

Relationship between obstructive sleep apnea hypopnea syndrome and neurocognitive changes – case report of a school

Abstract

According to the literature, the syndrome of obstructive sleep apnea or hypopnea (OSAHS) should be taken into account on issues related to the cognitive development of schoolchildren. Due to the considerable number of children who presented consistent complaints about their ability to perform school work, an interdisciplinary team was authorized by the parents to conduct evaluations to identify the relationship between the occurrence of signs of OSAHS and changes in the neurocognitive functions in children that could explain poor school performance. The results observed in the present case study shown 41 (76%) of the 54 evaluated children with difficulties in school work achievement were considered to present characteristic signs of the consequences of OSAHS. The interdisciplinary diagnostic actions in the present case have proven to be effective, low-cost, and easy to apply in a school environment to subsidize prevention and intervention policies and programs that may modify the health conditions and cognitive development of children.

Keywords: obstructive sleep apnea hypopnea syndrome, obstruction of the upper airways, sleep disorders, attention deficit, learning

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Introduction

Obstructive sleep apnea or hypopnea syndrome (OSAHS), which was first described in children by Osler¹ with a prevalence of 0.7 to 3% in this group² should be taken into account regarding issues related to the cognitive development of schoolchildren. In OSAHS, children have partial or total airway obstruction, which results in reduced air input, leading to sleep fragmentation due to oscillations in oxygen and carbon dioxide gas concentrations, which interferes with their cognitive functions and impairs learning. Due to the considerable number of children who presented consistent complaints about their ability to perform school work an interdisciplinary team was authorized by the parents to conduct evaluations to identify the relationship between the occurrence of signs of OSAHS and changes in the neurocognitive functions in children that could explain poor school performance.

Case presentation

This case report of a children's school involved a single group of 54 children of both genders, aged 6 to 9 years, from a municipal school in the western region of the state of Santa Catarina, Brazil, who presented learning difficulties and were evaluated by a multi-professional and interdisciplinary outpatient clinic. The data collection for the presentation of this case report was approved by the Ethics Committee on Research with Human Beings of the university (opinion no. 1.026.420/2014/).

Among the 54 children referred for evaluation 41 presented with oral or oronasal breathing and at least one or more alterations characterized by the national literature, as proposed by Coelho-

Ferraz³ & Marchesan et al.^{4,5} Such as an elongated and narrowed facial structure; a hypotonic, short and/or retracted upper lip; difficulty maintaining complete labial occlusion for more than a few minutes; a hypotonic, bulky tongue resting on the floor of the mouth; a small, tapered nose with straight wings; and the presence of dark circles under the eyes. The oroscopy findings indicative of the presence of OSAHS were classified according to Zonato et al.⁶ and included the presence of an anterior open bite or crossbite an ogival and/or deep hard palate, changes in the soft palate due to its elongation increased uvula size, and increased volume of palatine tonsils (hypertrophic tonsils).

To evaluate the neurocognitive changes, the children were submitted to the following tests: the Conners Test, which is intended for parents and teachers, aims to diagnose hyperactivity, and was adapted and validated in Brazil by Barbosa et al.⁷ the Trail Making Test (parts A and B) to evaluate the visual sustained attention and the mental flexibility of the child⁸ and the Swanson, Nolan and Pelham Scale version IV (SNAP-IV) test for attention deficit hyperactivity disorder (ADHD) which is based on the symptoms listed in the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-IV) and was validated in Brazil by Mattos et al.⁹ Unfortunately, in Brazil, a developing country with serious problems related to corruption in the public administration and scarce resources for health and education, these were the only methods available to the multidisciplinary team for the evaluation of the children at that time. Although more current methods exist, our results are still very significant, and it is important to publish them because in an economically globalized world, great asymmetries exist that may represent limitations in form but not in the results of the studies.

The SNAP-IV test, which was used to evaluate the presence of ADHD, did not show significant changes that could characterize the children evaluated as having ADHD. The Conners Test demonstrated that the children had a strong tendency to not finish the task they started presented behavior consistent with attempts to avoid the proposed tasks and were easily distracted. The Trail Making Test parts A and B were applied to assess the visual sustained attention and mental flexibility of the children, and the results indicated that 61% of the children had low and middle scores, indicating little visual sustained attention and mental flexibility. Another very common behavior of these children, which was a complaint of the parents, was frequent irritability, which occurred in more than 60% of the cases.

Discussion

Obstructive sleep apnea is one of the most common causes of sleep disordered breathing in children. It is associated with significant morbidity that can potentially impact long-term neurocognitive and behavioral development, as well as cardiovascular outcomes and metabolic homeostasis.¹⁰ In the same sense Tarasiuk et al.¹¹ reported that poor school performance and behavior are the most commonly reported consequences of pediatric OSAHS, but this disease has also been associated with cardiovascular morbidity, metabolic consequences and nocturnal enuresis. Children with OSAHS have also shown increased use of health services compared to their peers, with more hospital visits and prescriptions for medications, especially for respiratory infections.

Therefore, it is essential that both health and education professionals be attentive to the developmental difficulties of children by observing children in a broad and interdisciplinary manner, allowing for anticipation of problems through appropriate preventive and corrective actions. The results observed in the present case study corroborate the statements by the authors mentioned above, because 41(76%) of the 54 evaluated children with difficulties in school work achievement were considered to present characteristic signs of the consequences of OSAHS. Although the results of the SNAP-IV test are not intended to diagnose ADHD the Conners Test demonstrated that children have a strong tendency to not finish the tasks they started, present behaviors corresponding to escape from the proposed tasks, and can be easily distracted. These behaviors may explain why children with signs indicative of OSAHS can be easily labeled as having ADHD because these behaviors are common to both conditions (ADHD and OSAHS).

Increased irritability was observed by parents of children with signs suggestive of OSAHS. According to Dalgalarondo¹² irritability is a non-specific symptom and can be found in normal individuals; however, it becomes pathological when any stimulus is deemed as disruptive and the child or adolescent presents unpleasant, hostile, and eventually aggressive hyperactivity. This condition unquestionably negatively influences the cognitive development of children. According to Kovacs et al.¹³ the tendency to escape from initiated and unfinished proposed tasks, which was evidenced by the Conners Test, is a symptom of significant psychological changes, in which children may present with logorrhea, flight of ideas, delusions of grandeur associated with reduced sleep, and bizarre and extravagant behaviors. Correspondingly, the Trail Making Test showed a lower degree of visual sustained attention and reduced mental flexibility, a condition that negatively influences the academic performance of this group. The presence of signs indicative of OSAHS has been directly related to the occurrence of neurobehavioral and cognitive disorders

in school-age children that may compromise their school behavior and development, favoring school dropout.

Conclusion

The interdisciplinary diagnostic actions in the present case have proven to be effective, low-cost, and easy to apply in a school environment to subsidize prevention and intervention policies and programs that may modify the health conditions and cognitive development of children. Based on the situational diagnosis performed in this school corrective and preventive measures will be proposed by the interdisciplinary team to solve the problem.

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None

Conflict of interest

Author declares no conflicts of interest.

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