Mouth breathing within a multidisciplinary approach: Perception of orthodontists in the city of Recife, Brazil

Valdenice Aparecida de Menezes*, Luiza Laranjeira Cavalcanti**, Tâmara Cavalcanti de Albuquerque**, Ana Flávia Granville Garcia***, Rossana Barbosa Leal****

Abstract

Objectives: To assess the knowledge of a mouth breathing pattern among orthodontists in the city of Recife, Brazil, and to examine their treatment protocols. **Methods:** In this cross-sectional study, members of the Orthodontics and Facial Orthopedics Association of Pernambuco responded individual structured interviews. A form with 14 questions, validated using the face value method, was used to collect data. The level of significance was set at 5%. **Results:** Of the 90 participants, 55.6% were women; 78.9% were specialists (the highest educational level); 67.8% worked full-time in private practice, and 38.9% were also professors. The most frequent diagnostic criteria were: Body posture (97.8%), lip competence (96.7%), and dark circles under the eyes (86.7%), with similar results among young and old orthodontists. The use of the Glatzel mirror was infrequent (3.3%). The most frequently mentioned mouth breathing sequelae were craniofacial (94.4%) and body posture (37.8%) changes. According to interviewees, mouth breathing duration (84.4%) was the item most often associated with sequelae. There were no significant associations between time since graduation and any of the factors under analysis. Most respondents, whether working in private clinics or in the public healthcare system, believed that mouth breathers should be treated by a multidisciplinary team. **Conclusions:** Most orthodontists, regardless of experience, have knowledge of the mouth breathing syndrome and understand the need of a multidisciplinary treatment.

Keywords: Mouth breathing. Orthodontics. Perception.

How to cite this article: Menezes VA, Cavalcanti LL, Albuquerque TC, Garcia AFG, Leal RB. Mouth breathing within a multidisciplinary approach: Perception of orthodontists in the city of Recife, Brazil. Dental Press J Orthod. 2011 Nov-Dec;16(6):84-92.

» The authors report no commercial, proprietary, or financial interest in the products or companies described in this article.

* PhD in Pediatric Dentistry, School of Dentistry of Pernambuco, Pernambuco University (FOP-UPE). Professor, School of Dentistry of Caruaru, Caruaruense Association of Higher Education (ASCES), and Pernambuco University (UPE), Brazil.
** Undergraduate student, Caruaruense Association of Higher Education (ASCES), Brazil.
*** PhD in Pediatric Dentistry, School of Dentistry of Pernambuco, Pernambuco University (FOP-UPE). Professor, Department of Dentistry, Paraíba State University (UEPB), Brazil.
**** Assistant Professor, Caruaruense Association of Higher Education (ASCES), Brazil.

INTRODUCTION

Mouth breathing is a common respiratory disorder in childhood and one of the most serious public health problems.[5] Its extended duration may lead[15,16,21] to a series of structural and functional changes in the stomatognathic system and to physical, psychological and social effects. Mouth breathing problems and their complexity have been a matter of concern for health care workers in several specialties and have contributed to a more frequent adoption of multidisciplinary treatments and studies.[1,9,15,16,18]

The mechanism of normal breathing consists of air inhaled through the nose and its flow through the pharynx and larynx to be humidified, warmed and filtered until the lungs, where the gas exchanges occur. As a vital and innate function of human beings, breathing should be performed in a physiologically correct way to protect upper airways and promote a satisfactory development of the craniofacial complex. If there is abnormal breathing, the organism undergoes a series of adaptive changes throughout the body, which may have serious consequences if not treated at an early stage, since it affects children during the development phase.[3,8,13]

Mouth breathers are individuals that, for some organic, functional or neurological reason, develop an inadequate breathing pattern.[16] They may be classified as: Organic insufficient nasal breathers, due to the presence of nasal, pharyngeal or mouth mechanical obstacles; functional insufficient nasal breathers, which are those that need to undergo surgery; and functional disabled mouth breathers, as sequelae of neurological disorders.

The most common implications of mouth breathing are changes in: Craniofacial and dental anatomy, orofacial structures related to speech, corporal and behavioral patterns, and oral functions.[20] In dentistry, mouth breathing patients are diagnosed according to peculiar facial features, such as: Dark circles under the eyes, vacant eyes, short and incompetent upper lip, chapped lips, lip incompetence, hypotonic muscles, mandibular elevator muscle dysfunction, malocclusion, as well as swallowing, sucking and speaking disorders.[26,29]

As mouth breathing treatments should be planned within a multidisciplinary philosophy, this study assessed the knowledge of the mouth breathing syndrome among orthodontists and orthopedists in the city of Recife, Brazil, and examined their diagnostic and treatment protocols.

METHODS

A quantitative cross-sectional survey was conducted with orthodontists who are members of the Pernambuco Society of Orthodontics and Facial Orthopedics, and worked in private practices or public healthcare services in the city of Recife, Brazil, since 2006. Only 18 out of 108 orthodontists were not found or refused to participate in the study. A total of 90 participants filled out a questionnaire with 15 questions about mouth breathing.

Informed consent was obtained from all clinicians who agreed to participate in this study. The answers were written down at the time of the interview to ensure its accuracy and reliability and to avoid recall problems. Answers reliability was tested using the face validation method with 10% of the interviewees. In this method, they were asked to explain, in their own words, what they have understood about each question. The interviews were conducted in their offices (private practice or healthcare service) and, whenever possible, there was an attempt to not interfere with the routine activities of the interviewees.

Univariate and bivariate analyses were used to obtain absolute distributions and percentages, and the following statistical measures were calculated: Mean, standard deviation, variation coefficient, minimum and maximum values of age (descriptive statistical techniques). A chi-square test was used for comparisons, or the Fisher's exact test when the conditions to use the chi-square test were not met (inferential statistical techniques).

The level of significance was set at 5%. Data were stored in an Microsoft Office Excel spreadsheet, and the Statistical Analysis System v.8 (SAS) was used for statistical calculations.

This study was approved by the Research Ethics Committee of the Pernambuco University, under #020/07.

RESULTS

Only 78.9% of the interviewees were specialists (the highest educational level), 67.8% worked full-time in their private practice, and 38.9% were also professors (Table 1).

Table 2 shows that there were no significant associations between time since graduation and any other variable under study (p>0.05). Most of the interviewees made the diagnosis of breathing pattern during anamnesis (70%). The most frequent diagnostic criteria were body posture (97.8%) and lip competence (96.7%), with similar percentages between groups regarding time since graduation; the use of the Glatzel mirror was infrequent and mentioned by only 9.4% of the interviewees graduated for the longest time.

The greatest percentage differences were found between orthodontists that chose "learning disability" (behavioral changes) as a sequel of mouth breathing (Table 3). Those with 11 to 20 years of graduation had a higher percentage than those with 21 or more years (37.9% x 12.5%).

TABLE 1 - Distribution of interviewees according to sex, years since graduation, degree, place of work and position as professor.

Variable	n	%
Sex		
Men	40	44.4
Women	50	55.6
Time since graduation		
Up to 10 years	29	32.2
11 to 20 years	29	32.2
21 years or more	31	34.4
Not informed	1	1.1
Degree		
MSc	71	78.9
Specialization	11	12.2
PhD	8	8.9
Place of work		
Private practice	61	67.8
Private practice and public healthcare service	29	32.2
Professor		
Yes	35	38.9
No	55	61.1
TOTAL	**90**	**100.0**

TABLE 2 - Evaluation of items associated with diagnosis according to years since graduation.

Variable	Time since graduation								p value
	Up to 10 years		11 to 20 years		21 years or more		Total Group		
	n	%	n	%	n	%	n	%	
When do you make the patient's diagnosis?									
In the waiting room	6	20.7	10	34.5	14	43.8	30	33.3	$p^{(1)} = 0.160$
During history taking	22	75.9	21	72.4	20	62.5	63	70.0	$p^{(1)} = 0.494$
During examination	4	13.8	10	34.5	9	28.1	23	25.6	$p^{(1)} = 0.180$
Which diagnostic methods are used to define the patient's breathing pattern?									
Dental mirror	15	51.7	16	55.2	20	62.5	51	56.7	$p^{(1)} = 0.684$
Metal plate	-	-	-	-	3	9.4	3	3.3	$p^{(2)} = 0.104$
Water (3 minutes)	5	17.2	4	13.8	4	12.5	13	14.4	$p^{(2)} = 0.931$
Water (1 to 2 minutes)	8	27.6	5	17.2	11	34.4	24	26.7	$p^{(1)} = 0.316$
Spatula	1	3.4	1	3.4	4	12.5	6	6.7	$p^{(2)} = 0.360$
Radiographs	8	27.6	15	51.7	12	37.5	35	38.9	$p^{(1)} = 0.166$
Facial pattern	24	82.8	25	86.2	23	71.9	72	80.0	$p^{(2)} = 0.385$
Body posture	25	86.2	27	93.1	27	84.4	79	97.8	$p^{(2)} = 0.615$
Lip sealing	28	96.6	29	100.0	30	93.8	87	96.7	$p^{(2)} = 0.771$
Type of occlusion	21	72.4	23	79.3	23	71.9	67	74.4	$p^{(1)} = 0.765$
Swallowing	18	62.1	18	62.1	20	62.5	56	62.2	$p^{(1)} = 0.999$
Dark circles under the eyes	26	89.7	26	89.7	26	81.3	78	86.7	$p^{(2)} = 0.582$
TOTAL	**29**	**100.0**	**29**	**100.0**	**32**	**100.0**	**90**	**100.0**	

(1): Chi-square test. (2): Fisher's exact test.

Mouth breathing duration (84.4%) was the factor most often mentioned by interviewees as a cause of sequelae. There were no significant associations between time since graduation and any of the items under analysis, considering a level of significance of 5%.

All the 29 interviewees that worked in public healthcare services referred their patients to otolaryngologists and speech pathologists. Table 4 shows that the greatest percentage difference was found for those that refer to psychologists in the group with 21 or more years after graduation (7.7%) and those in the other two groups (37.5% each). For the clinicians that work in private practices, the greatest percentage difference was found in the group of those that refer patients to pediatricians, which was higher in the 11 to 22 years group than in the up to 10 years group. However, no significant association was found between time since graduation and the answers about referral by interviewees that worked in private practices and in public healthcare services.

Multidisciplinary treatment in cases of mouth breathing was classified as unimportant by two interviewees of the 21 or more years group, but this association was not significant ($p>0.05$) (Table 5).

TABLE 3 - Mouth breathing sequelae and their causes according to years since graduation.

Variable	Time since graduation								p value
	Up to 10 years		11 to 20 years		21 years or more		Total Group		
	n	%	n	%	n	%	n	%	
Which factors determine sequelae of mouth breathing?									
Patient age	20	69.0	24	82.8	23	71.9	67	74.4	$p^{(1)} = 0.444$
Etiologic factor	20	69.0	24	82.8	26	81.3	70	77.8	$p^{(1)} = 0.379$
Mouth breathing duration	26	89.7	25	86.2	25	78.1	76	84.4	$p^{(2)} = 0.508$
Other	1	3.4	-	-	-	-	1	1.1	$p^{(2)} = 0.644$
In your opinion, which sequelae are caused by mouth breathing?									
A – Craniofacial and dental anomalies									
Malocclusion	28	96.6	29	100.0	28	87.5	85	94.4	$p^{(2)} = 0.123$
Adenoid faces	6	20.7	10	34.5	8	25.0	24	26.7	$p^{(1)} = 0.477$
B – Anomalies of speech organs									
Lip sealing	7	24.1	9	31.0	10	31.3	26	28.9	$p^{(1)} = 0.790$
Gingival enlargement	1	3.4	6	20.7	3	9.4	10	11.1	$p^{(2)} = 0.111$
Abnormal pattern of facial muscles	2	6.9	6	20.7	7	21.9	15	16.7	$p^{(2)} = 0.252$
C – Body anomalies									
Changes in posture	11	37.9	12	41.4	11	34.4	34	37.8	$p^{(1)} = 0.853$
Dark circles under the eyes	4	13.8	4	13.8	4	12.5	12	13.3	$p^{(2)} = 1.000$
Respiratory deficiency	9	31.0	5	17.2	7	21.9	21	23.3	$p^{(1)} = 0.449$
D – Abnormal oral functions									
Atypical swallowing	10	34.5	11	37.9	9	28.1	30	33.3	$p^{(1)} = 0.710$
Speech anomalies	2	6.9	1	3.4	-	-	3	3.3	$p^{(2)} = 0.305$
E – Behavioral anomalies									
Learning disabilities	8	27.6	11	37.9	4	12.5	23	25.6	$p^{(1)} = 0.072$
Poor quality of life	3	10.3	3	10.3	-	-	6	6.7	$p^{(2)} = 0.135$
Physical tiredness	2	6.9	2	6.9	2	6.3	6	6.7	$p^{(2)} = 1.000$
Low self-esteem	2	6.9	1	3.4	-	-	3	3.3	$p^{(2)} = 0.305$
TOTAL	**29**	**100.0**	**29**	**100.0**	**32**	**100.0**	**90**	**100.0**	

(1): Pearson's chi-square test. (2): Fisher's exact test.

TABLE 4 - Protocol to treat mouth breathers in public healthcare services and private practices according to years since graduation.

Variables	Time since graduation								p value
	Up to 10 years		11 to 20 years		21 years or more		Total Group		
Public healthcare service - referrals	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Otolaryngologist	8	100.0	8	100.0	13	100.0	29	100.0	**
Speech pathologist	8	100.0	8	100.0	13	100.0	29	100.0	**
Psychologist	3	37.5	3	37.5	1	7.7	7	24.1	$p^{(1)} = 0.221$
Dentist	3	37.5	1	12.5	3	23.1	7	24.1	$p^{(1)} = 0.651$
Pediatrician	3	37.5	2	25.0	3	23.1	8	27.6	$p^{(1)} = 0.869$
Orthodontist or orthopedist	7	87.5	7	87.5	12	92.3	26	89.7	$p^{(1)} = 1.000$
TOTAL	**8**	**100**	**8**	**100.0**	**13**	**100.0**	**29**	**100.0**	
Private practice - referrals									
Otolaryngologist	27	93.1	29	100.0	30	93.8	86	95.6	$p^{(1)} = 0.542$
Speech pathologist	29	100.0	28	96.6	32	100.0	89	98.9	$p^{(1)} = 0.644$
Psychologist	4	13.8	6	20.7	4	12.5	14	15.6	$p^{(1)} = 0.762$
Dentist	6	20.7	7	24.1	8	25.0	21	23.3	$p^{(2)} = 0.917$
Pediatric dentist	4	13.8	10	34.5	7	21.9	21	23.3	$p^{(2)} = 0.171$
Orthodontist or orthopedist	28	96.6	28	96.6	31	96.9	87	96.7	$p^{(1)} = 1.000$
TOTAL	**29**	**100.0**	**29**	**100.0**	**32**	**100.0**	**90**	**100.0**	

(1): Fisher's exact test. (2): Pearson's chi-square test.

TABLE 5 - Evaluation of answers to the question "What is your opinion about multidisciplinary treatment in cases of mouth breathing?" according to years since graduation.

Opinion about multidisciplinary treatment	Time since graduation								p value
	Up to 10 years		11 to 20 years		21 years or more		Total Group		
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Very important	28	96.6	29	100.0	30	93.8	87	96.7	$p^{(1)} = 0.284$
Important	1	3.4	-	-	-	-	1	1.1	
Not important	-	-	-	-	2	6.3	2	2.2	
TOTAL	**29**	**100.0**	**29**	**100.0**	**32**	**100.0**	**90**	**100.0**	

(1): Pearson's chi-square test. (2): Fisher's exact test.

DISCUSSION

Changes in breathing patterns may affect the general health of an individual[1,9,15,16,18] and, therefore, are not limited to the occurrence of orthodontic disorders. For most dentists (70%), the breathing diagnosis is made according to anamnesis, which is taken when orthodontists, particularly those that graduated more recently ($p<0.05$), make an attempt to investigate other disorders associated with mouth breathing.[27]

In general, the selection of diagnostic clinical methods and criteria is directly associated with the objectives of the different healthcare specialties. One of the major problems in breathing diagnoses is the lack of an accurate definition of what a mouth breather is, as nasal breathing may occur in variable degrees.[26,28]

The main parameters to diagnose respiratory patterns were: Lip competence, body posture and dark circles under the eyes. The Glatzel mirror (3.3%), spatula (6.7%) and water in the mouth (14.4%) for 3 minutes ($p<0.05$) were diagnostic methods not often used by the interviewees (Table 2). These methods are frequently used to determine respiratory patterns and not to define causal factors. High percentages of participants mentioned the use of a dental mirror (56.7%) and radiographs (38.9%).

Mouth breathing is complex and compromises several organs and structures.[10] Therefore, diagnoses should be made by the otolaryngologist (radiographs of the cavum and fiberoptic nasal endoscopy), orthodontist (lateral radiograph) and speech pathologist.[11,13] Etiological factors should be carefully defined to avoid prescribing inadequate treatments,[20,29] and other physical, emotional and social anomalies that affect health and life quality should be analyzed.[15,16,21]

The most frequent answers for the question about what factors contribute to the deterioration of mouth breathing were: Mouth breathing duration, etiological factor and age. The difference in time since graduation was not significant ($p>0.05$). Breast-feeding in the first months of life stimulates nasal breathing,[23] and, in addition to responding to nutritional and emotional needs, ensures that infants develop facial and oral structures adequately and avoids that pacifier sucking, bottle feeding, finger sucking and nail biting become habits.[6,14,29]

Patients should be diagnosed and referred to specialists at an early stage, when facial bone deformations and cardiorespiratory, immunological and behavioral changes[22,26] have not yet developed. In this study, 87 respondents (96.5%) considered that multidisciplinary treatment is essential, and only 2 (2.2%) of those graduated for a period longer than 21 years classified it as irrelevant, although differences were not significant ($p>0.05$) (Table 5).

The dentists unanimously agreed that mouth breathing leads to several sequelae, the most frequent of which are, according to literature: Long face,[27] narrow nostrils, lip incompetence, lack of facial muscle tone,[17,24] drooping eyes, dark circles under the eyes, slanted eyes, stooping shoulders, unbalanced spine and small nose. The factors most often mentioned were: Lip sealing (97.8%), body posture (96.7%) and dark circles under the eyes (86.7%), in agreement with findings reported in other studies.[2,17,28]

The most remarkable oral features were: Hypotonic, dry or everted lips, narrow and deep palate, lip incompetence, constrict maxillary arch, Class II malocclusions (facial asymmetry, open bite and posterior crossbite)[24,26,29] and swallowing, sucking and speech abnormalities.[4,13,22,23] The highest percentage of sequelae mentioned by the dentists was in the group of craniofacial and dental changes; malocclusion was pointed out by 94.4% of the participants, in agreement with data reported in other studies.[13,21]

Mouth breathers have frequent behavioral changes, such as: Irritation, bad mood, sleepiness, restlessness, lack of concentration, agitation, anxiety, fear, depression, suspiciousness,

impulsivity[6,19] and learning disabilities.[20,30] These data confirm the opinion of the interviewees, as well as other authors belief:[1,7] Prevention and early diagnosis of mouth breathing are important to reduce problems in psychosocial adjustment.

Most dentists mentioned that mouth breathers are special patients who present a series of problems and sequelae, and need to be treated differently by using an interdisciplinary approach within a broad view of multidisciplinarity (Tables 4 and 5). This may be justified by the emphasis assigned to this problem in recent years and by the recognition that integrated approaches are important to improve life quality.[16,21] However, the difficulty to access public services and the fact that the general population is unaware of the sequelae caused by this disorder may affect the results.

CONCLUSIONS

- A high percentage of dentists have knowledge about the mouth breathing syndrome and its sequelae.
- According to most orthodontists and orthopedists interviewed, a multidisciplinary treatment is essential for full rehabilitation.

REFERENCES

1. Alvarenga AL, Pádua IPM, Silveira IA. O respirador bucal. Pro Homine. 2003;2(2):21-5.
2. Andrade FV, Andrade DV, Araújo AS, Ribeiro ACC, Deccax LDG, Nemr K. Alterações estruturais de órgãos fonoarticulatórios e más oclusões dentárias em respiradores orais de 6 a 10 anos. Rev CEFAC. 2005;7(3):318-25.
3. Bianchini AP, Guedes ZCF, Vieira MM. Estudo da relação entre a respiração oral e o tipo facial. Rev Bras Otorrinolaringol. 2007;73(4):500-5.
4. Bicalho GP, Motta AR, Vicente LCC. Avaliação da deglutição em crianças respiradoras orais. Rev CEFAC. 2006;8(1):50-5.
5. Carvalho GD. SOS respirador bucal: obstáculos nas diferentes estruturas dificultando ou impedindo o livre processo respiratório. [on line] 1999 oct-nov-dec [Acesso 2005 Feb 10] . Disponível em: http://www.ceaodontofono.com.br/artigos/art/1999/out99.htm.
6. Carvalho GD. Síndrome do respirador bucal ou insuficiente respirador nasal. Rev Secret Saúde. 1996;2(18)22-4.
7. Cintra CFSC, Castro FM, Cintra PPVC. As alterações orofaciais apresentadas em pacientes respiradores bucais. Rev Bras Alergia Imunopatol. 2000;23(2):78-83.
8. Correa MSNP. Odontopediatria na primeira infância. In: Altmann EBC, Vaz ACN. Atualização fonoaudiólogica em Odontopediatria. 2ª ed. São Paulo: Ed. Santos; 2005. p. 56-69.
9. Coimbra C. O tratamento da respiração bucal. 2002. [Acesso 2003 Mar 24]. Disponível em: www.jfservice.com.br/viver/arquivo/dicas/2002/10/17-Cal/.
10. Coelho MF, Terra VHTC. Implicações clínicas em pacientes respiradores bucais. Rev Bras Patologia Oral. 2004;3(1):17-9.
11. Costa CMF. Influência do tratamento da respiração oral na sintomatologia de crianças com transtorno do déficit de atenção/hiperatividade [dissertação]. 2007. São Paulo (SP): Universidade de São Paulo; 2007.

12. Cunha DA, Silva GAP, Motta MEFA, Lima CR, Silva HJ. A respiração oral em crianças e suas repercussões no estado nutricional. Rev CEFAC. 2007;9(1):47-54.
13. Di Francesco RC, Bregola EGP, Pereira LS, Lima RS. A obstrução nasal e o diagnóstico ortodôntico. Rev Dental Press Ortod Ortop Facial. 2006;11(1):107-13.
14. Ferraz MJPC, Souza MA. Respiração bucal. Uma abordagem interdisciplinar. 2003. [Acesso 2005 out 14]. Disponível em: www.respiremelhor.com.br/artigos.php.
15. Jorge TM, Duque C, Félix GB, Costa B, Gomide MR. Hábitos bucais: interação entre Odontopediatria e Fonoaudiologia. J Bras Odontopediatr Odontol Bebê. 2002;5(26):342-50.
16. Leal RB. Elaboração e validação de um instrumento para avaliar a qualidade de vida do respirador oral [dissertação]. Recife (PE): Universidade de Pernambuco; 2004.
17. Lessa FCR, Enoki C, Feres MFN, Valera FCP, Lima WTA, Matsumoto MAN. Influência do padrão respiratório na morfologia craniofacial. Rev Bras Otorrinolaringol. 2005;71(2):156-60.
18. Lemos CM, Junqueira PAS, Gomez MVSG, Faria MEJ, Basso SC. Estudo da relação entre oclusão dentária e a deglutição no respirador oral. Arq Int Otorrinolaringol. 2006;10(2):114-8.
19. Lusvargui L. Identificando o respirador bucal. Rev APCD. 1999;53(4):265-74.
20. Marchesan IQ. Avaliação e terapia dos problemas da respiração. In: Marchesan IQ. Fundamentos em Fonoaudiologia: aspectos clínicos da motricidade oral. São Paulo: Guanabara Koogan; 1998.
21. Menezes VA, Leal BR, Pessoa RS, Pontes RMES. Prevalência e fatores associados à respiração oral em escolares participantes do projeto Santo Amaro-Recife, 2005. Rev Bras Otorrinolaringol. 2006;72(3):394-9.
22. Parizotto SPCOL, Nardão GT, Rodrigues CRMD. Atuação multidisciplinar frente ao paciente portador da síndrome da respiração bucal. J Bras Clín Odontol Int. 2002;6(36):445-9.
23. Paiva JB. Entrevista. Identificando o respirador bucal. Rev APCD. 1999;53(4):265-74.
24. Queluz DP, Gimenez CMM. A síndrome do respirador bucal. Rev CROMG. 2000;6(1):4-9.
25. Rodrigues HOSN, Faria SR, Paula FSG,Motta AR. Ocorrência de respiração oral e alterações miofuncionais orofaciais em sujeitos em tratamento ortodôntico. Rev CEFAC. 2005;7(3):356-62.
26. Saffer M, Rasia Filho AA, Lubianca Neto JF. Efeitos sistêmicos da obstrução nasal e da respiração oral persistente na criança. Rev AMRIGS. 1995;39(3):179-82.
27. Schlenker WL, Jennings BD, Jeiroudi MT, Caruso JM. The effects of chronic absence of active nasal respiration on the growth of the skull: a pilot study. Am J Orthod Dentofacial Orthop. 2000;117(6):706-13.
28. Suliano AA, Rodrigues MJ, Caldas Júnior AF, Fonte PP, Porto-Carreiro CF. Prevalência de maloclusão e sua associação com alterações funcionais do sistema estomatognático entre escolares. Cad Saúde Pública. 2007;23(8):1913-23.
29. Spinelli MLM, Casanova PC. Respiração Bucal. 2002 fev [Acesso 2006 set 24]. Disponível em: www.odontologia.com.br/imprimir.asp?id=224&idesp=14.
30. Vera CFD, Conde GES, Wajnsztejn R, Nemr K. Transtornos de aprendizagem e presença de respiração oral em indivíduos com diagnóstico de transtornos de déficit de atenção /hiperatividade (TDAH) CEFAC. 2006;8(4):441-55.

Submitted: November 13, 2007
Reviewed and Accepted: December 4, 2008

Contact address
Valdenice Aparecida de Menezes
Rua Carlos Pereira Falcão 811/602 Boa Viagem
Zip code: 51021-350 – Recife / PE – Brazil
E-mail: valdmenezes@hotmail.com