ORIGINAL ARTICLE

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Oral health status in 12 to 17-year-old school children from Valle Nonguén, Concepción, 2013.

Abstract: Dental caries, periodontal disease and dento-maxillary anomalies are the most common oral problems both globally and nationally. The aim of this study is to determine the oral health status in terms of caries damage, oral hygiene and dento-maxillary anomalies, and their relationship with socio-demographic factors in school children from Valle Nonguén sector, whose ages fluctuate from 12 to 17 years old. This is a study of prevalence which was conducted on a sample of 210 school children, the following indexes were utilized: DMFT, Simplified Oral Hygiene Index (OHI-S), and Dental Aesthetic Index (DAI), sex, age and type of educational establishment (public/subsidized). The results showed that 94.76% of the students have caries damage with a DMFT average of 6.87±3.42, higher in women and adolescents aged 16-17; 73.57% of them have a regular hygiene, with OHI-S higher in 14-15-year-old adolescents and public schools, and a 75.2% has at least one manifest malocclusion (19.05% in a disabling level). These results show that the 12-17-year-old students from Valle Nonguén have a high rate of oral disease in all indexes, higher than national and international studies. A priority is to design and implement preventive/healing dental programs in this group. These results question the design and possible impact of the new program "FONASA Libre Elección 12-17 años" in neighborhoods with limited resources and high treatment needs.
Keywords: "Oral Health" [MeSH], "Adolescent" [MeSH], "Dental Caries" [MeSH], "Dental Esthetics" [MeSH], "Chile" [MeSH].

Estado de salud bucal en escolares de 12 a 17 años de Valle Nonguén, Concepción, 2013.

Resumen: La caries dental, la enfermedad periodontal y las anomalías dento-maxilares son los problemas bucales más frecuentes tanto a nivel mundial como nacional. El objetivo de este trabajo es determinar el estado de salud bucal en cuanto a historia de caries, higiene oral y anomalías dento-maxilares, y su relación con características socio-demográficas en escolares de 12 a 17 años del sector Valle Nonguén. Estudio de prevalencia sobre una muestra de 210 escolares, se utilizaron los siguientes indicadores: COPD, índice de higiene oral simplificado (IHO-S), índice de estética dental (IED), sexo, edad y tipo de colegio (municipal/subvencionado). Los resultados mostraron que: 94,76% de los escolares presenta historia de caries con COPD promedio de 6,87±3,42, mayor en mujeres y adolescentes de 16-17 años; 73,57% tiene una higiene regular, con un IHO-S mayor en 14-15 años y adolescentes de colegios municipales; y el 75,2% presenta al menos una maloclusión manifiesta (19,05% de carácter discapacitante). Estos resultados muestran que los escolares de 12 a 17 años del sector Valle Nonguén presentan un alto índice de morbilidad bucal en todos los indicadores, superiores a estudios nacionales e internacionales. Es prioritario diseñar e implementar programas odontológicos preventivo-curativos en este grupo. Estos resultados cuestionan el diseño y posible impacto del nuevo programa "FONASA Libre Elección 12-17 años" en poblaciones de recursos limitados y con altas necesidades de tratamiento.
Palabras clave: Salud bucal, adolescente, caries dental, estética dental, Chile.

Introduction.

Dental caries, periodontal disease and dento-maxillary anomalies are the most common oral problems at global and national levels[1]. Thus, they have become an important public health problem because of their high prevalence, impact on individuals and in society, as well as the high cost of their treatment[2]. The existence of these diseases affects people's lives, hindering their basic nutritional functions and communication, injuring their self-esteem, feeling ashamed of their smile, hindering their social and labor relationships, limiting their public performance and the possibilities of personal success in developing their full potential[3].

According to Soto *et al*[1], in Chile and the Bío-Bío region, caries prevalence affects a 62.5% and a 63.6% of children who are 12 years old and the prevalence of malocclusions a 52.5% and a 53.6%. However, this study dates from the year 2007 and there are not current epidemiological data at regional level. Awareness of the oral health status of the population is essential in making governmental decisions in order to plan, organize and control dental care appropriately; moreover, it constitutes a valuable system to assess the efficiency and effectiveness of the health system and it provides a tool to demonstrate the ability of the State to ensure the health of its population[4].

Nowadays, adolescents over 12 and under 18 years old are the beneficiaries of a governmental initiative which consists in providing dental coverage ("FONASA Libre Elección"). This initiative will be implemented

through the Program Associated to Diagnosis (PAD), which is a basket of dental attentions oriented to the provision of 5 restorations and endodontics[5]. However, this program would be supported by national statistics of the year 2007[1] and does not consider the characteristics of each town or commune.

The aim of this research is to determine the oral health status with regard to the history of caries, oral hygiene and dento-maxillary anomalies as well as their relationship with socio-demographic factors in 12 to 17-year-old school children from Valle Nonguén, Concepción through the year 2013.

Materials and methods.

Design: Descriptive cross-sectional study.

Population: 12-17-year-old students from educational institutions of Valle Nonguén, two of them public: Lautaro and Liceo Leopoldo Lucero and two subsidized: San Joaquin and Colegio Villa Nonguén, with a total register of 402 students. The only educational establishment that has primary and secondary education corresponds to Liceo Leopoldo Lucero.

Selection Criteria: The participants were selected considering their date of birth; since June 1, 1995 to May 30, 2001, without distinction of sex. Before the exam, authorization from parents was requested through an informed consent and the agreement of the students. Students with interceptive or corrective orthodontic treatment current or previous to the exam and those who had oral lesions which did not allow performing clinical examination were excluded. These criteria were based on that 12 years old is an age of international vigilance of dental caries[6] and Health Services in Chile have organized dental care prioritizing the population under 20 years of age, due to preventive measures have their greatest effectiveness upon this group and the oral damage manages to be controlled with the existing resources[7].

Sample: The estimation of the size of the sample was performed using a prevalence of 52.5% of dento-maxillary anomalies based on data delivered by Soto *et al.*[1] with an absolute precision of 5%, to a level of confidence of 95%, yielding an initial sample of 196 students. 226 students were examined anticipating a criterion for exclusion. The selection of the sample was done by a stratified sampling based on age. When the selection criteria were applied, four students who had active herpes lesions, 10 students who presented orthodontic treatment and two students who refused to participate, were excluded from the study. Finally, the sample was formed by 210 schools (Table 1).

Variables were operationalized as follows:

a) Bio-demographic characteristics: Sex (female / male), age categorized by biennium (12-13, 14-15, 16-17) and type of educational establishment (public/subsidized).

b) History of Dental Caries: Klein and Palmer DMFT[6] Index for permanent teeth was used. It is categorized according to WHO as: Very Low (0 - 1,1); Low (1.2 - 2.6), Moderate (2.7 - 4.4), High (4.5 - 6.5) and Very High (6.6 or more).

c) Oral Hygiene Status: It was obtained by the Simplified Oral Hygiene Index Greene and Vermillion (OHI-S)[6]. The average value was classified in: Excellent (0.0), Good (0,1 - 1.2), Regular (1.3 to 3.0) and Bad (3.1 to 6.0).

d) Dento-Maxillary Anomalies: Dental Aesthetic Index (DAI)[6] was used as evaluator instrument (proposed by PAHO / WHO), which has two components: aesthetic and dental, linked mathematically to produce a unique category which is classified into one of four categories: No abnormality or mild malocclusion where treatment is unnecessary or not very necessary (less than or equal to 25); manifest malocclusion where treatment would be optional (26-30); severe malocclusion where treatment is highly desirable (31-35), very severe or disabling malocclusion where treatment is mandatory (greater than or equal to 36).

Data collection: It was conducted in the premises of the four educational establishments, where school children were subjected to a clinical examination in a place especially created for the occasion, having natural light, curve probe for dental caries, mirror No. 5 and periodontal probe, according to WHO criteria[6]. There was only one examiner and one assistant to avoid bias arising from disagreements in data collection. The data was placed on a medical record designed for this research.

Statistical analysis: The tabulation of the data was performed on MS Excel 2013 spreadsheet. An analysis exploratory of data with the generation of descriptive statistics was conducted, including mean and standard deviation, frequency distribution and percentage. The normal distribution data was checked using the Shapiro-Wilk test. Statistical Nonparametric tests, such as chi square, Kruskal-Wallis and Mann-Whitney-Wilcoxon were used to determine differences among groups. In all the analyses $p < 0.05$ was considered significant.

Bioethical Issues: Informed Consent was developed for parents and / or guardians of the students in order to confirm their voluntary and informed participation in the study. Moreover, the basis of the clinical examination were explained and it was made clear that the information obtained from the study would be private and used for scientific or educational purposes only[8].

Results.

The 61% of the examined population consists of male individuals; in addition, the highest percentage of school-children varies in the range of 12-13 years old (Table 1).

94.76% of individuals presented caries history. The overall mean of DMFT index was 6.87 ± 3.42. The highest mean value of DMFT according to sex was for women (7.86 ± 3.6); according to age was 16 and 17 years old (8.63 ±3.68) and in the case of type of educational establishment was for public schools (7.19 ± 3.63).

The differences were statistically significant in relation to gender (p = 0.0061) and age (p = 0.0015) (Figure 1).

DMFT value was mainly determined by the number of tooth decay (D), with a mean of 4.81 ± 3.11. With regard to the filled teeth component (F) a mean of 1.87 ± 2 was found, and for missed by decay or removal indication (M) a mean of 0.19 ± 0.72 was observed (Figure 2).

The mean of tooth decay (D) for women was 5.44 ±3.38 and for men 4.45 ± 2.86 which was not statistically significant (p = 0.0598). According to age, the average of

decay for 12 to 13-year-old students was 4.38 ± 2.95; 4.73 ± 3.3 for 14-15, and 6.75 ± 2.6 for 16-17-year-old children, presenting statistically significant differences (p = 0.0003). The main value of caries lesions in public educational establishments was 4.98 ± 3.16 and 4.63 ± 3.02 in subsidized,

Age	Sex		Total
	Female	Male	
12 – 13 years old	55 (45.45%)	66 (54.55%)	121 (57.62%)
14 – 15 years old	17 (29.82%)	40 (70.18%)	57 (27.14%)
16 – 17 years old	10 (31.25%)	22 (68.75%)	32 (15.24%)
Total	82 (39%)	128 (61%)	210 (100%)

Table 1. Characterization by age and sex of 12-17-year-old school children from Valle Nonguén, Concepción, Chile, 2013.
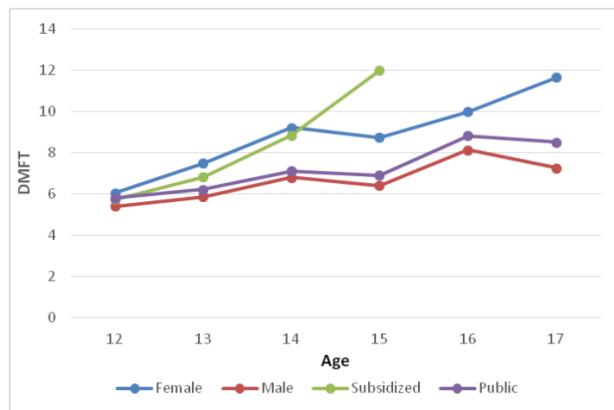

Figure 1. DMFT index by age of 12-17-year-old school children from Valle Nonguén, Concepción, Chile, 2013.
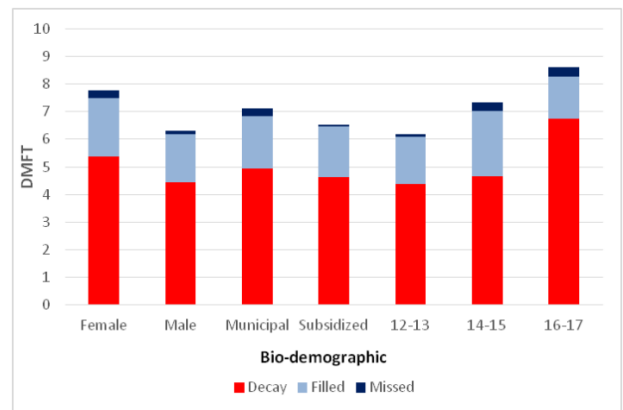

Figure 2. Decay, missed and filled teeth by bio-demographic characteristics of 12-17-year-old school children from Valle Nonguén, Concepción, Chile, 2013.
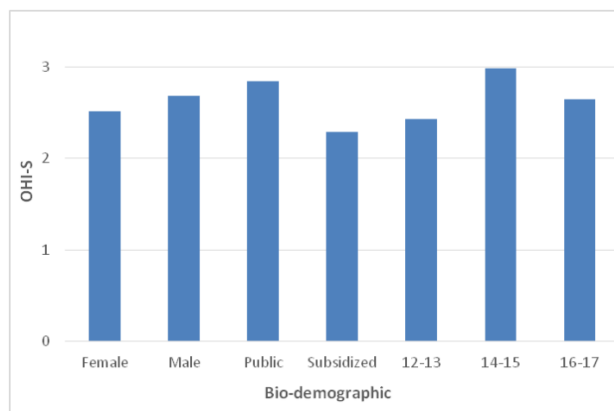

Figure 3. OHI-S by bio-demographic characteristics of 12-17-year-old school children from Valle Nonguén, Concepción, Chile, 2013.
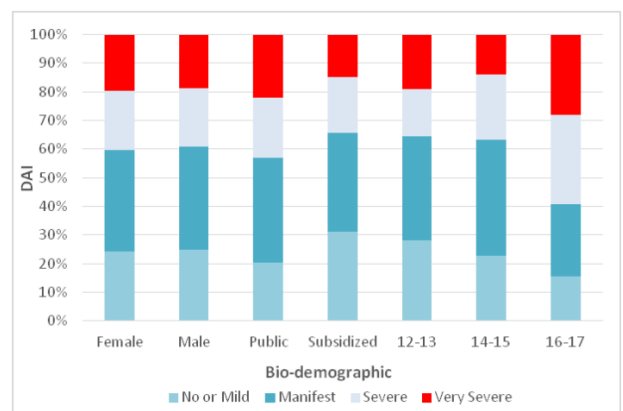

Figure 4. Percentage distribution of DAI by bio-demographic characteristics of 12-17-year-old school children from Valle Nonguén, Concepción, Chile, 2013.

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presenting no statistically significant differences (p = 0.48) (Figure 2).

In the case of the average number of filled pieces (F) and missed by caries (M) only statistically significant differences were observed in lost pieces and type of establishment (p = 0.0073), where public institutions registered greater value. (Figure 2)

The 73.57% of the studied population showed regular type hygiene, while 23.82% presented poor oral hygiene and only 2.61% presented good oral hygiene. No students registered excellent oral hygiene.

For the total sample, the mean OHI- S was 2.61 ± 0.88. The groups of students with the worst hygiene were men (2.68 ± 0.94), those of 14 and 15 years old (3.0 ± 0.94) who belong to public educational establishment (2.84 ± 0.94). These differences were statistically significant in age (p = 0.0005) and type of educational establishment (p = < 0.0001) (Figure 3).

The main of DAI was 30.23 ± 6.74. The results show that a 24.76% of students has a degree of DAI less than or equal to 25, that is to say, with no abnormalities or mild malocclusion where treatment is unnecessary or poorly necessary. 35.71% has manifest malocclusion (DAI 26-30) and treatment would be optional, a 20.48% has a severe malocclusion (DAI 31-36) and the treatment is highly desirable, while a 19.05% presents very severe malocclusion or disabling (DAI> 36) and treatment is mandatory. (Figure 4)

There was a very similar distribution of DAI with different bio-demographic characteristics, there were no statistically significant differences either (p values >0.05). Nevertheless, there was a higher prevalence and severity of malocclusion in the group of 16 to 17-year-old students (mean = 32.7 ± 6.8), although, it is not enough to be considered statistically significant (p = 0.0548). (Figure 4).

Discussion.

Most oral diseases are not life threatening, but because of its high prevalence and how they affect people, either in a functional, aesthetic and psychological way, are considered an important public health problem[9] and need dentistry attention. Therefore, it is crucial to know the actual epidemiological status of the population and, plan, according to these diagnoses, necessary interventions and subsequent assessments of the impact of such evaluations.

The results of this study show that about 95% of the population of 12-17- year-old students from Valle Nonguén has a history of cavities. In general, when increasing the age of the individuals, the damage by decay increases, active lesions being the main cause of these high rates. With regard to the variable type of educational establishment, the public average had higher DMFT.

The national study by Soto *et al.*[1] in 2007 with 12-year-old students showed an average of 1.9 DMFT in the country, and of 2.07 for the region of Bío-Bío, widely differing from the values found in the present study (6.87) and resemble other reported values for certain Chilean cities. In Peralillo (rural sector) the damage by decay in children of 12 years old would amount to a 86.03%[10], similar values were recorded in Frutillar in a group of school children of 10 years of age, where 83.03% had history of caries[11]. On the other hand, in a sample of 1190 children from 5 to 15 years old in the city of Santiago, Chile, except to those from the eastern sector of the city, 79.5% had history of caries[12]. Furthermore, internationally, it can be observed that Mexico[13] reported an average of 7.3 on DMFT students between 13 and 16 years old that resembles the value found in this study.

Regarding to Oral Hygiene in the studied population, the average OHI-S was 2.61. By categorizing this index, the highest percentage of the population presented a regular hygiene; similar results were observed in Cuba the year 2012[14]. It has been determined that during adolescence there is an increase of periodontal disease[14], this study can be supported by a worsening of oral hygiene from the group of 12-13 years old to 14-15, with a slight decrease in adolescents of 16-17, this phenomenon could involved psychological factors of adolescence rather than socioeconomic[15], but they are outside the scope of this work and should be analyzed in future research.

The high prevalence levels of malocclusions in Latin America, according to the Pan American Health Organization PAHO, are over the 80% of the population, being one of the most frequent reasons for consultation in dental clinics[16]. In Chile, a prevalence of malocclusions of a 70% in the population of children of 5-14 years old[17] was estimated to the year 2010. In the present study, a prevalence of 75.2% of students who had at least one malocclusion was found, where a 19.05% was of disabling character, thus treatment is mandatory according to the WHO; these results are similar to those found in Ralco from Pehuenche population[18], and in Brazil[19] in 2013 where it was observed that 65.6% of the population aged 12 had some type of malocclusion, approaching the values found in this study.

Nationally, Soto *et al.*[1] in 2007 found a prevalence of 52.6% dento-maxillary anomalies in school children aged 12, and 53.6% in the Bío-Bío region, these values are lower than those found in the present study. It is important to mention that the lowest values reported in the literature are found in Asian countries like India[20, 21] in the range of 15 to 40% of malocclusion in the population.

It is necessary to mention some limitations of this study such as the indexes used to measure the variables: DMFT index which considered injury only those cavities showing cavitations, and does not record the early stages of the disease, thus underestimating the total number of carious lesions; similar situation occurs with the OHI-S

that reflects the health of the patient at the examination and not necessarily the same permanent status, and finally, the DAI is not considered within its criteria the discrepancies in the midline posterior, cross bite, open bite or type of molar and canine relationship, so it also generates an underestimation of dento-maxillary anomalies. It should be mentioned that the choice of these, however, allows comparison with other studies, since these are the indexes recommended for this type of studies for the WHO[6]. Another point is that intra-observer variation was not determined (there was only one examiner), however, the examination time of all participants was limited and following the WHO[6] indications strictly.

Moreover, given the cross-sectional design of this study, the associations found cannot be interpreted as causal associations. While the results of this study are not generalizable to all adolescents in the region, they show the reality of the oral health of a group of young Chileans who live in outlying areas of the city. The results must not be extended to the population aged 12-17 not attending educational establishments.

By extrapolating the results obtained in this study to a larger population could be inferred that the new governmental initiative to provide with dental coverage through dental PAD "Modalidad Libre Elección" to adolescents between 12 and 17 years old assured by sections B , C and D of FONASA[5], is extremely expensive and in some cases unattainable, particularly for people with very poor oral health status, which is precisely the most vulnerable and therefore have more difficulty to afford the co-payments associated with PAD.

In economic terms, a 12-17-year-old adolescent from Valle Nonguén with five cavities (the average for this population) should be disbursed only for the treatment of these, a total of $ 71.550, which will be increased by the need of endodontic treatment. From the point of view of a family, if this is multiplied by the number of children in this age group, this would not be affordable. This calls into question the actual impact that the implementation of this policy will have, especially in the levels of inequality in oral health, broadly described in a global level[22].

The results obtained in this study show that the students of 12-17 years old from Valle Nonguén, have a high rate of oral disease, therefore, it is necessary: designing, implementing and developing dental programs in order to prevent the apparition of frequent oral disease and prioritize the most vulnerable groups with strategies that ensure access and increase health inequity.

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