

Association between Asthma and Primary Nocturnal Enuresis in Children

Patricia Dahan,* José de Bessa, Jr., Dayana Maria de Oliveira, Camila Couto Gomes, Julio Cesar Cardoso, Isabela Teixeira Macedo, Mariana de Almeida Belo, André Avarese de Figueiredo and José Murillo B. Netto

From the Department of Pediatrics (PD) and Division of Urology, Department of Surgery (DMdO, CCG, JCC, ITM, MdAB, AAdF, JMBN), Federal University of Juiz de Fora (UFJF) and Division of Urology, Department of Surgery, Hospital e Maternidade Therezinha de Jesus, School of Medical Science and Health of Juiz de Fora (JMBN), Juiz de Fora, Department of Pediatrics, School of Medicine of University Presidente Antônio Carlos (PD), Barbacena and Division of Urology, Department of Surgery, State University of Feira de Santana (JdB), Feira de Santana, Brazil

Purpose: Enuresis, sleep respiratory disorders and asthma compromise the quality of sleep in children and may occur in association with each other. An association between sleep respiratory disorders and enuresis has already been demonstrated. According to united airways disease abnormalities of the upper and lower airways may coexist. A child who wheezes has a greater chance of snoring and having obstructive sleep apnea. Since asthma and sleep respiratory disorders may be associated, and sleep respiratory disorders are associated with enuresis, we determined the possibility of an association between asthma and enuresis.

Materials and Methods: Between August 20 and March 2015 parents/guardians of children 6 to 14 years old from 16 elementary schools in our area were randomly chosen for study. Children with nonmonosymptomatic enuresis and urological or neurological disease were excluded. The Tucson and ISAAC (International Study of Asthma and Allergies in Childhood) questionnaires were used to assess sleep respiratory disorders and asthma, respectively.

Results: A total of 523 children (283 males and 240 females) with a mean \pm SD age of 9.42 ± 2.46 years were included in analysis. The overall prevalence of enuresis was 15.87% (95% CI 12.98–19.26). Asthmatic children with wheezing in the last 12 months were 2.33 times more likely to have had enuresis at some point in life (OR 2.33, 95% CI 1.37–3.95, $p = 0.0017$). If enuresis was present, the chance increased to 2.78 (95% CI 1.38–5.61, $p = 0.0041$). Enuretic children were 5.34 times more prone to have apnea reported by parents (95% CI 2.19–13.03, $p = 0.0002$).

Conclusions: These findings demonstrate that asthma as well as sleep respiratory disorders is associated with primary nocturnal enuresis.

Key Words: urinary bladder, nocturnal enuresis, asthma, apnea, sleep

ENURESIS, sleep respiratory diseases and asthma compromise the quality of sleep and may occur alone or in association with each other.

Enuresis is involuntary loss of urine during sleep in children older than 5

years whose bladder control should already be fully functional.¹ Enuresis develops in 15% to 20% of 5-year-old children and these enuretic patients become continent at a rate of 15% per year.² Since approximately 10% of

Abbreviations and Acronyms

OSA = obstructive sleep apnea
SRD = sleep respiratory disorder

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* Correspondence: Av. presidente Itamar Franco 2100/302, Juiz de Fora, Minas Gerais, Brazil, Zip Code: 36025-290 (telephone: 55 (32) 8884-9046; e-mail: pdahan1@hotmail.com).

children older than 7 years have at least 1 episode of nocturnal enuresis per month and about 5% of pediatric patients wet the bed once per week or more often, enuresis is considered one of the most common sleep disorders in pediatrics.³

SRDs are common childhood problems that are often not recognized. They occur due to partial and prolonged obstruction of the upper airway and/or intermittent and complete nocturnal blockage of the pharynx, leading to a change in ventilation and sleep continuity. The term SRD includes snoring and OSA among others.⁴ Epidemiological studies using questionnaires show a prevalence of 10% to 27.6% of habitual snoring and 0.5% to 9% of apnea reported by parents.⁵⁻⁷

Nocturnal asthma is not an entity distinct from bronchial asthma. Rather it is associated with greater severity and fatality of the disease. Asthma tends to worsen at night, probably as a result of an increased inflammatory response of the lower airways and bronchial hyperresponsiveness.⁸ The increase in nocturnal asthma symptoms is associated with lack of control of this condition.

The association between enuresis and SRD has been reported.⁹⁻¹¹ Most studies describe a resolution rate of approximately two-thirds or more of cases of enuresis after surgical procedures.^{9,12,13} The prevalence of enuresis in SRD correlates with the intensity of obstruction of the upper airways.¹⁴ Children who snore habitually have a higher prevalence of enuresis than those who do not snore.^{15,16}

Several mechanisms have been proposed to explain the association between SRD and asthma. Regarding snoring or apnea, repeat stimulation of the neural receptors at the entrance of the glottis and in the larynx can lead to bronchoconstriction.¹⁷ Likewise asthma may trigger symptoms of SRD due to the Venturi effect, in which the increase in air speed leads to a reduction in transmural pressure and consequent narrowing of the pharyngeal airway.⁸

Assuming that asthma is associated with SRD and this has already been correlated with enuresis, we questioned the possibility of an association between asthma and enuresis.

MATERIALS AND METHODS

We performed an observational cross-sectional study using questionnaires administered to parents/guardians of schoolchildren between 6 and 14 years old in public and private primary schools in our area. The institutional human research ethics committee approved this study and all parents/guardians of the children signed an informed consent form.

Of the 20 public and private schools that were randomly selected 16 agreed to participate. Contact with parents/guardians to complete the questionnaire was performed in 2 ways, including 1) randomly selecting 2 primary school

classes and sending a letter to the parents/guardians explaining about the project and 2) directly contacting parents/guardians as they were picking up or taking children to school, or during parent-teacher meetings.

School children younger than 6 or older than 14 years, those on diuretic medications and those with any medical condition that may involve enuresis, such as urinary tract or neurological disorders, were excluded from study.

After explaining the study to parents/guardians and applying the informed consent form an interview was scheduled. The questionnaires were then administered by telephone interviews performed by the investigator or a properly trained medical student. A structured questionnaire was used to collect general data related to child health, presence of diseases, use of medications and history of current or past bedwetting problems, allowing us to identify patients with exclusion criteria. When subjects had a history of current or past enuresis, a structured questionnaire about bedwetting was administered to classify the condition and assess the presence of associated daytime symptoms as well as current or previous treatment (see figure).

All parents/guardians answered a validated questionnaire on SRD.^{5,18} The questionnaire consisted of 13 questions about the symptoms of SRD. Possible answers were never, rarely, frequently, almost always and don't know. OSA was considered present when the parent/guardian answered frequently or almost always to the question, "Does your child stop breathing during sleeping?" "Do your child's lips ever turn blue or purple while he/she is sleeping?" or "Do you ever shake your child during sleep to make him/her breathe again?"

Finally, the ISAAC questionnaire was administered. This questionnaire assesses data on the current and previous history of children regarding asthma and atopy.^{19,20}

Wheezing was classified as wheezing at some point in life when the parent/guardian answered yes to the question, "Has your child ever had wheezing or whistling in the chest at any time in the past?" Wheezing was classified as wheezing in the last 12 months (current asthma) when the parent/guardian answered yes to the question, "Has your child had wheezing or whistling in the chest in the last 12 months?"

Quantitative, continuous or ordinal variables are described in regard to the central trend using the mean or median and to dispersion measures using the SD, IQR or minimum and maximum. Nominal or qualitative variables are expressed according to absolute values, percents or proportions. When comparing differences in continuous variables, the Student *t*-test, the Mann-Whitney test or ANOVA was used. To compare categorical data the Fisher exact or chi-square test and variations were used. The magnitude of associations between study parameters is expressed as the OR. The CI was used as a measure of precision and $p < 0.05$ was considered statistically significant. Prism®, version 5.0.3 was used for analysis.

RESULTS

Of the 20 public and private schools randomly selected to participate in the study 3 private schools and 1 state school refused to participate.

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