

## Assessment of the Effect of Complete Dentures on Respiratory Performance: A Spirometric Analysis

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### Abstract

**Background:** One of the most significant physiological processes is thought to be respiration. A prosthodontist should concentrate on building a thorough understanding of the patient in order to prepare patients to recognise the sort of prosthesis they need. The purpose of the current study was to determine how full dentures affected pulmonary function.

**Materials and Methods:** The study comprised 100 individuals with a complete edentulous arch and a history of wearing complete dentures for at least five years. Each and every spirometric procedure was performed by trained technicians. A diagnostic spirometer was used to perform the spirometric test. There were four stages to the testing process: stage 1, testing without a denture, stage 2, testing with both dentures in place, stage 3, testing with a maxillary denture only, and stage 4, testing with a mandibular denture only. Forced vital capacity (FVC), peak expiratory flow (PEF), forced expiratory volume in one second (FEV1), and forced expiratory flow 25%–75% (FEF<sub>25–75</sub>) were the measurements used to determine the outcomes of the spirometric test. Each outcome was examined using SPSS software.

**Results:** The spirometric value of FVC, PEF, FEV1, and FEF<sub>25–75</sub> in the absence of both maxillary and mandibular dentures was found to be 4.23, 6.21, 3.64, and 1.89, respectively. The spirometric value of FVC, PEF, FEV1, and FEF<sub>25–75</sub> in the presence of both maxillary and mandibular dentures was found to be 2.21, 3.98, 1.55, and 1.06, respectively. While analyzing statistically, it was seen that there was a significant decrease in the value of spirometric variables in the presence of dentures.

**Conclusion:** The aforementioned data show that people with edentulousness who wear dentures for an extended period of time are susceptible to spirometric alterations. As a result, these patients should receive immediate counselling on the various respiratory exercise regimens.

**Keywords:** Complete denture, spirometry, Forced vital capacity.

### Introduction

The proportion of elderly people in the population has increased throughout the course of the 20<sup>th</sup> century, particularly in developed countries. As might be expected, age is one of the most important factors in edentulousness. Although ageing itself does not cause tooth loss, the frequency of dental and general diseases and functional disabilities increase with advancing age, which may predispose older people to edentulousness<sup>1</sup>. Therefore, total edentulism is a widespread, intraoral condition among the aged population; complete dentures are still the most common treatment offered to the edentulous patient worldwide<sup>2,3</sup>. To ensure sufficient retention and stability, complete dentures must extend up to the soft palate in the maxilla and to retromolar tissues in the mandible<sup>3–6</sup>. Thus, the volume of the oral cavity may decrease and some crucial functions may be disturbed, such as speech production and chewing efficiency<sup>7–9</sup>.

Respiration is one of the most vital functions, and it can be described as the exchange of gases between the

living organism and the atmosphere to meet the metabolic demands of the body<sup>10</sup>. In the course of oral respiration, oral tissues and existing dentures are the first contacting structures of the air passing through upper airways. It has The proportion of elderly people in the population has increased throughout the course of the 20<sup>th</sup> century, particularly in developed countries. As might be expected, age is one of the most important factors in edentulousness. Although ageing itself does not cause tooth loss, the frequency of dental and general diseases and functional disabilities increase with advancing age, which may predispose older people to edentulousness<sup>1</sup>. Therefore, total edentulism is a widespread, intraoral condition among the aged population; complete dentures are still the most common treatment offered to the edentulous patient worldwide<sup>2,3</sup>. To ensure sufficient retention and stability, complete dentures must extend up to the soft palate in the maxilla and to retromolar tissues in the mandible<sup>3–6</sup>. Thus, the volume of the oral cavity may decrease and some crucial functions may be disturbed,

such as speech production and chewing efficiency<sup>7-9</sup>. Respiration is one of the most vital functions, and it can be described as the exchange of gases between the living organism and the atmosphere to meet the metabolic demands of the body<sup>10</sup>. In the course of oral respiration, oral tissues and existing dentures are the first contacting structures of the air passing through upper airways. It has The proportion of elderly people in the population has increased throughout the course of the 20<sup>th</sup> century, particularly in developed countries. As might be expected, age is one of the most important factors in edentulousness. Although ageing itself does not cause tooth loss, the frequency of dental and general diseases and functional disabilities increase with advancing age, which may predispose older people to edentulousness<sup>1</sup>. Therefore, total edentulism is a widespread, intraoral condition among the aged population; complete dentures are still the most common treatment offered to the edentulous patient worldwide<sup>2,3</sup>. To ensure sufficient retention and stability, complete dentures must extend up to the soft palate in the maxilla and to retromolar tissues in the mandible<sup>3-6</sup>. Thus, the volume of the oral cavity may decrease and some crucial functions may be disturbed, such as speech production and chewing efficiency<sup>7-9</sup>. Respiration is one of the most vital functions, and it can be described as the exchange of gases between the living organism and the atmosphere to meet the metabolic demands of the body<sup>10</sup>. In the course of oral respiration, oral tissues and existing dentures are the first contacting structures of the air passing through upper airways. It has Tooth loss is still an unfortunate reality for many patients, especially for the elderly.<sup>[1]</sup> Edentulism has consequences such as reduction of the lower third of the face, decrease of vertical dimension, loss or reduction of masticatory movement, poor esthetics and phonetic problems.<sup>[2]</sup> Dietary restrictions and difficulty to eat certain foods are also mentioned by edentulous patients.<sup>[3,4,5]</sup>

Typically, preference is given to foods that are easier to crush, which can compromise the nutritional needs of the individual, and thus affect general health.<sup>[6,7]</sup> Those alterations can impact oral health-related quality of life (OHRQoL) and compromise the psychosocial behavior of the individual.<sup>[8]</sup>

A potential unifying mechanism for a linkage between poor oral health and lung disease could relate to the close relationship between the respective microbiomes particularly as the oral microbiota can contribute to the lung microbiome [9-11].

Hence, the current study was conducted to evaluate the effects of complete denture on respiratory performance.

### Material and methods

The current study's aim was to investigate the effects of complete dentures on pulmonary function. The study comprised 100 individuals with a complete edentulous arch and a history of wearing complete dentures for at least five years. Additionally, admission was limited to those who were absolutely thrilled with their dentures. Participants with asthma and those who had a history of any other respiratory illness were not included in the current study. Patients were strictly instructed not to exercise for at least three to four hours before to the spirometric test. Complete demographic, clinical, and individualised patient data were recorded. Each patient's height, weight, and body mass index were also noted on a proforma. Each and every spirometric procedure was performed by trained technicians. A diagnostic spirometer was used to perform the spirometric test. Forced vital capacity (FVC), peak expiratory flow (PEF), forced expiratory volume in one second (FEV1), and FEF<sub>25-75</sub> were the measurements taken during the spirometric test. Each result was analysed using SPSS software version 16.0, and the significance level was assessed using the Chi-square test and Student's t-test.

## Results

**Table 1: Comparison of spirometric values**

Comparison	P value
Stage 1-FVC	
Stage 2-FVC	0.01*
Stage 3-FVC	0.04*
Stage 4-FVC	0.0001*
Stage 1-PEF	
Stage 2-PEF	0.26
Stage 3-PEF	0.01*
Stage 4-PEF	0.31

[\* : Significant, FVC: Forced vital capacity, PEF: Peak expiratory flow]

**Table 2: gender-wise distribution of subjects**

Gender	Number of subjects	Percentage
Males	90	90%
Females	10	10%
Total	100	100%

In the current study, an evaluation of 100 patients who had a complete edentulous arch and a history of wearing complete dentures for at least five years was conducted. The patients in the current study had a mean age of 56.5 years. 90% of the patients in the current study were men, with the other patients being women.

The spirometric value of FVC, PEF, FEV1, and FEF<sub>25-75</sub> in the absence of both maxillary and mandibular dentures was found to be 4.23, 6.21, 3.64, and 1.89, respectively. The spirometric value of FVC, PEF, FEV1, and FEF<sub>25-75</sub> in the presence of both maxillary and mandibular dentures was found to be 2.21, 3.98, 1.55, and 1.06, respectively. While analyzing statistically, it was seen that there was a significant decrease in the value of spirometric variables in the presence of dentures.

### Discussion

According to the findings from this study, spirometric values for pulmonary function testing were affected by wearing complete dentures. Indeed, previous studies<sup>12,13</sup> showed that there is a strict relationship between orofacial conditions and the upper airway. However, until the end of the 20th century, clinical findings were not used for the evaluation of respiratory functions in different dental conditions such as partial or total edentulism. The most significant clinical evidence about the relationship between oral conditions and respiratory functions emerged in the late 1990s.

Neves et al<sup>14</sup> determined whether the use of complete dentures has an influence on the respiratory capacity, assessed by the spirometry examination. A systematic review was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis and registered in the International Prospective Register of Systematic Reviews (CRD42021255224). The PICO question (population/exposure/comparison/outcome) was "Does the use of complete dentures influence the respiratory capacity of a toothless subject?" A search strategy was adapted for the PubMed/MEDLINE, The Cochrane Library, OpenGrey, Lilacs, Scopus, and Embase databases. Inclusion criteria were prospective and retrospective studies. The new castle ottawa (NOS) scale and the Methodological Index for Non-randomized studies were selected to assess the quality of the included studies. Four studies were selected, totaling the evaluation of 242 participants, aged ranging from 40 to 73 years old. Two studies concluded that the use of complete dentures can negatively affect the respiratory capacity. One study stated that it did not interfere regardless of its use during spirometric measurements, and the other reported that dental prosthesis was required in cases of evaluation of the extrathoracic airways. The use of complete dentures did not represent relevant changes from the reference values for pulmonary function in the spirometry test.

Kelly et al<sup>15</sup> investigated the association between denture wearing and airflow limitation in men in Northern Ireland enrolled in the Prospective Epidemiological Study of Myocardial Infarction (PRIME) study. A case-control design was used to study partially dentate men. Cases were men aged 58-72 years who were confirmed as denture wearers. Controls were never denture wearers who were matched by age ( $\pm 1$  month) and smoking habit to the cases. The men had a periodontal assessment and completed a questionnaire detailing their medical history, dental history and behaviours, social circumstances, demographic background and tobacco use. Physical examination and spirometry measurements of forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) were also undertaken. Spirometry data for edentulous men who wore complete dentures were compared with that recorded for the partially dentate men studied. There were 353 cases who were partially dentate and were confirmed denture wearers. They were matched for age and smoking habit to never denture wearer controls. The cases had an FEV1 that was on average 140 ml lower than the controls,  $p = 0.0013$  and a 4% reduction in percent predicted FEV1,  $p = 0.0022$ . Application of the GOLD criteria indicated that 61 (17.3%) of the cases had moderate to severe airflow limitation compared with 33 (9.3%) of controls,  $p = 0.0051$ . Fully adjusted multivariable analysis showed that partially dentate men who were denture wearers were significantly more likely ( $p = 0.01$ ) to have moderate to severe airflow reduction with an adjusted odds ratio (OR) of 2.37 (95% confidence intervals 1.23-4.55). In the 153 edentulous men studied moderate to severe airflow limitation was recorded in 44 (28.4%), which was significantly higher than in the partially dentate denture wearers ( $p = 0.017$ ), and the men who had never worn a denture ( $p < 0.0001$ ). It was concluded that denture wearing was associated with an increased risk of moderate to severe airflow limitation in the cohort of middle-aged Western European men studied.

### Conclusion

According to the aforementioned findings, prolonged denture wearer edentulous patients are at risk of developing spirometric changes. Therefore, prompt advice on the various respiratory exercise regimes should be given to these patients.

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