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Teachers knowledge of the effects of mouth breathing before and after an orientation program

Conhecimento dos professores sobre a respiração oral antes e após programa de orientação

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ABSTRACT

Purpose: To ascertain primary and secondary school teachers knowledge of mouth breathing, as well as to gauge teachers improvements in knowledge of the subject area after the speech therapy guidance program. **Methods:** 150 teachers from both public and private schools participated in the program. The promotion of information about mouth breathing was carried out as part of the Speech Therapy Program, which addressed areas such as the physiology of breathing, causes and consequences of mouth breathing and the professionals involved in the treatment. Before and after the program semi-structured questionnaires were given out, the questionnaires contained objective and discursive questions about the causes and consequences of mouth breathing. The McNemar test was used for statistical analysis of the pre and post program questionnaires. The comparison between the general average of correct answers was ascertained by using the t-Student test. All differences were considered statistically significant at a significance level of 5%. **Results:** Statistical differences ($p<0.05$) were found in all questions in the pre and post-orientation program questionnaires. **Conclusion:** The teachers showed they had some previous knowledge about mouth breathing, however the Speech Therapy Orientation Program proved to be effective and resulted in the teachers showing a greatly increased knowledge about the subject.

Keywords: Mouth breathing; Health promotion; School teachers; Early intervention; Child rearing

RESUMO

Objetivo: Verificar o conhecimento dos professores da educação infantil e ensino fundamental I a respeito da respiração oral, assim como verificar a ampliação do conhecimento dos professores sobre o tema, após a aplicação do programa de orientação fonoaudiológica. **Métodos:** A amostra foi composta por 150 professores de escolas públicas e particulares. A promoção do conhecimento sobre a respiração oral foi realizada por meio do Programa de Orientação Fonoaudiológica, que abordou sobre a fisiologia da respiração, as causas e as consequências da respiração oral e os profissionais envolvidos no tratamento. Antes e após o programa, foram aplicados questionários semiestruturados, compostos por questões objetivas e discursivas a respeito das causas e consequências da respiração oral. Para a análise estatística entre os questionários pré e pós-programa, foi utilizado o teste McNemar. A comparação entre a média geral das respostas corretas foi realizada por meio do teste t-Student. Todas as diferenças foram consideradas estatisticamente significativas para um nível de significância de 5%. **Resultados:** Observaram-se diferenças estatísticas ($p<0,05$) em todas as questões dos questionários pré e pós-programa de orientação. **Conclusão:** Os professores apresentaram conhecimento prévio sobre a respiração oral, porém, o Programa de Orientação Fonoaudiológica mostrou-se eficaz e promoveu a ampliação do conhecimento sobre o tema.

Palavras-chave: Respiração bucal; Promoção da saúde; Professores escolares; Intervenção precoce; Educação infantil

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INTRODUCTION

Difficulties can start at school during early childhood education and during the academic life of students[1]. It is essential that the school, the family and health professionals should be aware of the specific demands of each student, so that preventative measure can be taken to avoid any possible difficulties at school[1,2]. Extrinsic or intrinsic factors may be the reason for these difficulties, for example from a lack of stimuli and resources in the family environment to attention deficit hyperactivity disorder (ADHD) and/or dyslexia[1-4].

The speech therapist works in various areas of health and human communication, from primary care to high complexity[5,6] and also works in different environments. One of these places is the school, where the speech therapist must address actions to promote good health, together with teachers, helping to contribute to the educational practices of children[7].

One of the causes of school difficulties may be related to a poor breathing pattern[8]. Mouth breathing is common in children, with a prevalence of 56.8%[9]. Nasal obstructions cause mouth breathing and are due to many factors, the main ones being adenoid hypertrophy, tonsils and allergic rhinitis[10,11].

Mouth breathing can result in a series of consequences for the individual, from structural changes to behavioral changes, early diagnosis and intervention are crucial[12,13]. Structural changes may include, mouth breathing which can cause craniofacial, dental[14-18], orofacial musculature[17] and postural changes[19]. These changes can result in changes in the stomatognathic system, affecting chewing[20,21], speech[22] and swallowing[23].

We know that mouth breathing alters the position of the mandible and hyoid bone, which can cause narrowing of the upper airways and this narrowing in turn can lead to obstructive sleep apnea syndrome (OSAS)[24]. Studies[8,20] suggest that mouth breathing causes tiredness during the day in children because they may suffer from poor sleep quality at night, and this can hinder their performance and learning ability in the classroom.

Mouth breathing can be related to changes in central auditory processes and cause impaired concentration for the student resulting in compromised performance at school[13,25]. These changes can be explained by the presence of sleep related problems and also by decreased levels of oxygenation to the brain[24,25].

There are very few studies with both speech therapists and teachers about the possible alterations of students in primary and elementary education, particularly studies that use questionnaires as a form of evaluation. There are studies that focus on aspects of oral and written language and children's learning disorders[26-28], however, there are no studies about mouth breathing that investigate the knowledge of teachers on this subject.

This study is expected to increase teachers knowledge of mouth breathing and help students and their families with the knowledge acquired through the Speech Therapy Orientation Program, eliminating the necessity to refer children suffering from mouth breathing to specialized professionals for treatment. Teachers are fundamental to the development of a child and can be of utmost importance in the promotion of good health in the school environment.

The objective of this study was to learn how much primary and secondary school teachers knew about mouth breathing, as well as to gauge the improvements of teachers knowledge about the subject after the speech therapy guidance program.

METHOD

This study was approved by the Research Ethics Committee of the University of Brasília - Ceilândia Faculty, ruling 2,226,226.

This is an observational, cross-sectional and analytical study conducted with teachers from both public and private schools in Ceilândia and Taguatinga, satellite towns located in the Federal District area of Brazil, from August 2018 to April 2019. All the participants signed a consent agreement form (TCLE).

The research included teachers who worked in primary and elementary schools of the schools that participated. Teachers who did not participate in all stages of the study were excluded from the study.

The study consisted of a Speech Therapy Orientation Program about mouth breathing, with semi-structured pre-program and post-program questionnaires, which were given out for completion (Chart 1). A bibliographic survey was carried out to design the questions of the questionnaire which considered the main aspects of guidance on mouth breathing. Initially, candidate schools were visited, to select teachers that were qualified to participate in the research. In all, 40 schools were visited, and 12 schools gave permission for their teachers participate in the program. Of the 12 schools where the research was carried out, half were public schools and the other half were private schools.

A total of 150 teachers took part in the research, 104 from public schools (69.3%) and 46 from private schools (30.7%). The average age of the teachers was 40 and they had an average of 13 years experience in the teaching profession.

The types and responsibilities of the teachers were as follows, classroom teachers, that is, those teachers who teach students inside the classroom (86.7%), pedagogical coordinators (4.0%), PE teachers (1.3%), re-adapted teachers, that is absent teachers who were away from the classroom for health reasons and who could not perform their duties in the classroom (1.3%), special education teachers (0.7%) and 6% whom did not answer about their responsibilities.

The program was carried out in a place provided by each school, with groups of teachers gathered on their normal shift i.e (morning or afternoon shifts). Distribution of the questionnaires and the Speech Therapy Orientation Program took place on the same day. Each teacher received a pre-program questionnaire, consisting of 13 questions, discursive and objective, see (Chart 1). For data control, teachers drew a number and were instructed to transcribe it at the top of the questionnaire and to answer all of the questions. The questionnaire was completed in the presence of the researcher.

This was followed by the Speech Therapy Guidance Program on mouth breathing. In this program topics such as, the way we breathe in everyday life, ideal breathing and its importance, the causes of nasal obstruction and the possible consequences of mouth breathing. The professionals involved in the treatment stressed the importance of early action and the prevention of mouth breathing was addressed and also the importance of nasal hygiene and environmental hygiene. The program was carried out through lectures and with a presentation in PowerPoint. All the questions in the questionnaires were addressed during the program, in order to increase the teachers. knowledge about mouth breathing, as detailed in Table 1. Near the end there was a question time for comments and queries which anyone had, attempting to integrate the theoretical part with the experience of each teacher.

Chart 1. Pre-program and post-program questionnaire questions

Q1. Do you know someone who breathes through his or her mouth?
( ) yes ( ) no ( ) don't know
Q2. Do you think that people who breathe through their mouth may experience tiredness during the day?
( ) yes ( ) no ( ) don't know
Q3. Do you think that breathing through the mouth can lead to dietary problems?
( ) yes ( ) no ( ) don't know
Q4.Do you think that breathing through the mouth could lead to speech impairment?
( ) yes ( ) no ( ) don't know
Q5. Do you think that the development of facial features i.e. bones muscles may be related to breathing?
( ) yes ( ) no ( ) don't know
Q6. Do you think that sufferers of mouth breathing may also suffer from dental alterations?
( ) yes ( ) no ( ) don't know
Q7. Do you think that children who suffer from mouth breathing may have problems at school?
( ) yes ( ) no ( ) don't know
Q8. If you lived with someone who breathes mostly through their mouth what would you do to help them?
Q9. If someone breathes most of the time through the mouth should you refer the person to a health professional? Which health professional?
Q10. Do you have a student who breathes through the mouth all the time?
( ) yes ( ) no ( ) don't know
Q11. If so, what draws your attention to the physical and postural characteristics of that student (s)?
Q12. If so, what draws your attention to the behavioral characteristics of that student (s)?
Q13. If so, what draws your attention to the school performance of this or those students?

Subtitle: Q = question

The post-program questionnaire, composed of the same questions as the previous questionnaire was given out to teachers immediately after the completion of the program. Teachers were instructed to transcribe the number previously specified at the top of the questionnaire and to answer all the questions. The program and the distribution of the questionnaires were always carried out by the same researcher, following the methodological routine as described in Table 1. After the answers to the post-program questionnaires, the teachers received an information pack on the causes and consequences of mouth breathing.

The research data was computed in tables and the statistical analysis was performed using SPSS software, version 23. All differences were considered statistically significant with a 5% significance level. For analysis of pre and post-program responses, the McNemar statistical test was employed, grouping the "no" and "I don't know" answers to the objective questions.

The performance comparison between public and private schools was performed using the Student t test. For this analysis we considered the objective questions that had the possibility of correct or incorrect answers (questions Q2 to Q7), therefore, because six questions are listed, the maximum possibility of correct answers was six.

For the analysis of the discursive questions, it was necessary to group the answers together. To achieve this the researcher evaluated the main message of each answer then defined and divided them into groups for those with the same meaning and then named them equally. Teachers were free to answer discursive questions, without any clues being offered by the researchers.

RESULTS

The comparisons between the answers to the questions about the consequences of mouth breathing of the pre and post-program questionnaire showed a statistical difference

Table 1. Execution of the Speech Therapy Orientation Program

Stages	Description
Breathing physiology	The question "how do we breathe?" opened the lecture. According to the teachers' answers, the researcher was able to talk about "ideal breathing" and the importance of nasal breathing. It is important for teachers to understand that breathing through the nose promotes the preparation of air, leaving it clean, warm and moist., in addition nasal breathing favors adequate tone of orofacial muscles and craniofacial growth, which are essential for the functions of the stomatognathic system. Thus, teachers were able to understand aspects of the physiology of breathing and the importance of nasal breathing.
Causes of nasal obstructions	The main causes of nasal obstructions are adenoid hypertrophy, tonsil hypertrophy, allergic rhinitis and sinusitis amongst others. These changes were mentioned and the researcher highlighted the individual characteristics of each one.
The consequences of mouth breathing	The possible consequences of mouth breathing were pointed out, amongst them, orofacial, craniofacial and dental myofunctional changes, eating difficulties (preferences for soft food consistencies), speech impairment, poor sleep quality and school difficulties. The visual presentation featured images of real patients in order to illustrate the aspects discussed.
Professionals involved in the treatment of mouth breathing	The performance of professionals frequently involved in the treatment of mouth breathing, such as otorhinolaryngologists, speech therapists and orthodontists, were discussed at this stage.
Importance of early treatment	This part of the program favored teachers' understanding of the importance of early treatment, so that the consequences can be minimized.
The importance of nasal hygiene and environmental hygiene	This phase reported the relevance of nasal hygiene and environmental hygiene. The use of saline was mentioned and the importance of maintaining the cleanliness of the house, avoiding objects that accumulate dust, such as stuffed animals, carpets and curtains. The researcher explained that nasal hygiene should be performed with a saline mixture and a syringe, daily, and stressed the importance of keeping environments clean, such as the home and school.
Question time	At the end of the program, teachers had the opportunity to make comments or ask questions regarding different aspects of mouth breathing, which were not discussed during the program. The program did not have a minimum or maximum duration, the teachers were free to make comments and resolve any queries.

Table 2. Comparison of teachers' answers to the questionnaire before and after the Speech Therapy Orientation Program

		Pre-program		Post-program		P-value
		f	%	f	%	
Q1. Do you know someone who breathes through his or her mouth?	Yes	66	44.0	81	54.0	0.006*
	no/ don't know	83	56.0	68	45.3	
Q2. Do you think that people who breathe through their mouth may experience tiredness during the day?	Yes	128	85.3	143	96.7	0.000*
	no/ don't know	20	13.3	5	3.4	
Q3. Do you think that breathing through the mouth can lead to dietary problems?	Yes	107	71.3	145	96.7	0.000*
	no/ don't know	43	28.7	5	3.3	
Q4. .Do you think that breathing through the mouth could lead to speech impairment?	Yes	102	68.0	147	98.0	0.000*
	no/ don't know	48	32	3	2	
Q5. Do you think that the development of facial features i.e. bones muscles may be related to breathing?	Yes	101	67.3	145	98.0	0.000*
	no/ don't know	47	31.3	3	2.0	
Q6. Do you think that sufferers of mouth breathing may also suffer from dental alterations?	Yes	100	67.3	143	97.3	0.000*
	no/ don't know	45	30.6	2	2.6	
Q7. Do you think that children who suffer from mouth breathing may have problems at school?	Yes	94	62.7	148	98.7	0.000*
	no/ don't know	56	37.3	2	1.3	
Q10. Do you have a student who breathes through the mouth all the time?	Yes	20	13.3	27	18.0	0.039*
	no/ don't know	127	85.3	120	81.3	

McNemar static test; *Significance level p<0.05
Subtitle: f = frequency; % = percentage; Q = question

Tabel 3. Comparison of performance between public and private schools in the pre and post-program questionnaire

	Variables	n	Average	DP	Value-p
Total	Pre	150	4.22	1.59	*<0.01
	Post		5.85	0.64	
Public School	Pre	104	4.33	1.59	*<0.01
	Post		5.90	0.54	
Private School	Pre	46	3.95	1.57	*<0.01
	Post		5.73	0.82	

Static t-Student test; *Significance level p <0.05
Subtitle: n = number of participants; SD = standard deviation

(p <0.05) in the pre and post comparisons, in all of the questions. It could be seen that most teachers answered questions Q2 to Q7 correctly in the post-program questionnaire. In respect of the prevalence of mouth breathers known to teachers, it was noted that there was a greater number of "yes" answers in the post-program. (Table 2).

The total performance of the answers to objective questions (Q2 to Q7) in the pre- and post-program questionnaires by teachers of both public and private schools had, on average, 4.22 correct answers in the pre-program questionnaire and 5.85 correct answers in the post-program questionnaire. In all comparisons, statistical differences were found of (p <0.05), which showed the effectiveness of the program, both in public and private schools (Table 3).

Regarding the question: "If you know someone who breathes through their mouth, what would you do to help them?", consult a health professional was the most popular answer in the pre-program and post-program questionnaires. By contrast assistance in nasal hygiene was rarely mentioned. Figure 1A shows the main answers to this question.

As for the question: "If the individual breathes mostly through his or her mouth, should they seek a health professional? If so which one(s)?". The otorhinolaryngologist was the most commonly cited health professional, followed by the speech therapist and thirdly the dentist, both in the pre-program questionnaire and in the post-questionnaire. Figure 1B shows the most common responses.

Regarding the question: "If so, what are the physical characteristics that attract your attention to these student(s)?". There were several answers. Keeping one's mouth open was the most cited feature, followed by face shape in the post-program questionnaire responses. Figure 1C shows the most popular answers by teachers who mentioned having mouth breathing students.

With regard to the question: "If so, what are the behavioral characteristics of this (these) student(s)?". Tiredness and lack of concentration were the most common behavioral patterns observed by teachers in the answers to the post-program questionnaire. In Figure 1D it is possible to see the answers.

Regarding the question: "If so, what are the school characteristics of this (these) student(s)?". Learning problems were the most mentioned in the pre and post-program questionnaires. Figure 1E shows the answers to this question.

DISCUSSION

This study sought to analyze the teachers knowledge of mouth breathing, as well as improve their knowledge about the subject after the conclusion of the Speech Therapy Orientation Program. Orientation programs can bring new perspectives to teachers, changing the way they think or act when dealing with student's requirements[27,28].

Health promotion is a concept that broadly covers the individual and is not only related to disease prevention but also covers various aspects which are related to the quality of life[7] It is essential to understand the importance of interventions whose objectives are to promote good health, aimed at prevention and early intervention, so that further consequences can be avoided and which may result in an improvement in life quality.

The Speech Therapy Orientation Program aimed to promote speech therapy health, with mouth breathing being the specific topic addressed. All stages of the program were developed so

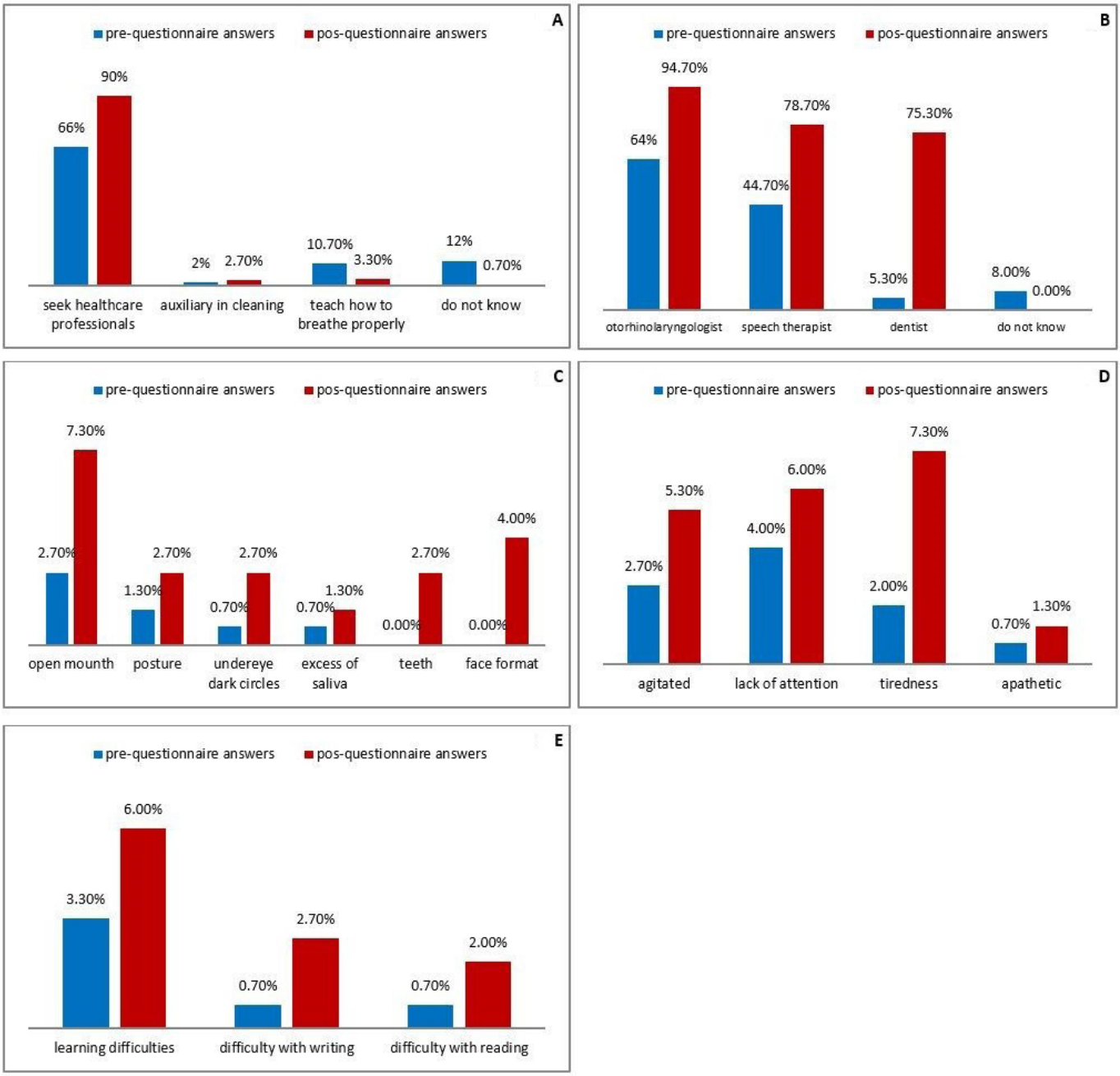

Figure 1. Comparison between pre and post-program responses regarding assistance to mouth breathers, professionals involved in the treatment and physical, behavioral and school characteristics of mouth breathing students. (A) assistance to those who breathe through their mouths; (B) professionals involved in the treatment of mouth breathing; (C) the physical characteristics of mouth breathing students; (D) the behavioral characteristics of mouth breathing students; (E) the school characteristics of mouth breathing students

that researchers as well as the professionals involved in treatment could disseminate the main causes and consequences of moth breathing. In addition, the program sought to assess what teachers knew about the topic and what they remembered of the different area covered after the Speech Therapy Orientation Program. As already mentioned and covered by this research mouth breathing can have a series of consequences that, in the long run can become more serious and which mostly impact the child population. For this reason it was necessary that this study should be carried out in schools. The study revealed the importance of the orientation work in schools, which was aimed at teachers and there is clear evidence of the success of this because of the satisfactory results which were achieved after completion of the program.

On comparing the answers to the question: "Do you know someone who breathes through their mouth?" (Q1), there was a statistically significant change in the pre-program and post-program questionnaires, suggesting that after the Speech Therapy Orientation Program teachers were able to identify the characteristics of a mouth breather, which perhaps, may have gone unnoticed before. In this study, 44% of teachers in the pre-program questionnaire, and 54% of teachers, in the post

questionnaire answered that they knew someone who breathed through their mouths. These results agreed with the findings of another study, which found an average of 56.8% of mouth breathers in the sample[9]. In addition, it is important to educate teachers about mouth breathing, because this will be instrumental in the dissemination of knowledge on the subject, which may improve early intervention and prevention.

Teachers reported that people who breathe through the mouth may suffer from tiredness (Q2), observed by 85.3% of teachers in the pre-program questionnaire and by 96.7% in the post-questionnaire. It is known that mouth breathing can cause daytime fatigue, due to the altered sleep pattern quality, and this tiredness may be related to poor school performance[8,20]. After the importance of understanding the relationship between tiredness and learning ability in mouth breathers was understood, it was decided to discuss this particular topic in the Speech Therapy Program.

On the subject of difficulties eating (Q3), 71.3% of teachers answered, in the pre-program questionnaire, that mouth breathing may be related to dietary problems, however in the post questionnaire this number increased to 96, 7%. Studies (20,21) show that mouth breathers may have difficulties in chewing with reduced masticatory speed, function disorder and poorer performance of the masseter muscle. Mouth breathers can also suffer from changes in swallowing giving rise to difficulties in swallowing solid foods[15]. It is important for teachers to understand these problems because difficulties in chewing and swallowing can cause changes in the eating process, and mouth breathers may well have a preference for softer foods.

Regarding changes in speech (Q4), 68% of teachers answered in the pre-program questionnaire, that mouth breathing may impair speech compared to 98% in the post-program questionnaire. Mouth breathing can cause phonetic impairments in the production of sound, as was found in another study that compared mouth and nose breathers, with lingual interposition as the most common alteration in those who breathed through the mouth[22], therefore it is important that teachers know that speech disorders can occur in mouth breathers, and that these changes even though they are not phonological should not be ignored.

As for changes in the facial features (Q5) 67.3% of the teachers answered that mouth breathing may be related to facial type, however in the post-program questionnaire this number increased to 96.7%. Facial changes in mouth breather are caused due to a number of factors that involve muscle and bone structures. There are studies[14,15,17] that show the pattern of vertical facial growth and the convex face. Altered facial patterns are a common feature and could be seen by most teachers. This study pointed out the main physical consequences attributed to mouth breathing such as muscle and craniofacial changes, which can contribute to the identification of people who breathe through their mouths. It was clear in the results that the teachers were able to understand the relationship between mouth breathing and altered facial patterns.

Regarding the possibility of dental alterations (Q6) caused by mouth breathing, 67.3% of teachers answered in the pre-program questionnaire that mouth breathing may cause dental changes, and 97.3% in the post questionnaire, which reveals the effectiveness of the Speech Therapy Orientation Program. Studies have shown that dental occlusion can undergo changes in people who breathe through the mouth, with increased dental overjet, crossed bite, open bite, increased vertical overlap, ogival palate and maxillary atresia[15-17]. Dental changes are related to a series of consequences of the functions of the stomatognathic system, such as chewing, swallowing and even speech. Therefore it is important for teachers to understand that occlusal changes may be related to an inadequate breathing pattern, and that there should be a referral to one of the professionals involved in relevant treatment such as a dentist.

Mouth breathing can cause changes in sleep quality[20] and, in more severe cases lead to OSAS[24]. For this reason it was essential that the program should bring this subject to the attention of the teachers. When asked, 62.7% of teachers answered in the pre-program questionnaire that school difficulties (Q7) may be related to mouth breathing and 98.7% in the post-program questionnaire that mouth breathing can cause difficulties. When comparing the responses it can be seen that the differences are significant. Teachers were able to understand the relationship between mouth breathing and sleep quality (which can consequently cause disorders related to concentration, attention span) resulting in poor school performance, an important issue and mouth breathing students can rely on the orientation of teachers in order to assist the family in finding multidisciplinary treatment and preventive measures.

When comparing the answers to the question: "Do you have any students who breathe through their mouths all the time?" (Q10), statistical differences were observed before and after the program. In the pre-program questionnaire 13.3% of teachers reported that they had mouth breathing students, and in the post-program this number increased to 18%. Despite being a low percentage there was an increase in the sample, which may be related to better identification of the characteristics after the orientation program. In another study the researchers found a prevalence of 56.8% of mouth breathers[9].

The guidance program was effective for both public and private schools alike, showing that the knowledge gained in relation to mouth breathing increased in both types of schools, which shows the importance of disseminating this subject in the school environment. Public school teachers had on average 4.33 correct answers in the pre-program questionnaire, and 5.90 correct answers in the post-program questionnaire, by comparison the average correct answer for private school teachers was 3.95 in the pre-program questionnaire, and 5.73 in the post-program questionnaire. These results prove the effectiveness of the program and an increase of the teachers knowledge of both groups that participated in the Speech Therapy Orientation Program.

The teachers learnt that, both in the pre-program questionnaire (66%) and in the post-program questionnaire (90%), it is necessary to seek a health professional to help those who breathe through their mouths (Q8), however few spoke of the importance of nasal hygiene, in the pre-questionnaire (2.0%) and in the post-questionnaire (2.7%). It is known that early intervention is essential to reduce the long-term consequences caused by mouth breathing, and referral to professionals trained in treatment is essential[13,15-17], and that nasal hygiene significantly changes the size of the nasal area, allowing for an improvement in the passage of air through the nose[12].

Because this is a problem with multiple consequences, it is essential that treatment is carried out by a multidisciplinary team[15-17] (Q9). In this study it was possible to identify that teachers had greater prior knowledge of the otorhinolaryngologist (64%) in respect of the treatment of mouth breathing and less prior knowledge of the dentist (5.3%), however after the program, we saw an increase in the percentages of teachers answers with the

otorhinolaryngologist (94.7%), the speech therapist (78.7%) and the dentist (75.3%) as the most cited health care professionals.

Physical and behavioral changes are diverse and common in mouth breathers[14-18]. Since this study was conducted with teachers, we tried to learn about the most common physical changes (Q11) which they noticed in their mouth breathing students. The most common changes found in the analysis of the pre-program questionnaire were open mouth (2.7%), posture (1.3%), dark circles (0.7%) and excess saliva (0.7%). In the post-program questionnaire open mouth (7.3%), posture (2.7%), dark circles (2.7%), excess saliva (1.3%), teeth (2.7%) and face shape (4.0%). These findings are in agreement with other studies that reported these physical changes in mouth breathers[10,14-16,19].

Teachers also observed behavioral changes were commonly found in their mouth breathing students.(Q12), and reported, in the pre-program questionnaire, that these students were agitated (2.7%), inattentive (4.0%), were tired (2, 0%) and were apathetic (0.7%). In the post-program questionnaire, these values changed, showing that teachers reported that mouth breathing students were agitated (5.3%), inattentive (6.0%), were tired (7.3%) and were apathetic (1.3%). It is known that mouth breathing children may have a poorer performance in central auditory processing skills, due to difficulties in concentration and attention[25]. A study[10] found that parents of mouth breathers observed behavioral changes in their children, complaining of attention deficit and hyperactivity. Altered behavior is often perceived by teachers, but it is not always associated with mouth breathing.

Regarding school performance (Q13), teachers answered, in the pre-program questionnaire, that their mouth breathing students had some learning problem (3.30%), reading difficulties (0.7%) and writing difficulties (0.70%). In the post-program questionnaire these values were different, showing that teachers were aware that mouth breathing students could have learning problems (6.0%), reading difficulties (2.0%) and writing difficulties (2.7%).

The school difficulties mentioned by the teachers were also seen in another study[8], which found that mouth breathing students had greater difficulties in mathematics, reading comprehension and with working memory. This data allows us to understand that mouth breathing can be related to school difficulties and therefore it is essential that teachers understand its causes and consequences.

In one study[27], the Speech-Language Pathology Teacher Education Program was carried out on the development of oral and written language skills in which the authors obtained positive results and the teachers understanding of the topic changed after the program. In this study, positive results were also observed, as there was a significant increase in knowledge about mouth breathing, after the orientation program.

Other studies[26,27] made use of questionnaires in order to analyze the teachers previous knowledge about language development and learning disorders. Both studies showed the importance of health promotion initiatives and actions that can guide teachers on the topics covered, as was done in this study.

Our study showed positive results, however it was not possible to obtain a specific location for the development of the Speech Therapy Orientation Program, neither in public or private schools, therefor it was necessary to adapt to the locations made available by the schools.

There are no other studies similar to this one, whose purpose was to educate teachers about the problems of mouth breathing. Therefore, it is important to highlight the relevance of this research, as it significantly contributed to the teachers knowledge of the subject area, when comparing the pre-program and post-program questionnaires. This highlights the relevance of health promotion and preventative actions in schools.

CONCLUSION

Although the teachers had some prior knowledge about the causes and consequences of mouth breathing, the Speech Therapy Orientation Program was effective in furthering this knowledge. It is important that teachers should be aware of mouth breathing, in order to advise both children and parents of the problem, in addition to helping with early identification of the problem so that more serious consequences can be avoided.

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