

| Outcome | Eichner C *vs* B – OR (95% CI) | p-value |
|---|---|---|
| Depressive symptoms | 1.79 (0.65–4.92) | 0.257 |
| Comorbidities | 0.74 (0.31–1.73) | 0.482 |

## DISCUSSION

This study aimed to evaluate the relationship between masticatory function, comorbidities, and depressive symptoms in severely edentulous individuals over 70 years old who wear dentures and exhibit functional decline. No statistically significant associations were observed between reduced masticatory function—assessed using the Eichner Index-and the presence of comorbidities or depressive symptoms, as measured by the Charlson Comorbidity Index and the 5-item Geriatric Depression Scale (5-GDS), respectively. The study population consisted of older adults relying on the public health system, all of whom exhibited impaired prosthetic function and reduced masticatory ability. This decline in masticatory ability is a key aspect of oral frailty. Oral frailty has been associated with adverse outcomes such as worsening physical and mental health, increased social isolation [24], reduced quality of life [25], and progression to overall frailty [26]. The concept of oral frailty, introduced by the Japanese Society of Geriatrics, covers functional decline, underlying causes, adverse effects, and coexisting systemic conditions. Although broad in scope, this definition emphasizes the link between oral health and systemic aging processes.

Our findings indicate that poor masticatory function alone does not necessarily relate to comorbidities or depressive symptoms in this group of older adults. These questions are part of the Japanese framework, particularly the concept that simultaneous declines in physical and mental reserves characterize oral frailty. In our sample, the presence of physical, cognitive, and social impairments was not enough to form a clear oral frailty profile. Instead, it emphasizes the complex, multidimensional nature of aging and the need for more comprehensive assessment methods. Most of the current evidence regarding the relationship between oral frailty, physical function, and nutritional status is derived from cross-sectional studies, which limit the ability to establish causality [27-29]. Therefore, additional longitudinal research is needed to investigate the direction and underlying mechanisms of these associations [30]. The development of oral frailty assessment tools is still in its early phases [31], and their ability to predict high-risk individuals has not been thoroughly evaluated [32].

Additionally, this study was conducted in an area within the Santiago Metropolitan Region, Chile, known for having one of the highest proportions of older residents nationwide. This area has a long-standing commitment to geriatric care and is a pioneer in providing dental services to functionally dependent older adults. Furthermore, its healthcare coverage indicators exceed the national average [33], which may have influenced the results seen in this study by reducing the prevalence or severity of unaddressed health conditions. Ultimately, these findings underscore the complexity of the relationship between oral function and overall health in aging populations, highlighting the need for comprehensive, multidimensional approaches to assess oral frailty in both clinical and public health settings.

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## AUTHOR CONTRIBUTIONS

Pilar Barahona: Developed Conceptualization, Funding acquisition and Project administration; Braulio Santibañez: Investigation; Andrés Celis: Methodology and Data Curation; Gerardo Fasce: Methodology and Administration; Juan Ignacio Godoy: Investigation; Erik Dreyer: Methodology and Writing-original draft.

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