The mouth breathing syndrome: prevalence, causes, consequences and treatment

Síndrome da respiração oral: prevalência, causas, consequências e tratamento

Diana Lopes Lacerda Martins, Luciana Fontes Silva Cunha Lima, Vanessa Favero Demeda, Ana Luiza Oliveira da Silva, Angela Rosanne Santos de Oliveira, Flávia Melo de Oliveira, Sarah Beatriz Freire Lima, Valéria Soraya de Farias Sales

Research performed at Department of Surgery, Federal University of Rio Grande do Norte (UFRN), Brazil.
Financial support: none.
Conflict of interest: none
Correspondence address: Diana Lopes Lacerda, Department of Surgery, Federal University of Rio Grande do Norte, at Av. Nilo Peçanha 620, Natal, RN, Brazil.
Submitted: 29 Jul 2014. Accepted, after review: 15 Aug 2014.

ABSTRACT

The Mouth Breathing Syndrome (MBS) is characterized by pattern of mouth breathing (MB) or mixed breathing chronic caused by nasal obstruction or inflammatory factors, which may be present in half of the school children. The permanence of the framework affects the individual globally, and especially their stomatognathic functions, posture and quality of life, requiring multidisciplinary care. This paper aims to provide an overview of recent scientific production on the prevalence, etiologies, sequelae and treatments in MBS. The method used was a literature review through a research in the databases of LILACS, Medline and SciELO, using defined inclusion criteria. The 45 articles chosen were distributed and analyzed in groups: prevalence (1), causes (9), consequences (28) and treatments (7). This review highlighted the lack of studies on the prevalence of MB, specially in adults, besides the preponderance of studies on the consequences rather than on the analysis of its causes and treatments. It also showed the need to sensitize health professionals to the recognition of MBS, as long as a global and early intervention with these patients.

Keywords: Mouth Breathing Syndrome; Mouth breathing; Prevalence, Causes, Sequelae; Treatment.

RESUMO

A Síndrome de Respiração Bucal, (SRB) é caracterizada por um padrão de respiração bucal (RB) ou respiração crônica mista causada por obstrução nasal ou fatores inflamatórios, que podem estar presentes em metade das crianças em idade escolar. A permanência do quadro afeta o indivíduo como um todo, especialmente as suas funções estomatognáticas, a postura e a qualidade de vida, necessitando de atendimento multidisciplinar. Este trabalho tem como objetivo fornecer uma visão geral da produção científica recente sobre a prevalência, etiologia, sequelas e tratamentos em SRB. O método utilizado foi uma revisão da literatura através de uma pesquisa nas bases de dados Lilacs, Medline e SciELO, utilizando critérios de inclusão definidos. Os

45 artigos selecionados foram distribuídos e analisados em grupos: prevalência (1), etiologia (9), conseqüências (28) e tratamentos (7). Esta avaliação destacou a falta de estudos sobre a prevalência da RB, especialmente em adultos, além da predominância de estudos sobre as consequências e não na análise de suas causas e tratamentos. A revisão também mostrou a necessidade de sensibilizar os profissionais de saúde para o reconhecimento da SRB, para uma intervenção global e precoce com esses pacientes.

Descritores: Síndrome de respiração bucal. Respiração oral. Prevalência. Etiologia. Sequelas. Tratamento.

INTRODUCTION

The mouth breathing syndrome (MBS) is characterized by the replacement of standard nasal breathing exclusively for a standard oral or mixed substitutive with lasting longer than 6 months. Commitments in functional, structural, postural and biomechanical aspects are involved in this syndrome[1].

Mouth breathing (MB) in children is a frequent complaint in the pediatrician's, the allergist and otolaryngologist offices[2]. Studies in Brazilian cities with students, found a prevalence of this syndrome ranging from 26% to 56% of the children[3,4] . In addition to these medical specialties, it is very important the contribution of audiologists, dentists and physiotherapists.

There are several factors that can lead to mouth breathing, and allergic rhinitis is possibly the most common, affecting 15-20% of the population. The hypertrophy of palatine tonsils and adenoids is the second cause of this breathing pattern[2]. The permanence of this framework, besides endangering the balance of stomatognathic functions, such as chewing, swallowing, breathing and phonation, conditions that influence development of individual, will change the balance of muscular and postural strength, that causes losses in sleep and learning. Therefore, the model of nasal breathing when replaced by supplementary, oral or mixed pattern, can, according to their duration, intensity and time of installation, cause severe morphological and quality of life changes[5].

Due to the relevance of the topic, this article aims to survey the scientific literature in recent years regarding prevalence, etiology, consequences and treatments for mouth breathing in order to update healthcare professionals involved in the recognition of this syndrome and sensitize them looking for an early and comprehensive intervention.

METHODS

For the preparation of this paper, we used a literature review from articles published in scientific indexed journals identified from the databases LILACS, MEDLINE and SciELO using key words "mouth breathing". In the study, inclusion criteria were papers that addressed prevalences, etiology, consequences and treatments for mouth breathing, published in the last five years, the scientific article type, made based on studies of the case-control, cohort, clinical trials or literature

reviews, conducted with samples of all age groups and both sexes. We found 47 articles and 2 were excluded. These articles were excluded for addressing similar results (postural consequences) to several other selected. Based on 45 studies, were presented the results of scientific production related to prevalence of MB, their causal relationships, impact and therapeutic approaches.

RESULTS

Prevalence

A Brazilian study analysed 419 school children, aged 6 to11 years, and showed that the prevalence of this syndrome was 56.8% from the sample investigated[4].

Causes

Regarding the causes of the MBS, two studies found that the emergence of MB coincides with the decrease in labial sealing and breastfeeding and also with the increased use of bottle and pacifier sucking[6,7]. In two articles, allergic rhinitis was identified as the major etiological factor[8,9], and in one of them about 36% of 439 children with MB had atopic cause[8]. This finding was consistent with a study on the impact of allergic rhinitis on the breath, revealing that 100% of adults, 96.7% of adolescents and 83.3% of children had MB[10]. There were also reports related with cystic fibrosis[11], moderate persistent asthma[12], present in 44% and 45% of patients, respectively. With regard to international literature, a study in Chile, with 100 oral breathing children aged 3 - 5 years showed that 27% had no obstruction of the upper airway. The main cause of the obstruction was adenoid hypertrophy (48, 8%), followed by turbinate hypertrophy (29.0%). The minor causes corresponded to choanal and maxillary atresia with 12.0% and 7.0%, respectively[13]. A Brazilian study with 308 mouth breathers 3-12 years found palatine tonsillar hypertrophy in 47%, adenoid hypertrophy in 46% and atopy in 36% of evaluated patients[2].

Consequences

Postural changes

The postural adaptations in MB are documented in five studies conducted with children containing samples variables of 34-430 people[1,3,14-16]. Two of which showed that the main postural change occurs in the cephalic segment, more anterior in the mouth breathers[14,15] . A study on changes in the thoracic spine showed abnormalities like retraction of chest, trunk inclination and thoracic kyphosis on the mouth breathers[3].

Four researches revealed that the MB and its postural changes negatively affected respiratory biomechanics [1,16-18], three of them showing a reduction in exercise capacity by decreased respiratory muscle strength in comparison with nose breathers[1,16,18].

Orofacial and stomatognathic changes

Addressing changes in facial morphology, a survey found that the main clinical changes of breathers are: long face, narrow nostrils, inappropriate lip seal and

malocclusion[5]. In controversy, other research of the sample revealed that the presence of adenotonsillar hypertrophy or rhinitis was not associated with these facial stigmas[19].

In the case of cephalometric evaluation, it was found a total of seven jobs conducted with children using samples ranging from 40 to 144 subjects[20-26]. One article found predominance of short face in nasal and long face in mouth breathers[20]. However, two other studies found no differences in anthropometric measurements and orofacial proportions[21,22]. Two studies demonstrated that cephalometry in children with mouth breathing is similar to the cephalometric pattern in patients with obstructive sleep apnea syndrome (OSAS) described in the literature[23,24].

Two studies analyzed measurements of the hard palate, and one of them demonstrated that the MB was associated, with great frequency, to increase the depth of the hard palate and, less frequently, to decrease its width[25]. In the other study, there was no difference in the measures of the palate in relation to respiratory pattern[26].

The research that compared the swallowing mouth and nose breathers found that the mouth breathers showed swallowing disorders with the presence of lip, chin and tongue thrust action, while nasal breathers showed no such changes[27]. Studies on chewing found no statistical difference on masticatory performance of the oral and nasal breathers[28,29]. Another study showed that the RO interfered negatively to masticatory muscle activity[30]. One of the studies showed decreased tone of the tongue and lower lip in oral breathers[31] and another highlighted phonation changed in 30% of the oral breathers analyzed[8].

A study related MB with the modification in the overall diet and nutritional status, associated with the involvement of structures such as the dental arch, to changes in the masticatory process, difficulties in smelling, taste disorders and orofacial miofunctional disorders[32].

Hearing changes

Research related to the leading causes of MBS with auditory consequences showed two results. In one of them, the mouth breathers by functional etiology had 100% of normal hearing and in the others etiologies, a mild conductive hearing loss was prevalent, especially in cases of adenoid hypertrophy[33]. In the other study, children with MB showed lower performance on auditory processing skills than children with normal breathing pattern[34].

Sleep changes

We found two articles in the literature that directly address sleep disorders. OSAS was present in 42% of individuals in a sample of 248 patients, being higher in males, and correlated with the finding of hypertrophy adenotonsillar, primary snoring in 58% and the peak occurrence of these disorders was within the age range from 4 to 7 years[35]. In another article, it was performed population-based survey that evaluated quality of life, especially the MB group reported having problems sleeping, with snoring achieving 87%[36].

Learling changes

With regard to learning, three articles tested the occurrence of learning deficit in children affected by MBS, two of which pointed out that damage[37,38] and the other showed no significant differences in this regard[36].

Treatments

In the literature, it was found the following approaches to physiotherapy for MBS: miofuncional therapy, study of 6 children[39], reeducation of the respiratory muscles in 10 school[40] and postural correction exercises performed in 12 children with MB[41], which respectively promoted improvement in the standard of labial sealing, increased inspiratory capacity and improved craniocervical alignment with restoration of physiological lordosis.

Regarding to the area of speech-therapy, two studies were conducted; one with 24 children and adolescents with asthma and allergic rhinitis, which was based on the awareness and proprioception mode and respiratory tract, isometric exercises for strengthening the lips, tongue and cheeks, appropriateness of placement of sealing lips, adequacy of habitual tongue position and breathing exercises to stimulate nasal breathing being effective in spacing and reduce allergic crises and exacerbations[42]. The second was an intervention made with 40 children, based miofunctional exercises, workout of the respiratory and miofuncional mode, which resulted in a significant gain in nasal breathing function, improvement of strength and praxis[43].

As for surgical approaches, research has demonstrated the benefits of adenotonsillectomy for 18 children with adenotonsillar hypertrophy in order to allow the return of nasal breathing, benefit to the dental occlusion, favoring the adequate morphofunctional development of the face[44]. Another article analyzed the effect of rapid maxillary expansion surgery in 29 children and it was found that this procedure, by itself, is not justified to induce a nasal breathing pattern in oral breathers[45].

DISCUSSION

Mouth breathing leads to several deleterious consequences, such as changes in body posture, development of the stomatognathic system, changes in nutritional status, sleep disorders and school problems[3]. Thus, it is imperative a global intervention, avoiding pathological compensatory mechanisms[1].

In addition to the consequences, it is critical to detect the cause of MB to not indicate inappropriate or insufficient treatments, and also the overall analysis of the patient, including aspects that compromise the quality of life.

MB inhibits the neural mechanisms that regulate airway function since its components are located in the nose[32]. Nasal block also results in higher airway resistance with inadequate alveolar ventilation. It has also been shown that breathing pattern imposed by the MBS involves adaptive postural requirements. To facilitate airflow through the pharynx, the patient projects the head and extends the neck[1,16]. These neuromuscular adaptations may compromise the body balance[14] since, facing the change of one unit biomechanics, refinements and compensation of the postural control systems occur.

When opening the mouth to breathe, it also occurs imbalance in orofacial functions[32], may cause dental abnormalities, of the phonoarticulatory organs, disturbances in chewing and swallowing[3]. When the genesis of the problem is adenoid hypertrophy, eustachian tube can be blocked contributing to the development of ear infections and hearing loss[33].

Some children who breathe through the mouth may have nocturnal obstructive apnea due to the reduction in nasopharyngeal airway[23]. The change in the sleep process, often caused by poor cerebral oxygenation, also leads to constant state of adynamia, headaches, daytime sleepiness, nocturnal enuresis and even learning deficit[32]. Sleep disorders are very frequent and pointed out as causes of reduced quality of life by interfering both in social and scholar performances.

Studies on the prevalence and causes of SRO found results in line with the literature with emphasis on allergic rhinitis, which is configured as the most prevalent cause. This reinforces the importance of the allergist in the management of oral breathing. Exception should be made for the lack of studies about other causes also common MBS, especially in adults, such as nasal septal deviation and turbinate hypertrophy, as well as prevalence studies of MBS in adults.

In the analysis of the consequences, is notorious the increase number of works focusing on this, as well as the range of observed changes. Studies on postural adaptations confirm what is already known in the literature about these sequels, especially the cervical anteriorization, recognized as the main compensatory postural change. Changes in facial measurements and the stomatognathic function were reported in several analyzed papers, but a minority of them did not find, in the samples tested, the presence of these deformities in their patients. Less studied sequelae, such as the effects on hearing health, sleep and neuropsychiatric were also explained, demonstrating that the MBS affects a wide range of issues involved in health.

The management towards a patient with mouth breathing consists of several treatment options depending on the cause and the sequel for each patient can be medication, surgery, rehabilitation speech therapy, physical therapy or orthodontics. Also in this case it was found that the studies, beyond limited number, are structured often based on small samples of patients without combat the cause of MB, which decreases the confidence in the results. Little has been investigated as treatments targeted on causes of the MB, and the majority of the work is focused only on reducing sequelae.

CONCLUSION

The mouth breather is a patient with multiple conditions and therefore requires comprehensive and multidisciplinary clinical look to early detect this syndrome, minimizing its deleterious effects.

This review showed the lack of studies of the prevalence of MB in adults, and the preponderance of studies about the consequences of MB rather than analyzing its causes and treatments. This review concludes that much progress is needed in a multidisciplinary look regarding these patients, for all health professionals better understand the syndrome and prevent its sequelae.

REFERENCES

1. Okuro RT, Morcillo AM, Ribeiro MÂ, Sakano E, Conti PB, Ribeiro JD. Mouth breathing and forward head posture: effects on respiratory biomechanics and exercise capacity in children. J Bras Pneumol. *2011; 37: 471-9.*
2. Costa Junior EC, Cantareira SHA, Sponchiado MC, Azevedo CB, Menezes UP, Pereira VFC et al . Atopia e hipertrofia adenoamigdaliana em pacientes respiradores bucais em um centro de referência. Braz J Otorhinolaryngol. 2013;79:663-7.
3. Conti PBM, Sakano E, Ribeiro MAGO, Schivinski CIS, Ribeiro JD. Avaliação da postura corporal em crianças e adolescentes respiradores orais. J Pediatr. 2011;87: 357-63.
4. Felcar JM, Bueno IR, Massan AC, Torezan RP, Cardoso JR. Prevalence of mouth breathing in children from an elementary school. Cien Saude Colet. 2010;15:437-44.
5. Menezes VA, Tavares RLO, Granville-Garcia AF. Síndrome da respiração oral: alterações clínicas e comportamentais. Arq Odontol. 2009; 45:160-5.
6. Pacheco AB, da Silva AMT, Mezzomo CL, Berwig LC, Neu AP. Relation between oral breathing and nonnutritive sucking habits and stomatognathic system alterations. Rev CEFAC. 2012;4:281-9.
7. Theodoro E, Oliveira AE, Barbosa RW. The influence of sucking habits on occlusion development in the first 36 months. Dental Press J Orthod. 2012;17:96–104.
8. Hitos SF, Arakaki R, Solé D, Weckx Luc L M. Respiração oral e alteração de fala em crianças. J] Pediatr. 2013;89:361-5.
9. Bezerra LA, Silva HJ, de Melo ACC, de Moraes KJR, da Cunha RA, da Cunha DA et al . Masticatory Changes in Oral Breath Secondary to Allergic Rhinitis: Integrative Review. Int Arch Otorhinolaryngol. 2014;18:128-31.
10. De Lemos CM, Wilhelmsen NSW, Mion OG, de Mello Júnior JF. Alterações funcionais do sistema estomatognático em pacientes com rinite alérgica: estudo caso-controle. Rev Bras Otorrinolaringol. 2009;75:268-74.
11. Franco L P, Moreira PA. Avaliação endoscópica nasal de crianças e adolescentes com fibrose cística. Braz J Otorhinolaryngol. 2009;75:806–13.
12. Menezes VA, Barbosa AMF, Leal RB, Santos JA, Barros LF, Azevedo MFA. Padrão de respiração em crianças asmáticas. Odonto. 2010;18:24-9.
13. Pérez Quiñónez JA, Martínez JL, Moure Ibarra M, Pérez Padrón A. Respiración bucal en niños de 3-5 años. Parroquia Catia la Mar Vargas. Rev Med Electrón. 2010; 32(5):1-7.
14. Roggia B, Correa B, Pranke GI, Facco R, Rossi AG. Postural control of mouth breathing school aged children regarding gender. Pro Fono. 2010;22:433-8.
15. Motta LJ, Martins MD, Fernandes KPS, Mesquita-Ferrari RA, Biasotto-Gonzalez DA, Bussadori SK. Relação da postura cervical e oclusão dentária em crianças respiradoras orais. Rev CEFAC. 2013;11:298-304.
16. Okuro RT, Morcillo AM, Sakano E, Schivinski CIS, Ribeiro MAGO, Ribeiro JD. Exercise capacity, respiratory mechanics and posture in mouth breathers. Braz J Otorhinolaryngol. 201;77:656-62.

17. Da Silveira W, Mello FCQ, Guimarães FS, de Menezes SLS. Alterações posturais e função pulmonar de crianças respiradoras bucais. Braz J Otorhinolaryngol. 2010;76:683-6.
18. Boas APDV, Marson FAL, Ribeiro MAGO, Sakano E, Conti PBM, Toro ADC et al. Teste de caminhada e rendimento escolar em crianças respiradoras bucais. Braz J Otorhinolaryngol. 2013;79:212-8.
19. Souki BQ, Pimenta GB, Souki MQ, Franco LP, Becker HM, Pinto JA. Prevalence of malocclusion among mouth breathing children: do expectations meet reality? Int J Pediatr Otorhinolaryngol. 2009;73:767-3.
20. Bolzan GP, Souza JA, Boton LM, da Silva AMT, Corrêa ECR. Tipo facial e postura de cabeça de crianças respiradoras nasais e orais. J Soc Bras Fonoaudiol. 2011;23:315-20.
21. Bolzan GP, da Silva AMT, Boton LM, Corrêa ECR. Estudo das medidas antropométricas e das proporções orofaciais em crianças respiradoras nasais e orais de diferentes etiologias. Rev Soc Bras Fonoaudiol. 2011;16:85-91.
22. Retamoso LB, Knop LAH, Guariza Filho O, Tanaka OM. Facial and dental alterations according to the breathing pattern. J Appl Oral Sci 2011;19:175-81.
23. Juliano ML, Machado MAC, de Carvalho LBC, do Prado LBF, do Prado GF. Mouth breathing children have cephalometric patterns similar to those of adults patients with obstructive sleep apnea syndrome. Arq Neuro-Psiquiatr. 2009;67(3B): 860-5.
24. Juliano ML, Machado MAC, de Carvalho LBC, dos Santos GMS, Zancanella E, do Prado LBF et al. Obstructive sleep apnea prevents the expected difference in craniofacial growth of boys and girls. Arq Neuro-Psiquiatr 2013;71:18-24.
25. Berwig LC, da Silva AMT. Análise quantitativa do palato duro de respiradores orais: revisão de literatura. Rev Soc Bras Fonoaudiol. 2011;16:483-7.
26. Berwig LC, da Silva AMT, Côrrea ECR, de Moraes AB, Montenegro MM, Ritzel RA. Análise quantitativa do palato duro em diferentes tipologias faciais de respiradores nasais e orais. Rev CEFAC. 2012;14:616-25.
27. Hennig TR, da Silva AMT, Busanelo AR, de Almeida FL, Berwig LC, Boton LM. Deglutição de respiradores orais e nasais: avaliação clínica fonoaudiológica e eletromiográfica. Rev CEFAC. 2009;11:618-23.
28. De Oliveira RLB, Noronha WP, Bonjardim LR. Avaliação da performance mastigatória em indivíduos respiradores nasais e orais. Rev CEFAC. 2012;14:114-21.
29. Pulido VY, Piloto MM, Gounelas AS, Rezk DA, Duque AY. Cambios cefalométricos en pacientes respiradores bucales con obstrucción de vías aéreas superiores entre 8-12 años. Rev Cien Méd. 2012;16:90-103.
30. Ikenaga N, Yamaguchi K, Daimon S. Effect of mouth breathing on masticatory muscle activity during chewing food. J Oral Rehabil. 2013;40:429-35.
31. De Andrada e Silva MA, Marchesan IQ, Ferreira LP, Schmidt R, Ramires RR. Postura, tônus e mobilidade de lábios e língua de crianças respiradoras orais. Rev. CEFAC. 2012;14:853-60.
32. Da Cunha DA, da Silva GAP, da Silva HJ. Repercussões da respiração oral no estado nutricional: por que acontece? Arq Int Otorrinolaringol. 2011;15:223-30.
33. Bianchini AP, Guedes ZCF, Hitos S. Respiração oral: causa x audição. Rev CEFAC. 2009;11:10-5.
34. Correa BM, Rossi AG, Roggia B, da Silva AMT. Análise das habilidades auditivas de crianças com respiração oral. Rev CEFAC. 2011;13:668-75.

35. Izu SC, Itamoto CH, Pradella-Hallinan M, Pizarro GU, Tufik S, Pignatari S, Fujita RR. Obstructive sleep apnea syndrome (OSAS) in mouth breathing children. Braz J Otorhinolaryngol. 2010;*76*:552–6.
36. Popoaski C, Marcelino TDF, Sakae TM, Schmitz LM, Henrique L, Correa L. Avaliação da qualidade de vida em pacientes respiradores orais. Arq Int Otorrinolaringol. 2012;16:74–81.
37. De Menezes VA, Luiz R, Tavares DO, Granville-garcia AF. Síndrome da respiração oral : alterações clínicas e comportamentais. Arq Odontol. 2009;45:160-5.
38. Fensterseifer GS, Carpes O, Weckx LL, Martha VF. Mouth breathing in children with learning disorders. Braz J Otorhinolaryngol. 2013;79:620-4.
39. Gallo J, Campiotto AR. Terapia miofuncional orofacial em crianças respiradoras orais. Rev CEFAC. 2009;11:305-10.
40. Ferreira FS, Weber P, Corrêa ECR, Milanesi JM, Borin GS, Dias MF. Efeito da fisioterapia sobre os parâmetros ventilatórios e a dinâmica tóraco-abdominal de crianças respiradoras bucais. Fisioter Pesqui. 2012;19:8-13.
41. Weber P, Corrêa ECR, Ferreira FS, Milanesi JM, Trevisan ME. Análise da postura craniocervical de crianças respiradoras bucais após tratamento postural em bola suíça. Fisioter Pesqui. 2012;19:109-14.
42. Campanha SMA, Fontes MJF, Camargos PAM, Freire LMS. O impacto do tratamento fonoaudiológico no controle da asma e da rinite alérgica em crianças e adolescentes respiradores orais. J Pediatr. 2010;86:202-8.
43. Marson A, Tessitore A, Sakano E, Nemr K. Efetividade da fonoterapia e proposta de intervenção breve em respiradores orais. Rev CEFAC. 2012;14:1153-66.
44. Pereira SRA, Bakor SF, Weckx LLM. Adenotonsillectomy in facial growing patients: spontaneous dental effects. Braz J Otorhinolaryngol. 2011;77:600-4.
45. Itikawa CE, Valera FCP, Matsumoto MAN, Lima WTA. Effect of rapid maxillary expansion on the dimension of the nasal cavity and on facial morphology assessed by acoustic rhinometry and rhinomanometry. Dental Press J Orthod. 2012;17:129-33.