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RESEARCH ARTICLE

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PREVALENCE AND CLINICAL CHARACTERIZATION OF MOUTH BREATHING PATIENTS IN VIÑA DEL MAR AND QUILPUÉ, CHILE.

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ABSTRACT

Objective: This study aimed to clinically characterize and determine the prevalence of mouth breathing in the pediatric population.

Materials and methods: 383 students, aged 6 to 13 years, from public and private subsidized schools were analyzed. Clinical criteria were applied, and measurement of maximum nasal inhalation flow (PNIF) was performed to determine their breathing condition (Mouth, Nasal, or Mixed). Statistical analysis of the data was carried out through Stata SE 10.1, R-Cran 2.13.1, and Minitab 15.

Results: The prevalence of mouth breathers was 18,80%, mixed breathers 17,49%, and nasal breathers 63,71%. The most common facial characteristic was the presence of eye bags (82%) and dry lips (78%). The maximum nasal inhalation flow (PNIF) average registered in mouth breathing patients was 54,4 L/min, meanwhile in nasal breathing patients was 84,7 L/min.

Conclusion: Mouth-breathers are a relevant percentage of the examined population. Early intervention of pediatricians is transcendental for the diagnosis, derivation, and treatment of this syndrome in order to limit future complications.

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INTRODUCTION

Human breathing is a basic function of life. If there is any obstacle that prevents nasal-breathing, survival will depend on the adaptation to oral or mouth-breathing. Mouth-breathing corresponds to a mechanism through which air is inhaled through the mouth instead of the nose.[1]

The nasal-breathing function not only concerns general doctors, but also pediatricians, otolaryngologists, allergy specialists, language-speech therapists, pneumonia-specialists, orthodontists, and maxillofacial surgeons; in other words, all those specialists involved in the nasal-breathing function and facial growth[2]. The early detection of the mouth-breathing syndrome is relevant since alterations of the anatomical structures involved, affect not only the orofacial condition of the child but also their systemic health, aesthetics, body posture, mastication function, language-speech function and personality disorders that could affect them for the rest of their lives.

Each member of the health team who examines the child in due course must be prepared to detect mouth-breathing and explain the parents the consequences if the syndrome is not corrected on time, considering that if the habit persists throughout the patient growing period, the alterations will worsen, and correction will become more complex.

The purpose of this study was to determine the prevalence of mouth-breathing in children and make a clinical characterization of it. However, the practical application of this article is to guide the general doctor, and especially pediatricians, for early diagnosis and treatment of this pathology.

MATERIAL AND METHODS

A prevalence study was conducted with students attending public and private subsidized schools in the communes of Viña del Mar and Quilpué in Chile. 6 to 13-year-old children were included, who at the moment of the examination did not have a cold, were not depressed, did not suffer from attention deficit disorder or mental retardation. Informed consent was obtained from the parents or guardians of the students, in addition to the consent of the children.

The examination included the clinical evaluation of the following intra and extraoral characteristics: Dark circles below the eyes (bilateral change of coloration of lower eyelid and of the periorbital socket, ranging from a violet tone to dark brown), Dry lips (dry and cracked lips), Forward posture of head (distance from cervical spine greater than 6 cm from the vertical tangent to the thoracic spine), Hypertrophy of tonsils (size enlarged tonsils), Paleness (abnormal loss of skin coloration), Lip gap (distance from the lowest part of upper lip to the uppermost part of the lower lip), Eversion of the lower lip (voluminous and outwards lower lip), Exposition of upper incisors (measured from the lowest point of the upper lip to the upper incisive edge), compression of maxilla (high palate or narrow base), Deep palate (high or ogival palate dome), Interposition of tongue in phoneme (usual forward push of tongue during speech), Protrusion of upper incisors (incisors in vestibular position), Gingivitis (pathological inflammation of gums), Oral biofilm (mixed heterogeneous microbial community -aerobic and anaerobic- surrounded by an inter-cellular matrix of polymers of salivary or microbial origin adhered over teeth surface), and Nasal permeability These were measured as can be appreciated in figure 1, by means of the maximum nasal inhalation flow using a Portable Nasal Inhalation Flowmeter or PNIF (In-Check Nasal® manufactured by Clement-Clarke International) imported from England. (Figure1)

Figure 1: Collection of clinical characteristics to reach a diagnosis:

A. Clinical examination; B. Nasal permeability record. A + B = Diagnosis.

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By nose-breathing it was considered the free flow of air through the nasal and nasal-pharynx canals; by mixed-breathing, the partial flow of air both through nose and mouth –being this condition temporary or permanent, and by mouth breathing, the mechanism through which air is inhaled through the mouth instead of the nose (1) in a permanent way. The diagnosis of mouth-breathing was carried out according to the clinical criteria presented by Treviño-Salinas (3), in other words, if a child manifested ten or more of the clinical characteristics described above (mouth breathing always present) they were considered a mouth-breather. The qualitative variables were expressed by tables of absolute and relative frequency. Odds Ratio (OR) values were estimated, with their respective confidence intervals at 95% as an association measure for the condition of mouth-breathing, according to the different variables measured. For quantitative variables, descriptive measures were estimated. Fisher's exact test, Pearson's Square-Chi, Mood's median, and Kolmogorov-Smirnov test were applied, according to the behavior of the variables. They were considered significant when the p-value was less than 0.05. The analysis of the database was done using Microsoft Excel 2007, R-Cran 2.13.1, and Minitab 15 software.

RESULTS

The examined sample was composed of 383 students, of which 51% were male and 44.9% female. The average age of children was 9.9 years (SD=2,3). 73.1% of these children attended private subsidized schools, and the remaining 26.7% public schools.

This study determined a prevalence of mouth-breathers of 18.8% [14.9 – 22.7%], nasal-breathers 63.7% [58.89 – 68.52%] and mixed-breathers, 17.5% [13.69 – 21.30%]. The prevalence of characteristics and odds ratio showed on table I. (Table I)

The clinical examination revealed that the most common alterations in mouth breathers were the following: Regarding the maximum inhalation flow (PNIF) and the breathing condition of students, it was observed (Figure 2) an average

Figure 2. Graphic of the relationship between PNIF and respiratory condition

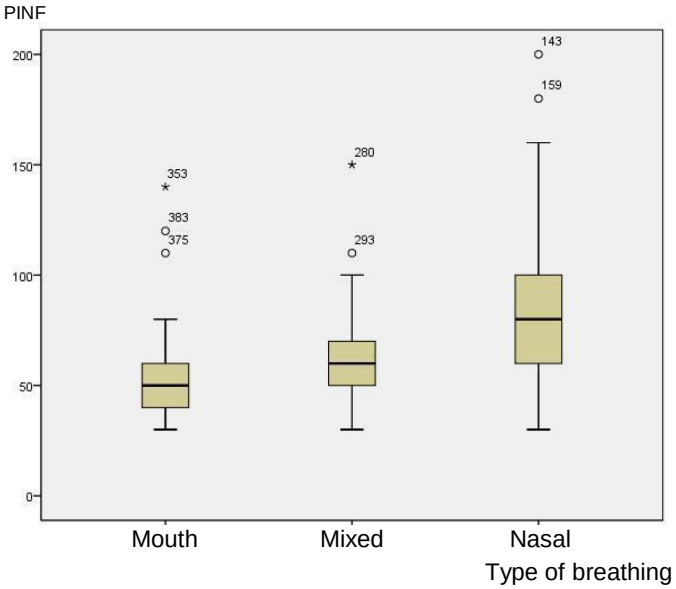

Table I: Prevalence of characteristics and odds ratio

Characteristic	%	OR	IC of 95% for OR
Oral Biofilm	94	6,9	[2,4 - 27,2]
Tongue interposition in phoneme	89	3,9	[1,8 - 10,0]
Lip Gap	88	129,7	[50,6 - 374,5]
Dark circles under eyes	82	4,8	[2,4 - 10,1]
Dry lips	78	4,6	[2,4 - 9,1]
Deep palate	72	4,3	[2,4 - 8,2]
Forward posture of head	65	4,6	[2,5 - 8,5]
Protrusion of upper incisors	63	5,9	[3,3 - 11,0]
Hypertrophy of tonsils	58	4,6	[2,5 - 8,5]
Gingivitis	56	3,8	[2,1 - 6,8]
Eversion of lower lip	51	33,6	[13,5 - 96,6]
Maxillary compression	49	3,3	[1,9 - 8,2]
Paleness	40	6,1	[3,1 - 12,2]
Exposition of upper incisor	18	19,5	[10,2 – 39,1]

PNIF of 5.4 L/min (SD=±20.6) in mouth-breathing children, 84.7 L/min (SD=±30.5) in nose-breathing children, and 62.5 L/min (SD=±21.8) in mixed-breathing children.

In PNIF it was measured no statistically significant differences among mouth and mixed-

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breathers (P-value=0.114).
However, there was a statistically significant difference in the distribution of PNIF measures between mixed and nasal-breathing children (P-value=0), and in the distribution of PNIF measures between mouth and nasal-breathers (P-value=0).

DISCUSSION

The syndrome of mouth-breathing is corroborated as a frequent condition in 6 to 13-year-old students, although this pathology could be easily detected at an early age by diverse medical professionals.

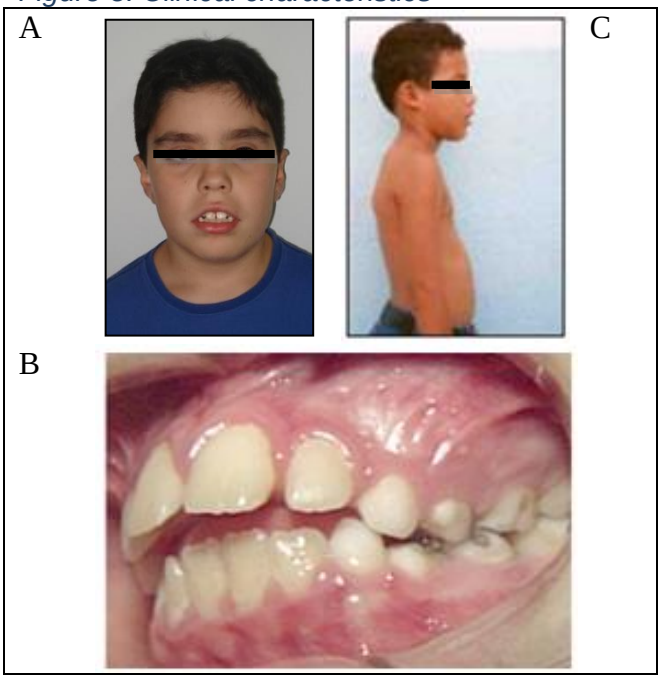
This study considered a standardized procedure for the examination and gathering of data, using a tester calibrated by experienced dentists to ensure a right and reliable diagnosis for each tested student[1,3]. Children sick with cold were excluded so as not to incorporate bias to the sample, as they show a momentary mouth-breathing pattern conditioned by the temporary obstruction of their respiratory airways.
Our results are similar to the ones detected by other studies carried out in Chile: in 1999 it was determined a prevalence of 23% of mouth-breathers among 1878 students evaluated4; meanwhile, in 2001 it was reported a 34.5% (5) of the prevalence of mouth-breathing in 5 to 17-year-old children in Santiago de Chile.

At an international level, a Cuban study carried out in 2009 reported a percentage of 24.7% of mouth-breathing children from 3 to 14-year-old. The most affected group was those from 6 to 11-year-old children[3].

Mouth-breathing is a syndrome that can have its etiological origin in obstructive problems, habits, and/or anatomy[6]. Thus, we see that it can be originated due to an atypical swallowing habit encouraged by finger sucking or prolonged use of pacifiers. In the beginning, this action is done consciously but afterward in an unconscious and repetitive way causing damage and setting up mouth-breathing in a permanent way4. Thus, if it is detected before the conscious stage the best therapeutic effect will be reached.
Some children breathe by the mouth due to obstructions and/or anatomy as they have a deviation in nose septum, enlarged turbinate bones, chronic inflammation, and congestion of the pharynx mucous membrane, allergies, and tonsils hypertrophy[7]. These children will need a more complex treatment, probably complemented with surgery or orthodontics to achieve correcting the bone and teeth alterations.

The consequences of mouth-breathing may be divided into extraoral, facial, and body clinical characteristics. Among the former, the following stand out: hypoplasia of the middle third of the face or maxillary atrophy, mandibular prognathism, weakness of facial muscles, dark circles below the eyes, narrow nostrils, hypo-tonicity of the upper lip, upper lip short and inefficient, lower lip thick and everted, and dry lips8 (figure 3A). Among the extraoral non-facial characteristics most frequently found in mouth breathing children the following stand out: abnormal body posture[8], a forward posture of the head, lordosis, protrusion of shoulders (figure 3C), elevation of scapulas and poor growth of thorax[9] which are easy to be detected and professionals must take into consideration to make a prompt diagnosis.

Figure 3: Clinical characteristics



A. Facial extraoral clinical characteristics; B. Protrusion of upper incisors; C. Protrusion of shoulders[11]

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Our results coincide with those reported by other studies, which conclude that the most common intraoral characteristics are the presence of oral biofilm, irritation of oral mucosa, hypertrophy of tonsils[9], maxillary compression, vis a vis bite (overjet and overbite equal to 0mm) or crossed bite2, descended tongue, deep palate, protruded upper incisors (figure 3B), atypical swallowing, gingivitis, and tendency to forward open bite[10].

It is extremely important to recognize the signs of mouth-breathing at an early stage, to give prompt treatment that will prevent further consequences, not only in the oral and maxillofacial zone but also, others described in the literature, such as hypoxia[12], speaking alterations, neck and/or back pain, the sensation of lack of fresh air, tiredness during physical activities, daily drowsiness and poor school performance[3].

Based on the correlation between low nasal permeability and the breathing pattern of the child (Figure 2), it would be recommended to perform follow-up examinations to achieve a more specific diagnose of mouth-breathing.

If detected prematurely, and derivation occurs promptly, the intervention of the pedodontist or orthodontist will be fundamental since these specialists will prescribe the required treatments to hinder and correct the alterations in orofacial growth and development. However, if the syndrome is detected late, a greater amount of health professionals will be required, and eventually, permanent consequences could remain, demanding higher economic costs.

CONCLUSION

Mouth-breathers are a relevant percentage of the examined population. Early intervention of pediatricians is transcendental for the diagnosis, derivation, and treatment of this syndrome in order to limit future complications.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest with respect to this article.

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