

MOUTH BREATHING SYNDROM-AN INTERDISCIPLINARY APPROACH

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ABSTRACT

Aim of the study Mouth breathing syndrome (MBS) is a multifactorial condition where the patient breathes predominantly through the mouth instead of the nose, leading to negative consequences on facial development, oral and general health. Because of its complexity, MBS therapy requires close collaboration between different specialities. MBS is not just a respiratory problem; it also affects cranio-facial development, oral health, sleep and even some systemic functions of the body. An interdisciplinary approach ensures a complete evaluation and holistic treatment of the patient, addressing not only the symptoms but also the underlying causes of MBS. Collaboration between specialists allows an individualized treatment, adapted to the specific needs of each patient preventing long-term complications. Involvement of both patient and family in the oral rehabilitation process, supported by the interdisciplinary medical team, is crucial for the success and maintenance of long-term results.

Materials and methods The research undertaken aimed to identify the opportunities, challenges and barriers existing in the interdisciplinary approach to complete MBS rehabilitation. The study took into account the responses of 720 specialists from various fields of medicine involved in MBS therapy. **Results** Dentistry has only 14.5% of recommendation because it is the most represented among the specializations present in the study. Most often, the dentist recommends an ENT specialty or orthodontics. At the top of most frequent symptomatology was sleep disorders, with only 14 doctors specialised in somnology as classified itself as the newest type of the specialty. The most frequent symptomatology (484 responses) is sleep apnea followed by 432 answers of orthodontic issues and with close values of dry mouth and halitosis. **Conclusions** Through collaboration between otolaryngologists, orthodontists, dentists, speech therapists, allergists and other specialists, optimal results can be achieved, improving the general health, craniofacial development and quality of life of patients.

Key words: mouth breathing syndrome, oral rehabilitation, obstructive sleep apnea (OSA), polysomnography

INTRODUCTION

Mouth breathing syndrome (MBS) is a variety of symptoms and signs in which an

individual substitutes nasal breathing predominantly or exclusively to mouth breathing. The nasal cavity mucosa filters, moistens and warms the inhaled air. Patients

with MBS use their mouths to breathe, daytime but it usually progress even at times of rest, during sleep. It affects children and adults leading to chronic conditions [1].

MBS involve structural modification that prevent nasal breathing such as nasal obstructions (eg, allergic rhinitis, deviated septum, nasal polyps), hypertrophy of tonsils or adenoids and craniofacial malformations [2].

MBS is accompanied by a number of symptoms and consequences, such as dry mouth, dental caries, malocclusion, sleep disorders (including obstructive sleep apnea), leading to craniofacial changes in children [3,4].

Furthermore, if not properly rehabilitated, MBS can have negative effect on facial development, leading to reversible dysfunction of maxillofacial morphology, which contribute to dental migration leading orthodontic conditions, breathing sleep-disorders, and even impaired cognitive and behavioural development especially in children [1, 5].

Due to the various causes of MBS an interdisciplinary approach is often necessary, involving specialists from multiple fields, such as otorhinolaryngology, orthodontics, dentistry, and speech therapy because prompt recognition and treatment is essential to prevent long-term complications. This syndrome is a complex but treatable condition that requires a complete evaluation and a treatment plan tailored to each individual patient [3, 5].

Etiology of Mouth Breathing Syndrome

The etiology of MBS is complex and multifactorial, involving multiple factors: anatomical, functional, developmental, behavioural or environmental. It is essential to understand these aspects because they influence formulating of diagnosis and preparing treatment plans [6, 7].

The anatomical factors of MBS affect the

structure of the airways and contribute to the obstruction or limitation of airflow through the nose, forcing the individual to breathe through the mouth, and require careful evaluation for correct diagnosis and appropriate treatment [8]. Nasal obstruction is the most frequent symptom of the nasal cavity. The most common anatomical causes of MBS is nasal septum deviation or an abnormal alignment of the nasal septum after trauma to nose. The deviated septum is between the two nostrils leading to blocking of nostrils, reducing airflow causing difficult of breath and forcing mouth breathing [9]. Another form of nasal obstruction that contribute to MBS is nasal turbinate hypertrophy and represents the swelling of mucosa due to allergy, medicaments, hormones or respiratory infections. Nasal polyps are benign growths from the nasal mucosa due to chronic inflammation associated with asthma and allergy that obstruct the nasal passage. Unfortunately, multiple surgery is required due to the disease recurrence [10]. Hypertrophy of the tonsils and adenoids is another anatomical cause of MBS. Tonsils are lymphatic tissue located in the tonsillar fossa at the junction between oro- and hypopharynx. When enlarged, they partially or completely narrow the upper airway, forcing mouth breathing. Adenoids, located behind the nasal passage, histological similar to the tonsils, but are located higher up in the nasopharynx. When adenoids hypertrophied, they can completely block the nasal airflow, causing mouth breathing. These causes of MBS present especially in children [11].

Craniofacial malformations represent another category of anatomical factors favouring MBS. Within this type of malformations is important to mention the following conditions: high arched palate, ogival palate, mandibular retrognathia (condition characterized by a retraction of the lower jaw, can lead also to an abnormal

positioning of the tongue), macroglossia [12].

Other category of anatomical factors that favour and maintain MBS malocclusions. Abnormal alignment of teeth and jaws, dental malocclusions by affecting tongue and airway position. An exaggerated overlap of the upper teeth over the lower teeth (overbite) can push the tongue back, resulting an obstruction of airflow; moreover, a narrow dental arch can limit the space needed for effective nasal breathing, forcing children or adults to breathe through the mouth [10].

Anatomical factors are essential in the evaluation of patients with MBS and often require an interdisciplinary approach to correct, involving specialists from otorhinolaryngology, orthodontics, maxillofacial surgery, and dentistry. Treatment can range from surgery to correct obstructions to orthodontic and speech therapy to retrain nasal breathing.

Functional factors of mouth breathing syndrome are related to the functioning of the respiratory system as well as breathing behaviour that contribute to the emergence or maintenance of this breathing pattern. These factors can influence or aggravate MBS even in the absence of significant anatomic obstructions [13].

Bad breathing habits represent the development of a habit of breathing through the mouth, even when the nasal passages are not obstructed, a habit that can become chronic. Night time mouth breathing in some people occurs predominantly during sleep and this is related to excessive relaxation of the throat and upper airway muscles, leading to partial or complete obstruction of nasal airflow [7, 14].

Viral or bacterial infections of the upper respiratory tract (for example, common cold) cause temporary nasal congestion, forcing the patient to breathe through the mouth. If these episodes are frequent, they may help establish a pattern of mouth breathing. During sleep,

intermittent upper airway obstructions can cause frequent awakenings and favour mouth breathing leading to obstructive sleep apnea disorder (OSA) is often associated with MBS, especially in adults [9,12].

An additional category of functional factors are respiratory allergens causing allergic rhinitis or increased sensitivity to irritants. Inflammation of the nasal lining caused by allergens (such as pollen, dust, or mold) can lead to chronic nasal congestion. This can force the individual to breathe through the mouth for prolonged periods, contributing to the onset and persistence of MBS. In addition, people who are sensitive to environmental irritants such as cigarette smoke or air pollution may experience chronic inflammation of the upper respiratory airways, which favours mouth breathing [12, 15].

Behaviour factors. State of anxiety or stress can lead to rapid and shallow breathing, often through mouth, which can become a predominant breathing pattern. In some individuals, mouth breathing may be a reaction to anxiety or panic, which may perpetuate the habit of mouth breathing even in the absence of acute stress [13, 16].

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In cases of obesity reduced muscle tone of the oro- and hypopharynx muscles can contribute to mouth breathing because these muscles fail to keep the upper airway open. This can be a common problem in children, but also in adults. If the tongue and soft palate muscles do not function properly, this can lead to abnormal tongue positioning and soft palate

collapse, obstructing the airway and favouring oral breathing [7, 17].

Behaviour factors play an important role in the onset and maintenance of MBS and may interact with anatomical factors to exacerbate the problem. Identifying and correcting these factors requires a holistic and interdisciplinary approach, which may include behavioural therapy, speech therapy, breathing re-education, as well as specific treatments for allergies or other medical conditions [13, 18].

Developmental factors that contribute to MBS are related to how certain anatomical and functional characteristics form and evolve during a child's growth. These factors can influence an individual's predisposition to MBS, either by influencing the facial structure or the way the child gets used to breathing. Here is a description of the main developmental factors that can cause MBS [19]. Craniofacial features, such as shape and size of the jaw, position of the teeth, or the size of nasal cavities, are inherited genetically. For example, a narrow palate or an underdeveloped jaw can be passed down from parents and contribute to nasal breathing difficulties, thus favouring MBS. Additionally, genetic syndromes such as Down syndrome, Marfan syndrome, orofaciogigital syndrome, and Pierre Robin sequence are frequently linked to craniofacial abnormalities and increase the likelihood of individuals developing MBS [20]. There is even a genetic component to allergy susceptibility. Children from families with a history of allergies are more prone to allergic rhinitis and, implicitly, to chronic nasal congestion, which can lead to mouth breathing [21, 22].

Oral breathing habits such as prolonged thumb sucking, pacifier use or breastfeeding can influence the development of the jaws and palate, which can contribute to malocclusions and oral breathing patterns. If a child develops a temporary habit of mouth breathing due to

nasal congestion or infection, this habit may persist even after the initial problem is resolved, becoming another factor in the development of MBS [23].

Modern diet, which often includes soft and easy-to-chew foods, can lead to underdevelopment of the masticatory muscles and jaws, which can contribute to malocclusions and other problems that favour oral breathing. Breastfeeding helps the jaws and facial muscles to develop properly. Children who are not breastfed or are weaned prematurely may be at increased risk of developing craniofacial structures that predispose to MBS [24].

Environmental factors are represented by habits, lifestyles and surrounding conditions that can contribute to the occurrence or worsening of mouth breathing [26, 27].

Firstly, children can adopt mouth breathing by imitating their parents or other people around them who have this habit. If parents are predominantly mouth breathers, children may develop the same breathing patterns. Then, insufficient education about the importance of healthy nasal breathing can contribute to the perpetuation of oral breathing. Many parents and educators are unaware of the negative effects of mouth breathing, which may delay appropriate intervention [28, 29].

Children who grow up in environments with increased pollution, cigarette smoke, or other respiratory irritants are more likely to develop chronic nasal obstructions, which can contribute to MBS. Addressing these factors can prevent or minimize the impact of MBS on the overall health and development of the child [26].

Dry air, especially in rooms with air conditioning or central heating, dry out the nasal mucosa, causing irritation and congestion. This can make nasal breathing uncomfortable and encourage mouth breathing. Poorly ventilated spaces, where moisture and mold are common problems, can

exacerbate respiratory conditions, forcing individuals to adopt mouth breathing. Living or working in cold environments can lead to nasal congestion because cold air causes vasoconstriction [30, 31].

All these factors emphasize the importance of a holistic approach in the treatment of MBS. Changing breathing habits, improving environmental conditions. Educating patients and their families are essential for the effective prevention and management of oral breathing syndrome.

Consequences of mouth breathing syndrome in oral health

MBS can have multiple health consequences, starting with physical development and general well-being of patients. These consequences vary depending on the duration and severity of the syndrome, as well as the age at which it begins and how quickly it is treated [32, 33].

The most frequent consequences on oral health involve dental cavities, gingivitis, periodontal diseases, halitosis or dental malocclusion. Constant mouth breathing leads to the evaporation of saliva (xerostomia). Saliva plays a crucial role in maintaining oral health by neutralizing acids produced by bacteria, removing food debris and remineralizing tooth enamel. A lower presence of saliva is associated with a higher risk of plaque formation because it can no longer effectively remove bacteria and food from the oral cavity. Saliva has a buffering effect on acids, helping to maintain a neutral pH in the oral cavity. In the absence of saliva, the pH drops, creating an acidic environment in which cavities develop more easily. In a dry environment, mouth bacteria, especially *Streptococcus mutans* tend to multiply. These bacteria metabolize sugars in food and produce acids as by-product, which attack tooth enamel and lead to its demineralization therefore bacterial plaque accumulates on the surface of the teeth, favouring the appearance of dental

caries [34-37]

Chronic oral breathing can create conditions that favour the development of gingival inflammation and periodontal disease, negatively influencing the overall health of the gums and the supporting structures of the teeth. Constant mouth breathing exposes the gums to dry air, which causes them to become dehydrated. Dry gums are more vulnerable to irritation and inflammation, which can lead to gingivitis. Gingivitis is an inflammation of the gums caused by the accumulation of bacterial plaque [38]. In the context of MBS, inflammation can be more severe due to dry oral conditions and a lack of saliva, which normally helps and protect the gums. Nevertheless if gingivitis is not treated, bacteria and inflammation resulting from plaque build-up can progress to periodontal disease (periodontitis), a more serious condition where not only gums but also the supporting structures of the teeth (alveolar bone) is affected leading to damage of the periodontal ligaments [39]. Chronic mouth breathing can accelerate this destruction due to constant inflammation and lack of salivary protection. Periodontal diseases are associated with various systemic complications such as cardiovascular disease, diabetes and other inflammatory conditions. Appropriate management of MBS, along with rigorous oral hygiene and preventive interventions, is necessary for maintaining gingival health and preventing periodontal complications [40, 41].

Moreover, mouth breathing lead to a change of an oral environment propitious for development of halitosis also known as bad breath. Patients with MBS especially when sleeping are often affected even by a severe morning halitosis, due to the increased drying of the oral cavity during the night, when salivary flow is already naturally reduced. Absence of saliva to wash away bacteria and food debris overnight, leading to the formation of volatile sulphur compounds which is the

main cause of halitosis. Therefore, it is essential that people with MBS maintain rigorous oral hygiene, including regular brushing of the teeth and tongue, flossing, and using antibacterial mouthwashes. Using products that stimulate saliva production or maintain moisture in the oral cavity can help combat dryness and, by implication, halitosis. To correct mouth breathing, there are behavioural therapies, treatments for nasal obstructions or surgery intervention, which can reduce halitosis associated with MBS. In severe cases, second opinion with a dentist or an otorinolaryngologist is recommended for a personalized treatment plan [42-44].

Consequences on craniofacial development.

Mouth breathing syndrome has significant effects on craniofacial development, especially in children. Breathing through the mouth instead of nose negatively influences how the jaws, facial bones and adjacent structures develop. These effects can have long-term consequences on facial appearance, oral function and general health [45]. The main consequences of MBS on craniofacial development are insufficient development of the upper jaw (narrow jaw – narrow palate), mandibular retrognathia (retraction of the mandible), adenoid face (elongated face, narrow palate, small nostrils, prominent upper jaw and retracted chin), anterior open occlusion (tooth spacing - the upper and lower front teeth do not meet when the mouth is closed), asymmetric facial development (improper positioning of the jaws or in asymmetric dental alignment), various orthodontic complications (corrected by treatments may include palatal expansion, orthodontic corrections and, in some cases, orthognathic surgery) and associated respiratory problems (respiratory obstruction or sleep problems) [48].

Mouth breathing syndrome can have significant and long-term consequences on

craniofacial development, influencing negatively facial aesthetics, oral function and general health. Early recognition and treatment of MBS is essential to prevent these problems and to ensure normal and healthy development of the face and associated structures. Interdisciplinary intervention, which may include orthodontists, otolaryngologists, speech therapists, and other specialists, is often necessary to manage these effects effectively [47, 48].

General health consequences.

MBS can worsen existing respiratory conditions, such as asthma and allergies, and contribute to the development of chronic respiratory conditions. Obstructive sleep apnea associated with MBS increase the risk of high blood pressure, cardiovascular disease, and stroke. People who do not receive treatment for MBS in childhood have an increased risk of developing obstructive sleep apnea in adulthood. Incorrect positioning of the tongue and abnormal development of the oral cavity can lead to speech difficulties, including pronunciation defects and other speech disorders. Constant mouth breathing can impair the protective barrier of the airways, increasing susceptibility to respiratory infections such as recurrent pharyngitis and otitis [49, 50].

In children and adolescents with MBS psychosocial consequences are seen in those who become self-conscious about their facial appearance or develop insecurities with snoring and mouth breathing, which can affect self-esteem and social relationships. Also sleep disturbances and breathing problems can lead to unfocus, memory problems, and poor academic performance [51, 52].

The effects of MBS are multiple and can dramatic affect a person's quality of life, physical development, and overall health. Therefore, early identification and treatment of this condition is essential, preferably through an interdisciplinary approach that includes

dentists, otolaryngologists, orthodontists and other relevant specialists [53, 54].

identification of the underlying causes of MBS and the development of a personalized treatment plan that addresses all aspects of the condition.

MATERIALS AND METHODS

In order to identify the challenges assumed by the interdisciplinary approach, we carried out an observational study conducted between April and November 2023, having two successive and distinct periods. In a first phase, the target group was formed, with the agreement to participate by completing the informed consent. The batch consisted of 720 specialists from various fields of general medicine and dentistry related to mouth breathing syndrome.

The second stage consisted of completing a questionnaire through which we analyse the degree of collaboration between specialists in the treatment of MBS and at the same time to find the objective or subjective reasons that cause the lack of collaboration. The target group consisted of doctors working in clinics and individual medical practices who were willing to participate in the study after being explained what it consisted of and what this study aimed for. The method used was the Questionnaire and the chosen form of data collection was the face-to-face discussion with the interviewees. The motivation of the form of data collection was precisely to be able to provide additional explanations where the items in the questionnaire were not 100% understood and thus to ensure that all the answers are given in an informed manner and the results of the study are not flawed.

Interdisciplinary approach in clinical evaluation

For MBS diagnosis is required a comprehensive approach involving equally clinical assessment and various paraclinical

tests. This is necessary to identify the underlying causes and establish an appropriate treatment plan. Here are the main diagnostic methods used in the evaluation of MBS:

Clinical assessment involves a detailed history: gathering information about the patient's symptoms, medical and family history, including history of respiratory infections, allergies, breathing habits, and associated symptoms such as snoring or daytime sleepiness. The assessment continues with patient inspection, the doctor note if the patient breathes through the mouth during the consultation, observing signs such as constantly open mouth, dry lips, or forward head position. It is noted typical facial features associated with MBS, such as an elongated face or receding chin. Moving forward to clinical examination of teeth, gums, tongue, and palate for signs of dryness, tooth decay, gingivitis, cleft palate, or other structural changes. Tongue positioning and the presence of malocclusions. Finally, the last aspect monitored during this stage is the evaluation of craniofacial development (signs of malocclusions, facial asymmetries or other structural abnormalities) that may be associated with MBS.

In parallel with the clinical evaluation, various functional and paraclinical tests will be undertaken. Using direct rhinoscopy to view the nasal cavity and detect obstructions, deviated septum, nasal polyps, or hypertrophy of the nasal turbinates that may be contributing to MBS. A "gold standard" method is flexible endoscope to visualize the nasal and nasopharyngeal structures in detail. This test helps identify enlarged adenoids, nasal polyps, or other abnormalities that may be obstructing the upper respiratory airway.

Polysomnography is a sleep study that measures brain activity, eye movements, muscle tone, heart rate, oxygen saturation, and breathing during sleep. The investigation is essential for diagnosing sleep disorders

associated with MBS, such as obstructive sleep apnea. Another useful test that measures airflow and pressure in the nasal cavity during breathing is rhinomanometry, providing information about nasal functionality and degree of obstruction. Also in this context, spirometry test measures the volume of air used in a lung capacity, useful in evaluating respiratory function and identifying possible pulmonary complications related to MBS.

Imaging tests such as lateral cranial radiography (telecranial – used to assess craniofacial structures, including the positioning of the jaws, palate, and tongue), computed tomography (CT – used to obtain detailed images of nasal structures and sinuses) or nuclear magnetic resonance (MRI) – provides detailed images of the soft and bony structures of the upper respiratory tract).

Allergy skin tests (for identifying allergies that may contribute to chronic nasal congestion and mouth breathing) or serology (measurement of immunoglobulin (IgE) levels

specific for common allergens can provide additional information about the patient's sensitivity) are very useful in detecting functional factors in mouth breathing syndrome.

Orthodontic evaluation is useful because an orthodontist can evaluate dental alignment, jaw positioning, and the presence of malocclusions, which is necessary to understand the impact of MBS on dental development and to plan orthodontic treatment, if necessary. Working closely with the orthodontist, a speech therapist can assess the patient's oral muscle function and breathing pattern. The speech therapist can provide therapy to re-educate breathing and correct mouth breathing habits.

The correct diagnosis of mouth breathing syndrome requires a multidisciplinary and comprehensive approach involving a combination of clinical evaluations, functional, imaging and paraclinical tests. This comprehensive assessment allows for the

RESULTS AND DISCUSSIONS

From the point of view of the size and complexity of the clinics, we recorded the following data, contained in Table 1. and 2.

Table 1. Distribution of the number of specialtis per clinic.

No. Specialtis/ Clinic	No. Clinics	Percent %
6	4	6,9%
5	5	8,6%
4	8	13,8%
3	12	20,7%

2	14	24,1%
1	15	25,9%
Total	58 Clinics	

According to the number of doctors employed at each clinic, the synthesized situation is presented as follows:

Table 2. Distribution of clinics according to the number of doctors per clinic.

No. Doctors/ Clinic	No. Clinics	Percent%
10	2	3,4%

Type of Specialtis	Years of experience
Otorhinolaryngology	19 years and 5 months
Orthodontics	15 years and 5 months
Dentistry	16 years and 11 months
Pneumology	18 years and 3 months
Speech therapy	6 years
Somnology	4 years and 3 months
Median experience	15 years and 5 months

9	3	5.2%
8	3	5.2%
7	2	3.4%
6	2	3.4%
5	3	5.2%
4	3	5.2%
3	8	13.8%
2	11	19.0%
1	21	36.2%
	58 Clinics	

Analyzing the data, we believe that a medium-sized clinic makes the interdisciplinary approach to mouth breathing syndrome easier because the physical and relational distance between doctors is much shorter compared to two independent clinics focused on different specialties. The study included 12 medical

clinics that had general medicine and dentistry in their range of specialties, nevertheless not one of the multispecialty clinics directly related signs and symptoms of MBS. At the same time, the clinics that focus exclusively on dental medicine have the specialty of orthodontics in their portfolio, and only one clinic from the spectrum of general medicine has included this discipline in the service offer.

Relevant for expertise was years the fact that the years of medical expertise influenced collaboration between specializations. The question was open-ended and the answers were entered into the database in the form of a numeric field. Age of the respondents was not taken in consideration. The centralized situation of data is in Table.3.

Table 3. Years of experience per specialtis.

The highest expertise in our study regarding MBS was in the field of general medicine: otorhinolaryngology specialty, followed by pneumology with a level of expertise of 19 and 5 months and 18 and 3 months. In the field of dental medicine, general dentistry specialty has an expertise level of 16 years and 11 months, followed by orthodontics with 15 years and 5 month. Orthodontics was only later included as a specialty. The classification has 2 new areas of expertise: speech therapy and somnology. Some speech therapy specialists have at least 6 years of experience; somnology has an average of 4 years of experience and 3 months of experience in the field.

In order to evaluate how the specialists manage the mouth-breathing syndrome, we formed a series of questions that were passed to patients in order to identify the frequency of this syndrome and the main symptoms.

Table 4. Frequency of mouth breathing syndrome among patients

Prevalence of MBS	No. Clinics	Percent %
Never	77	10,7%
Rare	102	14,2%
Occasionally	234	32,5%
Often	178	24,7%
Very often	129	17,9%

In Tabel 4. "often" and "very often" syndrome identified in 42.7% of the patients of the study, only 10.7 percent of the doctors stated that they never encountered this syndrome in their case report. In Fig 1. the most frequent symptomatology (484 responses) is sleep apnea followed by 432 answers of orthodontic issues and with close values of dry mouth and halitosis. Only 20 doctors indicated other possible symptoms after which they diagnosed mouth breathing syndrome.

Therefore, dry mouth, orthodontic problems or halitosis is associated with dental specialties. At the top of most frequent symptomatology was sleep disorders, with only 14 doctors specialised in somnology as classified itself as the newest of the specialty. Which led to

Specialtis Type	No. of Medical Doctors	Percent%
Otorhinolaryngology	420	32,2%
Orthodontics	262	20,1%
Dentistry	189	14,5%
Pneumology	148	11,3%
Speech therapy	122	9,3%
Somnology	132	10,1%
Other specialties	32	2,5%
1305 recommendations towards other specializations – approximately 2 spec/doctor		

the conclusion that in the included study the measured values depend on the specialty of the person who made the diagnosis. another observation that sleep disorders are precisely common among contemporary people due to stress, but if we seek to identify the physiological causes, then surely the mouth breathing syndrome is one of them.

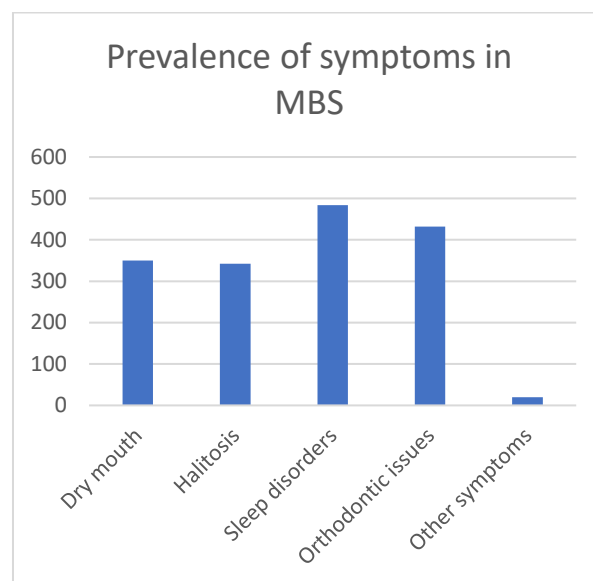


Figure 1. Prevalence of symptoms in MBS

The 3rd question asked to identify the misapprehensions in the interdisciplinary of the diagnosis of mouth breathing syndrome was "To which other medical specialties do you refer patients with mouth breathing syndrome?". A ranking according to the number of specializations to which the responding doctor refers the patient is presented in Table 5.

Table 5. Number of doctors who make referrals for specialist consultation in other specialties

Dentistry has only 14.5% of recommendation because it is the most represented among the specializations present in the study. Most often the dentist recommends an ENT specialty or orthodontics. Of all the specializations

measured with the help of this questionnaire, the ENT specialization is the most strongly recommended for a second specialist consultation in case of MBS diagnosis (420 doctors identified this specialty for an additional second opinion). We can also observe that from the specializations of general medicine, pneumology is the branch of medicine that is the 2nd in the interdisciplinary consultation. From the study undertaken, we observed that 95.8% of doctors identify the possibility of a more accurate diagnosis through the interdisciplinary approach of MBS, and 80.6% of them state that such an approach will lead to a more comprehensive treatment plan. The advantages are observed by more than 64% of doctors in all aspects taken into account in the research.

Regarding the difficulties encountered in the interdisciplinary collaboration for the treatment of MBS, the responses primarily identified differences in therapeutic approaches (65.3%) but also the limited availability of specialists (61.1%). In a somewhat equal proportion, 59.7% of the responses indicated the lack of effective communication between specialists as a disturbing factor of interdisciplinary collaboration. From the measurements carried out, it can be seen that doctors understand very well the advantages of the holistic and interdisciplinary approach and would be willing to overcome the difficulties that might arise in fulfilling this desire.

The measurements carried out with the help of the questionnaire highlighted the existing challenges in the professional spectrum of the MBS approach, but these exist, perhaps equally, on the part of patients and their families. The role of the patient and family is essential in the management and treatment of MBS. Their active involvement can positively influence treatment results, contributing to a faster recovery and preventing long-term complications. It is

crucial that both the patient and the family are counselled about what are MBS causes, the consequences and the importance of treatment. Proper understanding of the condition can motivate them to follow the treatment plan and make the necessary lifestyle changes. Because usually the family notice early symptoms of MBS (mouth breathing, snoring, dental problems, or changes in the child's facial appearance) an early identification of these signs can lead to rapid and effective intervention [55, 56].

The family support the patient in adopting healthy habits, such as maintaining good oral hygiene, following medical recommendations, and avoiding risk factors that may worsen MBS (eg, exposure to allergens or air pollution). Families can help monitor treatment adherence and observe progress. For example, in the case of children, parents can ensure the correct and regular use of orthodontic appliances or other prescribed treatments [57, 58].

Parents can be proactive in re-educating their child's behaviour by encouraging them to breathe through their nose instead of their mouth. This can include constant reminders and even incorporating activities or games that support this correct breathing pattern. Parents and other family members can model healthy behaviours, such as proper nasal breathing, maintaining good oral hygiene, and following medical recommendations. Children are often influenced by the behaviours of those around them, and a good example can have a positive impact on treatment adherence [59, 60].

The family can play an important role in providing emotional support to the patient, especially if the patient is a child experiencing fear or anxiety related to medical procedures or their physical appearance. Emotional support can contribute to better compliance to treatment. Parents or family members can actively participate in speech therapy sessions or orthodontist appointments, providing

support and feedback to the therapist and encouraging the child to follow instructions at home [61,62].

Collaboration between family support and doctors/therapists in developing and adjusting the treatment plan is essential making sure that all aspects of the patient's health are taken into account. This includes providing complete and accurate information about your medical history and observed symptoms, treatment options, whether it is surgery, orthodontic therapy, or other procedures. Understanding the risks and benefits of each treatment in choosing the most beneficial for the patient [63, 64].

Also the patient has to improve sleeping environment by reducing exposure to allergens, ensuring proper sleeping position, and eliminating factors that can affect nasal breathing, such as cigarette smoke or dry air. Support in maintaining a balanced diet, which may include avoiding foods that aggravate inflammation or allergies, may be helpful in managing MBS symptoms [65, 66].

Mouth breathing syndrome is likely to cause sleep disturbances during the night [1], causing similar symptoms of attention-deficit/hyperactivity disorder in children [67, 68]. In prolonged MBS changes in the lips, tongue and mandible, which implicitly influence the skeletal changes through neuromuscular responses leading to maxillo-facial morphological changes [69, 70], leading to the alteration of the child's appearance and later adult with implications on self-perception, self-esteem and predisposition to the development of dysmorphophobia [71, 72]. The prevalence of body dysmorphic disorder and dysmorphic concerns in dentistry and prosthetics has not been properly assessed, but the oral area and teeth are among the main concerns of these individuals [73, 74]. Identification of patients with dysmorphic disorders in dental practice before starting any form of facial aesthetic treatment is essential

[75].

Patients with dysmorphophobia often have unrealistic expectations about aesthetic procedures and are thus dissatisfied regardless of the actual outcome, which can have important negative effects on both the patient and the clinician [76, 77]. Currently, there is controversy as to whether dysmorphophobia can be a contraindication for surgical and non-surgical cosmetic dental procedures. Within the oral breathing syndrome, from the perspective of the risk of this type of disorders, prevention is essential [78].

Because the main causes are related to upper airway obstructions such as septal deviations, nasal polyps or hypertrophy of the tonsils and adenoids. According to the literature, an interdisciplinary approach is essential to effectively manage all aspects of oral breathing syndrome, involving collaboration with orthodontists and other specialists to correct the structural abnormalities that contribute to the condition. Dentists and orthodontists play a crucial role in correcting dental and jaw problems that can contribute to mouth breathing syndrome. Problems such as malocclusion and dental crowding require interdisciplinary collaboration with ENT physicians and physical therapists to develop holistic treatment plans that include both orthodontic corrections and breathing exercises. William R. Proffit and his colleagues emphasize in "Contemporary Orthodontics" the importance of an integrated approach to obtain optimal results [79].

Pulmonologists can assess the impact of mouth breathing on respiratory function and overall health. Interdisciplinary interventions, including lung function assessments and collaborations with nutritionists and physical therapists, are essential to improve lung capacity and overall health of patients.

Nutritionists help improve overall health and immune function through appropriate dietary

recommendations. A balanced diet can reduce inflammation and support respiratory health. Judith E. Brown, in "Nutrition Through the Life Cycle," highlights the critical role of nutrition at various stages of life and its impact on overall health and respiratory function.

Physiotherapists help re-educate the respiratory muscles and improve posture, facilitating nasal breathing. Respiratory therapy and postural exercises are essential components of an interdisciplinary treatment plan for mouth breathing syndrome. Collaboration with other medical professionals maximizes the effectiveness of these interventions.

Psychologists help patients manage the stress and anxiety associated with mouth breathing syndrome and adapt to the necessary lifestyle changes. Psychological aspects are essential to complete treatment, and emotional support and stress management techniques complement physical and medical interventions. Mouth breathing syndrome is a complex condition that requires an interdisciplinary approach to be effectively treated. The diversity of symptoms and their impact on the general health of patients

implies the need for collaboration between several medical specialties. Collaboration between ENT doctors, dentists, orthodontists, pulmonologists, nutritionists, physiotherapists and psychologists ensures accurate diagnosis and comprehensive treatment. Each specialty contributes its specific expertise, which allows treatment plans to be customized according to the individual needs of patients [80].

The integrated approach leads to significant improvement in respiratory function, oral health and quality of life of patients. Each specialty has its specific area of competence in the holistic approach to MBS. ENT physicians focus on the evaluation and treatment of upper airway obstructions while dentists and orthodontists correct dental and jaw abnormalities that contribute to oral breathing. Pulmonologists assess and treat the impact on lung function and nutritionists provide dietary recommendations to support respiratory health. Physiotherapists re-educate the respiratory muscles and improve posture and the psychologist helps patients manage the stress and anxiety associated with mouth breathing syndrome.

CONCLUSIONS

1. Formation of interdisciplinary teams dedicated to the treatment of mouth breathing syndrome in clinics and hospitals. These teams would facilitate communication and collaboration between different specialties and ensure continuity of patient care.
2. Organization of interdisciplinary courses and workshops for the continuous training of specialists involved in the treatment of mouth breathing syndrome. These programs would emphasize the importance of collaboration and provide hands-on training in the use of specialty-specific techniques and interventions.
3. Promoting interdisciplinary research to evaluate the effectiveness of different interventions and to develop new treatment methods. Longitudinal studies could provide valuable data on the impact of the interdisciplinary approach on long-term patient outcomes.
4. Creating support programs for patients and their families, including support groups and educational resources. These programs could help patients better understand mouth breathing syndrome and adapt more easily to the necessary orthodontic and ENT treatments for ORS

- rehabilitation.
5. Implementation of these goals could significantly improve treatment outcomes for patients with oral breathing syndrome and serve as a model for the interdisciplinary approach to other complex conditions.

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