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Rhinitis symptoms and habitual snoring in Ecuadorian children

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ABSTRACT

Study objectives: To determine the prevalence of habitual snoring (HS) and its association with symptoms of rhinitis in a Latin American country and, secondarily, to assess how commonly physicians address rhinitis in the community.

Patients or participants: Six- to twelve-year-old school-aged children.

Population and methods: We designed a cross-sectional, community-based study of the pediatric population, centered in schools of Guayaquil, Ecuador. The study was evaluated and approved by the ethical committee of the Hospital Luis Vernaza as a local institution.

Measurements and results: A 15.1% prevalence of HS was reported among 806 responders out of 1193 surveys. The frequency of HS was associated with the number of rhinitis symptoms and a previous diagnosis of rhinitis, with those reporting ≥ 2 rhinitic symptoms being more likely to report HS ($p = 0.01$). Only a small minority of caregivers reported being aware of either HS or rhinitis as health problems.

Conclusions: HS is a highly prevalent symptom among Ecuadorian children, and the prevalence is further increased if the diagnosis of rhinitis or even >1 rhinitis symptom is concomitantly present. Since few caregivers of HS children are informed about the causes and consequences of this condition, increased health education about this condition is needed.

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1. Introduction

Snoring, the hallmark indicator of increased upper airway resistance during sleep and a prominent risk factor for the presence of sleep-disordered breathing [1], is a common condition in children all over the world. For example, the prevalence of habitual snoring (HS) in children in countries such as Germany, Sweden, Italy, Portugal, Australia, China, Thailand, and the USA has been reported to range from 5.6% to 15% [2–10]. This wide range of habitual snoring is partially due to the widely variable methodologies used for collection of questionnaire data. There is no universally accepted, clear definition of snoring. Thus, prevalence of the condition may differ based on varying perceptions of the word across cultures. Overall prevalence of parent-reported snoring by any definition in a recent meta-analysis was 7.45% [11]. HS, defined as parentally-reported audible snoring occurring ≥ 3 nights/week, has emerged not only as a predictor of sleep-associated respiratory-re-

lated disturbances [1], but also as predictive of an oxygen desaturation index $\geq 5/h$ of sleep [12].

The common nature of HS in children should not be misconstrued as primarily representing a social nuisance, but should instead be viewed as an important indicator of potentially serious health problems. Indeed, HS children are at increased risk for hyperactivity behaviors, as well as symptoms of conduct and oppositional defiance, inattention, aggressiveness, and sleepiness, all of which emphasize the major neurobehavioral health impact that HS can impose, including psychiatric, social, or medical problems [13–20].

Recognized risk factors associated with an increased prevalence of HS include obesity, dental malocclusion, exposure to respiratory viruses and cigarette smoking, recurrent otitis media, as well as allergic rhinitis [21,22,39–41]. Consequently, prevention or treatment of these conditions should lead to improvement in quality of life, health-related costs, and most importantly, long term health outcomes [23,24,42]. More specifically, allergic rhinitis has been shown to increase the risk of HS in both children and adults [4,7,17,18]. However, the prevalence of rhinitis symptoms as described by the ISAAC study is highly variable in Latin America [25]. Furthermore, there are no epidemiologic studies on the prev-

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alence of HS in a Latin American pediatric population [26], and the potential associations of HS with specific rhinitis symptoms or other sleep disorders have yet to be examined.

We should also emphasize that, although rhinitis and obstructive sleep apnea (OSA) are treatable conditions, it is not clear whether physicians in Latin America recognize these problems and advise caregivers of their pediatric patients to evaluate and treat these conditions. In recent studies in the US, both awareness and confidence in the level of knowledge on sleep problems were low, indicating the presence of significant barriers to appropriate care delivery [27,43]. If indeed, our leading assumption is confirmed, and reveals only infrequent assessment of symptoms related to rhinitis and OSA, then such findings would represent a unique opportunity to improve care in the pediatric population.

Based on aforementioned considerations, we conducted a cross-sectional survey of HS and rhinitic symptoms among school children in Guayaquil, Ecuador. A secondary aim was to determine how commonly physicians address these problems during routine office consultation. In other words, we wished to assess the level of parental knowledge on HS and rhinitis by assessing how commonly their primary care physicians provided them with pertinent information about these conditions.

2. Population and methods

We designed a cross-sectional, community-based study of the pediatric population, centered in schools of Guayaquil, Ecuador. The study was evaluated and approved by the ethical committee of the Hospital Luis Vernaza as a local institution.

2.1. Study population and administration

The survey was carried out in Guayaquil, the largest city in Ecuador, with a population over 2 million people. About 20% of the Ecuadorian population is concentrated in this city. We selected our study population from all elementary schools (ages 6–12 years) in the city that met the following criteria: (1) co-educational, (2) greater than 300 enrolled students, and (3) within the geographical limits of the city. A total of 127 out of 223 schools (representing a total population of 100,518 children), met these study criteria. After visiting the school administrators, only half of the schools accepted to participate in the study. We randomly selected schools from the list of institutions that accepted to participate. We kept track of the total number of students per school and stopped the selection once the estimated sample size had been matched or exceeded. The initial selection of 7 schools had a total of 2569 students between the ages of 6 and 12 years. During this phase, students were given a survey to be taken home, which specified that only one caregiver should answer the questions. All of the students were given a consent form to be returned. After three schools, an interim analysis revealed statistical significance and, therefore, recruitment was discontinued.

2.2. Definitions of variables

2.2.1. Snoring

The main variables collected were on snoring, rhinitis and demographic information. We defined habitual snoring (HS) as “always” or “often” answers to the question: “Does your child snore?” This specific question has been previously validated in the pediatric population and shown to have a high sensitivity and specificity [11,44]. During the statistical analysis, answers “always” + “often” were grouped and considered to represent “Habitual Snoring” as previously described by Ersu et al. [28]. Age was recorded in years, and gender was also recorded as stated by responding caretaker.

2.2.2. Rhinitis

Rhinitis was defined as a positive answer to any of the following questions:

- Over the past 12 months, did your son/daughter sneeze without having a cold or the flu?
- Over the past 12 months, did your son/daughter get a stuffy nose without having a cold or the flu?
- Over the past 12 months, did your son/daughter have post nasal drip without having a cold or the flu?
- Over the past 12 months, did your son/daughter get sinus pressure or sinus headache without having a cold or the flu?

We considered each upper airway symptom question separately, and also combined them into a Rhinitis Score (0–4, based on the sum of positive answers to each of the four questions). We refer to the score as “cumulative rhinitis symptoms.” Current diagnosis of rhinitis was also recorded as a yes or no answer to: “Has a doctor ever told you that your son/daughter has rhinitis?”

2.3. Data collection and quality control

After collection of the surveys, we entered the data into an Excel spreadsheet. A copy of the data was e-mailed on a weekly basis to an account specially created for the study. Only the authors had access to the e-mail account. The authors checked the data looking for missing data and entry mistakes. One of the authors was responsible for tracking the total numbers of responders during the recruitment period. All the original copies were classified based on the presence or absence of HS or rhinitis and schools. These files which also contain the duly signed consent forms are being temporarily kept by one of the members of QOLERS.

2.4. Statistical issues

For statistical analyses, we used STATA statistical software version 8 (Stata Corp, College Station, TX). Cross tabulations were used to assess frequencies and prevalence. Student's *t*-test or the χ^2 -test were used, as appropriate, to examine univariate associations. A *p*-value <0.05 was considered as reaching statistical significance. Logistic multivariate analyses were used to assess the independent contributions of demographic and co-morbidity variables to HS.

3. Results

We randomly recruited a total of three schools (1193 students) out of the initial randomized selection of 127 schools of the urban Guayaquil area. The response rate in the selected schools was 67% (i.e., 806 responders). The majority of children were girls (62%) and the mean age was nearly nine years (Table 1). We found 122 children with HS, reflecting a prevalence of 15.1%. The caregivers of male students reported a higher prevalence of HS as opposed to caregivers of the female population (17.1% vs. 13.9%, *p* = 0.02). The prevalence of HS did not exhibit age dependency (*p* = 0.9) (Fig. 1).

Each of the rhinitic symptoms was significantly associated with HS. Cumulative rhinitic symptoms were also significantly associated with HS, with more rhinitic symptoms being associated with a higher prevalence of HS (Fig. 2). After adjustment in a multivariate model (Table 2), a significant independent association between HS and a previous rhinitis diagnosis emerged (OR = 2.6; 95% CI: 1.45–4.67; *p* < 0.001). We also found that, after adjustment, those reporting >1 rhinitis symptom were more likely to have HS (OR = 1.67; 95% CI: 1.12–2.49; *p* < 0.01).

Table 1
Description of study population^a.

	HS n = 122 (15.1)	Non HS n = 684 (84.8)	Total	p value ^b
Sex %				0.2
Male	42.6	36.7	37.7	
Female	57.4	63.3	62.3	
Age, mean (SD)	8.9 ± 1.5	8.9 ± 1.6	8.95 ± 1.6	0.95
Rhinitis symptoms past 12 mo				
Sneeze	64.7	54.2	55.8	0.03
Stuffy nose	44.2	30.4	32.5	0.03
Post-nasal drip	36.8	27.1	28.6	0.02
Sinus pressure/headache	11.4	3.9	5	<0.0001
Cumulative rhinitis symptoms ^c				<0.0001
0	30.3	36.1	35.2	
1	18.0	27.2	25.8	
2	22.0	22.9	22.8	
3	22.9	11.7	13.4	
4	6.5	1.9	2.6	
Previous rhinitis diagnosis	16.3	6.1	7.7	<0.0001

^a Plus-minus values are mean ± SD.

^b P values for univariate association χ^2 -test and t-test were used. Logistic analysis for multivariate relationship was used.

^c Cumulative rhinitis symptoms are shown according to the rhinitis Score (0–4).

Despite the relatively high frequency of HS, only 9.8% of the HS caregivers reported being well informed, including 12.5% of those with all four rhinitic symptoms (Table 3).

4. Discussion

In the present study, a high prevalence of snoring was identified among school-aged children in Ecuador. This prevalence is markedly higher than the frequencies of HS previously reported in other parts of the world. A strong association between HS and symptoms of rhinitis was also present, despite most parents reporting that a

doctor had not diagnosed them with rhinitis. These findings, along with the low rates of knowledge and awareness about consequences of snoring by physicians, suggest a substantial opportunity to improve the healthcare of Ecuadorian children. Specifically, there is clearly a need for a health promoting campaign that provides the necessary information to primary care physicians on these two conditions, and thus enhances the awareness and need to treat rhinitis in their patients with HS, as treatment of rhinitis may relieve snoring and improve health and behavioral consequences [29,30].

The comparisons between the prevalence of HS in our study and those reported by other surveys around the world are clearly difficult, considering not only the differences in age ranges across studies, but also the discrepant sampling methods and assessment tools used by the various surveys. The absence of a standardized definition of HS that transcends cultural boundaries makes comparisons even more inaccurate. While we are concerned by the very high prevalence in HS in our population survey, we should point out that a study from Australia that shared many of our methodological approaches recently reported a similar prevalence of HS [31]. These investigators also found strong correlations between HS and environmental factors [31]. Notwithstanding such considerations, the questionnaire used herein did not inquire about duration, loudness, and other attributes of snoring, such that an increased sensitivity, albeit at the expense of reduced specificity, could be expected and is likely to have played some role in the overall prevalence rate reported in this study [12]. We should also point out that socio-economic status (SES) was not assessed, even though childhood OSA is associated with low SES [32]. Under these circumstances, the low levels of SES among Guayaquil residents may have also led to accrual of elevated HS rates. The age ranges of the populations surveyed are highly variable among the published studies on pediatric HS. For example, Brunetti et al. assessed a range of 3–13 years and reported a prevalence of HS of 4.9% [44]. On the other hand, in the two studies that surveyed populations with an age range closer to the one appraised by our study, Corbo et al. [33] and Ferreira et al. [37] reported a preva-

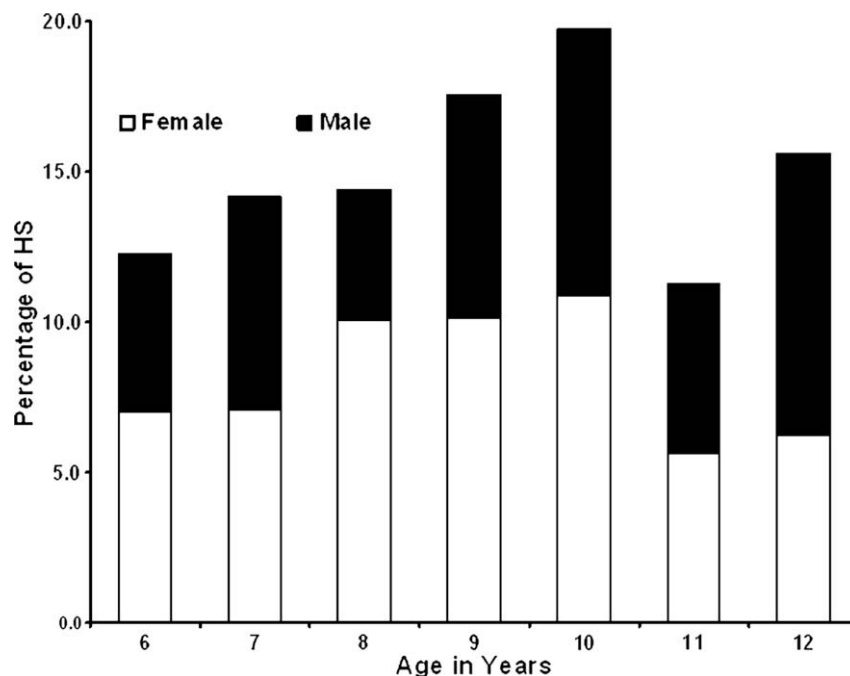


Fig. 1. Percentage of habitual snoring (HS) according to age group. The prevalence of HS did not exhibit age dependency ($p = 0.9$). The dark segment of bars is representative of boys, and the white segments represent girls.

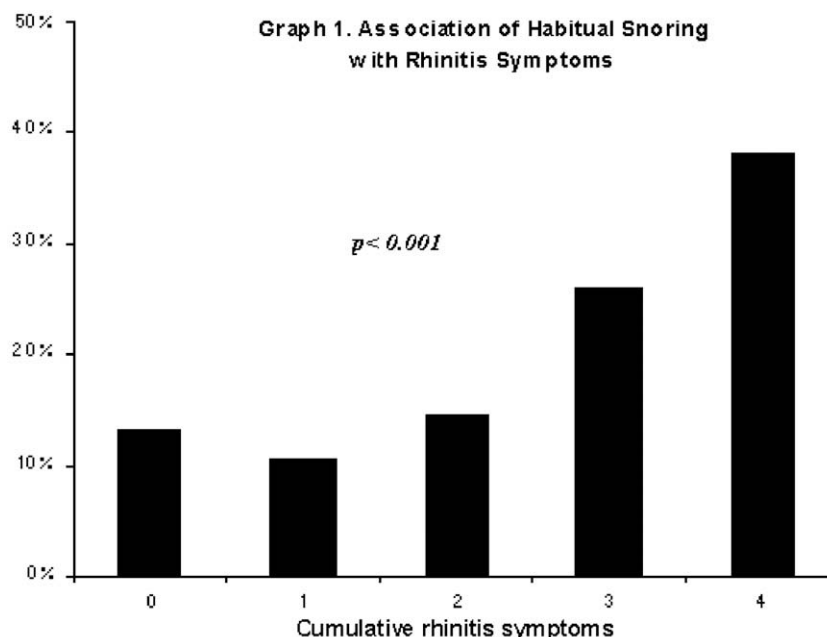


Fig. 2. The graph shows the cumulative prevalence of rhinitic symptoms and habitual snoring.

Table 2
Multivariate model of prediction of habitual snoring.

	OR	CI	P ^a
Sex			
Male	1.3	0.87–1.92	0.2
Female	1.0	–	–
Cumulative rhinitis symptoms			
<2	1.0	–	–
2 or more	1.7	1.12–2.49	0.01
Previous rhinitis diagnosis	2.6	1.45–4.67	0.001

^a P values were calculated by the χ^2 -test and *t*-test as appropriate with a 95% of confidence interval (CI). Multivariate analysis was used to establish association between habitual snoring and previous rhinitis diagnosis.

Table 3
Patient factors associated with doctor informing to habitual snorers.

	Informed n = 12 (9.8)	Not informed n = 110 (90.2)	P ^a
Habitual snorers			NA
Cumulative rhinitis symptoms ^b			0.5
0	10.8	89.2	
1	0.0	100.0	
2	11.1	88.9	
3	14.3	85.7	
4	12.5	87.5	
Symptoms past 12 mo			
Sneeze	10.1	89.9	0.8
Stuffy nose	13.0	87.0	0.3
Post-nasal drip	11.1	88.9	0.7
Sinus pressure/headache	14.3	85.7	0.5
Previous rhinitis diagnosis	15.0	85.0	0.3

^a P values were calculated using multivariate analysis.

^b Rhinitis score (0–4) was used to evaluate rhinitis symptoms.

lence of HS of 8.6% and 7.3%, respectively. However, it may be argued that these figures may still not be immediately comparable to ours, since both of these studies used different definitions for snoring. Nevertheless, a recent study in Istanbul by Ersu and colleagues, using the same snoring definition and interviewing a sim-

ilar population (5–13 years), reported a 7% prevalence [28]. Although the prevalence of snoring that we report is evidently higher than the one reflected in most of the international literature, similar variability has been reported in international studies of HS in an adult population [34–37]. As corroboration to the latter assumption, Goodwin and colleagues reported higher rates of HS and associated daytime symptoms in Hispanic school aged children compared to Caucasian children [22]. While the variability in survey response rates may also influence the reported prevalence rates, we cannot infer that this is the case, particularly considering the relatively high response rates in the present study. In addition, age was not a predictor of HS in our study, and this may be due to the relative absence of pubertal children in our cohort [28]. The trend towards a significantly higher prevalence of HS in boys may also indicate the emergence of gender-related differences during post-pubertal years. Although the population of Guayaquil as the largest city of Ecuador is representative of the global Ecuadorian population, the lack of inclusion of other urban conglomerations could lead to selection bias. We are unclear as to whether such concern would actually alter the prevalence of HS. An additional limitation of our study is the cross-sectional survey design, which does not allow for more objective confirmation of either HS or rhinitis. Recall bias is always a concern, which is, however, somewhat alleviated by the high levels of concordance between objective and subjective reports of HS [38].

In close agreement with previous reports [45–50], we found a strong association between an existing diagnosis of rhinitis and HS. Furthermore, we also observed that reports of ≥ 2 rhinitis symptoms also predicted a higher likelihood of HS. Symptoms in allergic rhinitis are nasal pruritus, nasal congestion, rhinorrhea and sneezing; however, one common presentation of allergic rhinitis in childhood also includes recurrent sore throats and upper respiratory tract infections. Children with chronic allergic rhinitis typically have hypernasal speech, fatigue, decreased appetite, chronic cough, and poor growth. Taken together, the published data and the confirmatory evidence derived from the present study would strongly support the need for not only evaluating rhinitis symptoms, but also that the presence of such symptoms should alert clinicians to explore the possibility of HS.

Despite the high prevalence of HS in children, the low levels of both awareness and knowledge about the potentially adverse implications of HS among physicians and families are highly concerning. A previous study has already shown that only 25% of United States pediatricians actually screen for snoring among school aged children [27], and a subsequent study further revealed the presence of major deficits in basic knowledge about childhood sleep apnea that were unrelated to the type of physician practice setting and specialty training [43]. Thus, considering the markedly low rates of routine screening for HS in our study, it is imperative to develop pragmatic programs aiming at providing more education to both physicians and the public and focusing on the diagnosis and treatment of HS, rhinitis and sleep apnea. Such measures should, in turn, lead to increased identification of children at risk for these conditions, and, thus, improve overall outcomes.

In summary, habitual snoring is a highly prevalent condition in a pediatric urban population living in Ecuador. Furthermore, those children who are either diagnosed with rhinitis or report more than one rhinitis symptom are also more likely to report habitual snoring. The cumulative evidence indicating the strong association between HS and several co-morbidities, as well as the adverse health-related and quality of life outcomes linked to HS, should lead to public health campaigns aiming to increase the recognition and treatment of these highly prevalent conditions.

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