INTRODUCTION

Currently the world’s population and Chilean population are aging, with an increase percentage of senior population; 60 years and more (1-4). Some clinical studies have reported that there is a prevalence of 20% and 40% of dry mouth in adults over 50 years population, concluding that this condition is higher in women (3-4).

Hyposalivation corresponds to an objective reduction in salivary flow (5-7) while xerostomia is a subjective sensation of dry mouth (8-11). It is considered being production of saliva equals to or less than 0.1 or 0.2 ml per minute (12, 13).

Hyposalivation can be produced by several factors, such as dysfunction in salivary gland, autoimmune diseases, other diseases, medications and smoking (3, 5, 7, 10-14). Hyposalivation may or may not be accompanied by the perception of dry mouth or xerostomia, which corresponds to a condition commonly reported in senior people (3, 5, 10-14). The prevalence of hyposalivation in general population ranged 14.4% to 20%. Meanwhile in autoimmune diseases is over 50% (19, 20).

The prevalence of xerostomia ranged from 0.9% to 64.8% (11, 14, 21). Researchers adjusted xerostomia-influencing factors such as head and neck radiotherapy, Sjögren syndrome, chemotherapy and Graft-versus-host disease (6, 10, 12, 22-24). Other studies relate this condition, in systemic disease, polypharmacy, or simply declare idiopathic (13, 5, 10, 15, 22, 25-27).

Studies have attributed a higher prevalence of oral candidiasis and denture stomatitis, atrophic tongue, dysgeusia, fissured tongue, associated with both hyposalivation and xerostomia (15-7, 15, 28, 29). Because of this, the purpose of this study was to identify the risk factors of xerostomia and hyposalivation in senior people; 60 years and older, and to investigate the association with medications, habits and other oral complications. The hypothesis expected a relationship between Xerostomia and Hyposalivation and at the same time, being women and being senior patients aged 60 years and older. Both were risk factors conditions.

MATERIAL AND METHODS

Design

The study used a cross-sectional non-experimental quantitative research type. The relationship between xerostomia and hyposalivation was evaluated in patients over 60-years old treated at the School of Dentistry at the University of Concepción, Chile.

Patients younger than 60-years old, or people who suffer diseases that do not allow proper examination by the examiner such as psychiatric disorders and bedridden patients, were excluded from the study.

Selection and sample size

Sampling was randomly conducted, using the existing database of patients in the Diagnostic Office, School of Dentistry. The universe of patients 60 years and older who were treated during year 2017 in the School of Dentistry at University of Concepción was 483 people, and the sample calculated for this study was 211 senior people, considering a prevalence of 39.5%, which corresponds to the known prevalence of xerostomia. Data was obtained considering a confidence level of 95% and a margin of error of 5%, power 80%.

Clinical evaluation

A medical history was obtained from all patients, including information related to current systemic diseases, regularly use of medication, tobacco smoking, and alcohol consumption. Complete extraoral and intraoral clinical examinations were performed for all patients to detect oral mucosal lesions using Oral Health Survey; Basic Methods (29) as well as and others disorder such as dry mouth, fissure tongue, atrophic glossitis, dysgeusia, and burning mouth syndrome (BMS). The clinical examinations were carried out by a single operator, (AM).

Xerostomia Inventory- Spanish (XI-sp)

This is a multidimensional survey for measuring dry mouth, which approach evaluates experiential and behavioral aspects of the disease, depending on the relation of results between dry mouth with the levels of salivary secretion of the patient, getting a diagnosis and tracking changes in symptomatology (21, 30). The questionnaire was validated to the Spanish (30) and consists of 11 items in which the patient answers “never”, “rarely”, “occasionally”, “often” and “very often”. With a score ranging from one to five according to code selected response, delivers a sum between 11 and 55 points, which determines the severity of xerostomia perceived by the patient.
patient. It was considered that patients did not present xerostomia when they answered “never” to all or most of the questions, that is, when they obtained total values lower than 14.5 points in the xerostomia inventory. The questionnaires were carried out by a single examiner.

**Spitting method**

For the unstimulated saliva collection, people were told not to eat, drink, smoke, brush their teeth or put anything into their mouths during the 90 min prior to the exam(31). The samples were taken during the morning between 09:00 to 12:00 h due to circadian cycle regulating salivary flow.12 The flow collection must be performed in a quiet environment with the person sitting in a vertical position, head leaning forwards and open eyes, avoiding any body or oral-facial movements.

Patients are asked to remain still, swallow saliva at the beginning and allowed to produce saliva the following five minutes to passively drain all the saliva in the mouth spitting it into the glass tube. The accepted range of normal flow for unstimulated saliva is something above 0.3 to 0.4 mL/min during observation(12,31). Flow rate below 0.2 mL/min is considered hyposalivation(13,32).

Informed consents were obtained from all patients and this study was approved by the Ethics Committee of the University of Concepción.

**Statistical analysis**

Data was analyzed using statistical software (SPSS for Windows [Microsoft] v 16.0; SPSS Inc). Values were normally distributed as verified by Kolmogorov-Smirnov test. Nonparametric statistical tests Chi-square test with Yates’s correction and Fisher’s exact test were used. A multivariate logistic regression models were constructed after checking for collinearity and forward stepwise selection determined the final model. Differences were considered statistically significant when p<0.05.

**RESULTS**

A total of 211 participants were included. There were 159 women and 52 men (75.4% and 24.6%, respectively). The average age of the study population was 69.2±7.1 years; ranged between 60 and 94-years old. From all participants, 171 (81%) presented xerostomia and 140 (66.4%) had hyposalivation. Among the 171 patients who reported having xerostomia, all participants, 171 (81%) presented xerostomia and 140 (66.4%) had hyposalivation. Only female gender (OR=2.54; 95% CI: 1.19-5.43, p=0.036). On the other hand, the hyposalivation was significantly higher for women (p=0.016) was significantly associated with xerostomia. Comparison of age, medications, smoking habits, drinking alcohol, fissure tongue, dysgeusia and BMS do not associate with xerostomia and hyposalivation (p>.005).

**Xerostomia occurs more often in female; 134 (84.3%), with a statistically significant difference when comparing to male (p=.036). On the other hand, the hyposalivation was significantly higher for women (p=.004), as demonstrated in Table 2.**

The relation of hyposalivation and oral mucosal lesions are presented in Table 3. The Chi-square test showed that hyposalivation had a significant association with dysgeusia (p=.035), fissured tongue (p=.001), atrophic tongue (p<.0001), and denture stomatitis (p=.005). When comparing xerostomia and oral diseases a statistically significant correlation was found between atrophic tongue (p=.0001), and denture stomatitis (p=.005) (Table 4).

**Significant associations were considered with a p < 0.05**

**DISCUSSION**

This study identified the risk factors of xerostomia and hyposalivation in senior people 60 years and older, and investigated the relationship
among medication, habits and other oral complications with these pathologies, using the spitting method and xerostomia inventory-Spanish. The hypothesis was partially supported because of there is not a statistically significant correlation between xerostomia and hyposalivation, but multivariate logistic regression analysis revealed that being a woman was significantly associated with xerostomia and hyposalivation.

The current study revealed high rates of xerostomia (81%) compared with other studies where the prevalence varies from 17.2% to 64.8% in senior people1-10,14-15. A great prevalence of xerostomia in female was found (84.3%), with a statistically significant difference comparing to male, this agrees with other observed findings by other authors13,14,17,18.

Regarding hyposalivation in this study, the total participants, 66.4% presented this condition, higher than the prevalence of hyposalivation registered in general population values, ranging from 11.5% to 47%14,16. Hyposalivation is significantly associated with females. Several researches have demonstrated that these differences could be explained by hormonal changes that women experience during the menopause6,19.

Among 171 patients who reported having xerostomia, 69% of them had hyposalivation, these data suggest that xerostomia may occur independent of the amount of saliva secreted by patients, so it is important to perform the evaluation of both xerostomia as hyposalivation in senior population.

In the current research, most frequent systemic diseases were hypertension (58%) and diabetes (21%), which is in concordance with previous studies14,20.

Several studies have reported that most medications used in senior population provoked xerostomia and/or hyposalivation15,16,18,19,21,23. Unlike some authors18,6,9 who found a significant relationship between drug use and perception subjective or objective of dry mouth. The present study found a significant relationship only between xerostomia and intake anxiolytic and tricyclic antidepressants. These findings agreed with those obtained by Ohara et al.16 who showed that people with major depression were more likely to suffer from xerostomia, but it was not found association between depression and hyposalivation.

Another factor identified regarding dry mouth were the habits of tobacco smoking and alcohol consumption15,16,20. When investigating the relation of smoking and amounts of saliva, this study found a significant relationship between smoking habits and hyposalivation, like those reported in previous studies15,17,18,20. Whereas, other studies demonstrated that hyposalivation and xerostomia are not associated with tobacco and alcohol consumption15,23.

The data of multiple regression analyses in the current study show that with being female, oral candidiasis, denture stomatitis and atrophic tongue were significantly associated with hyposalivation. For xerostomia, only for being a woman was a risk factor.

It is widely stated that patients with hyposalivation and/or xerostomia, the more of the senior patients are also affected by candidiasis, dysgeusia, fissured tongue, atrophic tongue, halitosis, burning mouth syndrome, caries, periodontal diseases and taste disturbances5,15,16,20. In the present study, analysis of hyposalivation data and oral mucosal pathologies, were significantly associated with dysgeusia, fissured tongue, atrophic glosisit and denture stomatitis. By linking these oral pathologies with xerostomia, a significant relationship only with atrophic tongue, and denture stomatitis was found. This finding is in concordance with Kimori et al.29, who found a high Candida CFUs, low stimulated saliva flow rate and advanced age were identified as closely associated factors for the risk of development of atrophic tongue. On the other hand, Nakamura et al.30, reported C. albicans was associated with atrophic glosisit in xerostomia patients who had no systemic predisposing factors, indicating that C. albicans remains a treatment target for Candida-related atrophic glosisit.

The study included some limitations. The patient’s recruitment was performed in a dental clinic of a tertiary care center. The study did not include the measure of patient’s quality life outcomes, and saliva composition profile study.

Dentists should be aware of the symptoms of xerostomia and hyposalivation in senior patients (60 years older). They should administer proper treatment to prevent the development of oral lesion. It is important to carry out future research on the prevalence of hyposalivation in the Senior Chilean population. As well as to include routine unstimulated whole-salivary flow measurement, as part of the clinical examination for a correct design of the treatment plans, achieving to improve their quality of life.

CONCLUSIONS

1. No statistically significant association was found between hyposalivation and xerostomia.
2. Hyposalivation was a risk factor for denture stomatitis and atrophic tongue.
3. Being woman was a risk factor for xerostomia and hyposalivation.

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CONFLICT OF INTEREST STATEMENT

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