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Prevalence of symptoms of asthma and allergic rhinitis in children in Southern Brazil: a ten-year monitoring study

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ABSTRACT

Objective: This study analyzes and describes trends in prevalence of asthma and rhinitis in children 6–7 years old living in Santo Ângelo, Brazil, by comparing data from 2007, 2012, and 2017. **Methods:** The ISAAC (International Study of Asthma and Allergies in Childhood) standardized written questionnaire was used in a three cross-sectional survey. The questionnaire was applied between March and May of 2007, 2012 and 2017. **Results:** A total of 701 children participated in the survey: 225 children in 2007, 229 in 2012, and 247 in 2017. There were no differences in the prevalence of current wheeze in the years of this study. On the other hand, a higher percentage of children were diagnosed with asthma in 2012 (26.2%) than in 2007 (10.2%) and 2017 (10.1%) ($p < 0.05$); however, the severity of asthma was lower in 2012 when compared to other years. Regarding cases of probable asthma – which included patients with suspected asthma or wheezing and nocturnal cough without a diagnosis of asthma – these corresponded to 15.7, 17.0, and 25.1% of the cases in 2007, 2012 and 2017, respectively. For other allergic diseases, we found no statistical difference in the frequency of symptoms of current rhinitis (55.5%, 54.6%, 51.8% in 2007, 2012, and 2017, respectively), allergic rhinitis (45.3%, 45.0%, 36.4% in 2007, 2012, and 2017, respectively), or pollinosis (17.8%, 12.7%, 14.2% in 2007, 2012, and 2017, respectively). **Conclusions:** The prevalence of probable asthma increased from 2007 to 2017. The prevalence of symptoms and diagnosis of allergic rhinitis and pollinosis was relatively high and these allergies must be considered in the pediatric population of the region.

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Introduction

The prevalence of allergic respiratory diseases, such as asthma and rhinitis has increased in recent years and represents a major problem, both for the public health sector and for affected individuals, compromising their wellbeing and quality of life. However, the prevalence of these diseases differs between countries and between regions of the same country [1,2].

Written questionnaires on respiratory symptoms designed to determine the prevalence of asthma and allergies in children have been widely used in epidemiological studies to track prevalence trends, and to determine the associated factors and the severity of allergic diseases [3]. The International Study of Asthma and Allergies in Childhood (ISAAC) was considered the pioneer in the use of standardized questionnaires, an important landmark in the epidemiology of asthma worldwide. At phase I of

ISAAC, 91 centers from 38 countries – including Brazil, that joined ISAAC in 1995 (2,3) – were included for the compilation of global data on children aged 6 and 7 years old; the results demonstrated a great variability in rates between the different participating centers, mainly because it was one of the first times that the indicators were being used. After 7 years, the ISAAC was again conducted, with a significant higher number of participating centers of children aged 6 and 7 years old (144 centers in 61 countries), including countries not involved in phase I; a slight increase in the mean prevalence of asthma was found during phase III of the study [4]. For Brazil, results indicated a small increase in Asthma symptoms from 21.3 to 24.4% in phase I to III [5].

In a recent study, our group applied the ISAAC questionnaire to evaluate the relationship between allergic respiratory disease and recurrent respiratory infection in children and adolescents (0–15 years old

patients) [6]. Other studies using the ISAAC questionnaire have been performed in Southern Brazil, with adolescents aged 13 and 14 years old [7], with college students [8], and with army soldiers [9]. These studies demonstrated a high prevalence of allergic rhinitis and pollinosis in the municipality of Santo Ângelo, compared to other regions of the state of Rio Grande do Sul (RS), Southern Brazil.

Considering that an increase in allergic respiratory diseases has been reported by clinicians and health authorities in our region, especially in pediatric patients, the present study aimed to analyze and describe trends in the prevalence of asthma and rhinitis in schoolchildren aged 6 and 7 years old living in the municipality of Santo Ângelo, RS, Brazil, based on the ISAAC questionnaire, comparing data obtained in 2007, 2012, and 2017.

Methods

Study design

The work represents a three cross-sectional study design in the same location and using the same survey. Participants of the study were students from private and public schools of Santo Ângelo, RS, Brazil. The municipality of Santo Ângelo is located in the Northwestern part of RS, 28°17'56"S, 54°15'46"W, with an altitude of 285 m. According to the latest Census of the Brazilian Institute of Geography and Statistics (IBGE) in 2010, the population was estimated at 76,275 inhabitants, of whom approximately a little more than 2000 were 6 and 7 years old children. The city's economy is based mainly on the agricultural sector, having as second economic activity the provision of services.

Selection of cases

Based on the sample size calculation for a finite population of 2000 individuals in the age group (6 and 7 years), with an estimated frequency of allergic processes of 20%, a 5% error and 95% confidence interval, a minimum of 220 questionnaires were needed.

Santo Ângelo has a total of 38 schools, of which 6 are private and 32 are public schools. For selection of schools, the municipality was divided into zones (North, South, East, West and Center), and one public school was randomly drawn for each zone. In addition, 3 other schools were drawn for the Center (1 public and 2 private). Therefore, in total 8 schools were sorted. Each school received a number; the draw of the schools was carried out in 2006, and students

of the same schools were interviewed during the period of the study.

Questionnaire and definitions

We used the standardized questionnaire on the frequency of allergic respiratory problems in children, known as ISAAC (International Study of Asthma and Allergies in Childhood) by Asher et al. [10], with the asthma content validated for the Portuguese language by Solé et al. [11], and the allergic rhinitis and pollinosis by Esteves et al. [12]

The data collection was done by applying the ISAAC standardized questionnaire between March and May of the year 2007, and later at the same months in 2012 and in 2017. We sought to collect data during the fall period, therefore before spring, in order to avoid possible seasonal influences.

The questionnaires were forwarded to the parents by the teachers in each class, along with the consent form and a letter explaining the importance of the work and asking the parents to answer all questions of the two modules and return them to the school. The questionnaires were collected after 7–10 days; when incomplete, parents were contacted and the questionnaires were returned to them to be correctly filled out.

The questionnaire included 8 questions about asthma and 9 questions about allergic rhinitis. The special definitions used in the study were as follows: current wheeze analysis based on the percentage of positive responses to the question “Has your child presented wheezing in the past 12 months?” (*Current wheeze*). Medical diagnosis of asthma was assessed indirectly by the question: “Has your child ever had or has asthma?” (*Asthma diagnosis*). The *severity of asthma* was considered as intense wheezing that could limit speech in the past 12 months as reported by the subject.

The prevalence of *diagnosed or referred rhinitis* was determined by positive responses to the question “Has your child ever had or has hay fever?” The question: “Has your child ever had sneezing and runny nose in the past 12 months?” identified children who currently have *active rhinitis*. And the response to “In the past 12 months, has this nose problem been accompanied by itchy-watery eyes?” identified children with *rhinoconjunctivitis*. In addition, those children whose parents answered “No” to the question “Has your child ever had or have allergic rhinitis?” but reported that the child presented sneezing and runny nose in the past 12 months, accompanied by symptoms of

itchy and watery eyes, were classified as children with *probable allergic rhinitis*, according to established criteria [13].

We assessed pollinosis based on questions about pollen allergy in the spring; accordingly, individuals who marked pollen allergy associated with the presence of nasal and optic allergic symptoms specifically during spring months (October and November) were considered as having *pollinosis* [8].

Probable asthmatic children were those who did not report having or having ever had asthma, but who presented, in the past 12 months: 4 or more wheezing episodes; or interrupted sleep and with 1 to 3 wheezing episodes; or with 1 to 3 wheezing episodes without interrupted sleep but with nocturnal cough; or wheezing during exercises, according to previously established criteria [13,14].

All questionnaires correctly completed and with the consent of the parents were included in the study. We excluded the questionnaires that were not adequately filled, following the same criteria adopted in the research. This study was approved by the research ethics committee of URI (Universidade Regional Integrada) and by the National Ethics Committee (CAAE 66223817.9.0000.5354), and was also informed to the Municipal Secretary of Education of Santo Ângelo and State Coordination of Education (CRE).

Statistical analysis

The prevalence was calculated by dividing the positive responses to a given question by the total validated and completed questionnaires. The Fisher test was used for the categorical data. The odds ratio (OR) at a 95% confidence interval (CI) were calculated. A p values <0.05 was considered statistically significant for all tests. The Winepi software version 11.65 was used for statistical analyses.

Results

The questionnaires were applied in a total of 8 public and private schools of the city of Santo Ângelo. The same schools were visited in the years of 2007, 2012, and 2017. To carry out the research, 1192 questionnaires were handed out, of which 701 were returned and considered valid. This generated an average rate of return of 58.8% during the years studied. Table 1 presents characteristics of the population interviewed. With regards to gender, a slightly higher proportion of females than males answered to the questionnaires in 2007 (50.6% vs 49.4%) and 2012 (53.7% vs 46.3%),

Table 1. Description of the study population.

	2007 <i>n</i> (%)	2012 <i>n</i> (%)	2017 <i>n</i> (%)	Total <i>n</i> (%)
Questionnaire				
<i>All invited</i>	379	358	455	1,192 (100)
<i>Participated</i>	225 (59.5)	229 (64.0)	247 (54.3)	701 (58.8)
Gender				
<i>Female</i>	114 (50.6)	123 (53.7)	122 (49.4)	329 (51.2)
<i>Male</i>	111 (49.4)	106 (46.3)	125 (50.6)	313 (48.8)

however such a difference was minimum and not statistically significant.

Table 2 presents the prevalence of affirmative responses to the different aspects of the asthma and rhinitis module of the ISAAC questionnaire for children aged 6–7 years old in 2007, 2012, and 2017.

The prevalence of wheezing was similar for all 3 years. On the other hand, we found differences in the severity of asthma, which was based on reported respiratory problems that could limit speech; accordingly, asthma severity was reported for 7.1 and 6.5% of the children in 2007 and 2017, respectively, while in 2012 only 2.6% of the children had symptoms suggestive of asthma severity ($p < 0.05$). Regarding the diagnosis of asthma (asthma ever in life), this parameter showed trends opposite to that of asthma severity, with an increase in prevalence from 2007 (10.2%) to 2012 (26.2%), followed by a subsequent reduction in 2017 (10.1%). The prevalence of asthma diagnosis was similar between 2007 and 2017.

Regarding nasal symptoms in the past 12 months (active rhinitis), rhinoconjunctivitis, diagnosis of allergic rhinitis (hay fever), and pollinosis, no significant differences in frequency were found along the years of this study.

Table 3 shows the results for probable asthma and probable allergic rhinitis, checked by the affirmative answers in the year 2007, 2012, and 2017. A significant increase in probable asthmatic children for the year 2017 (25.1%) in relation to the other years (15.7% and 17% in 2007 and 2012, respectively) can be observed ($p < 0.05$). As the diagnosis of asthma was higher in 2012 (Table 2), when added to the probable asthmatics a significant increase occurred between 2007 and 2012, which stayed high in 2017 since there is no significant change compared to 2012. Considering that the number of probable allergic rhinitis was significantly higher in 2007 (12.9%) than in other years (2.6% in 2012 and 4% in 2017), when cases of allergic rhinitis diagnosis are added to this parameter, a significant decrease during the study period is observed, though there are no significant difference between 2012 and 2017.

Table 2. Prevalence of current wheeze, allergic rhinitis and clinically diagnosed disease in 2007, 2012, and 2017.

	Year, n (%)			Odds ratio (95% confidence interval)		
	2007 (n = 225)	2012 (n = 229)	2017 (n = 247)	2007 vs 2012	2007 vs 2017	2012 vs 2017
Wheezing (ever in life)	137 (60.8)	129 (56.3)	138 (55.9)	0.8 (0.6–1.2)	0.8 (0.5–1.2)	1.0 (0.7–1.4)
Wheezing in the past 12 months	88 (39.2)	95 (41.5)	93 (37.7)	1.1 (0.7–1.6)	0.9 (0.6–1.4)	0.8 (0.6–1.2)
Speech impairment	16 (7.1)	6 (2.6)	16 (6.5)	0.3 (0.1–0.9)*	0.9 (0.4–2.0)	2.6 (0.9–8.2)
Asthma diagnosis	23 (10.2)	60 (26.2)	25 (10.1)	3.1 (1.9–5.5)*	1.0 (0.5–1.9)	0.3 (0.2–0.5)*
Nasal symptoms in the past 12 months	125 (55.5)	125 (54.6)	128 (51.8)	1.0 (0.6–1.4)	0.9 (0.6–1.3)	0.9 (0.6–1.3)
Rhinoconjunctivitis	62 (27.6)	58 (25.3)	72 (29.1)	0.9 (0.6–1.4)	1.1 (0.7–1.6)	1.2 (0.8–1.9)
Hay fever (ever in life)	102 (45.3)	103 (45.0)	90 (36.4)	1.0 (0.7–1.4)	0.7 (0.5–1.0)	0.7 (0.5–1.0)
Pollinosis	40 (17.8)	29 (12.7)	35 (14.2)	0.7 (0.4–1.2)	0.8 (0.4–1.3)	1.1 (0.6–2.0)

*Fisher test: $p < 0.05$.**Table 3.** Prevalence of probable asthma and allergic rhinitis in 2007, 2012, and 2017.

	Year, n (%)			Odds ratio (95% confidence interval)		
	2007 (n = 225)	2012 (n = 229)	2017 (n = 247)	2007 vs 2012	2007 vs 2017	2012 vs 2017
Probable Asthma	35 (15.7)	39 (17.0)	62 (25.1)	1.1 (0.7–1.9)	1.8 (1.1–3.0)*	1.6 (1.1–2.6)*
Asthma diagnosis + Probable Asthma	58 (25.8)	99 (43.2)	87 (35.2)	2.2 (1.4–3.3)***	1.6 (1.1–2.4)*	0.7 (0.5–1.0)
Probable Allergic Rhinitis	29 (12.9)	6 (2.6)	10 (4.0)	0.2 (0.1–0.5)***	0.3 (0.1–0.6)***	1.6 (0.5–5.3)
Allergic Rhinitis + Probable Allergic Rhinitis	131 (58.2)	109 (47.6)	100 (40.5)	0.6 (0.4–1.0)*	0.5 (0.3–0.7)***	0.7 (0.5–1.1)

*Fisher test: $p < 0.05$.**Fisher test: $p < 0.01$.***Fisher test: $p < 0.001$.

Discussion

In the city of Santo Ângelo, in Southern Brazil, physicians have long reported an increase in the number of pediatric patients presenting allergic conditions, however there are no studies evaluating the aspects observed. Considering that the incidence of asthma and allergic rhinitis has increased over the past years, mainly in developing countries [1,15], the present study analyzed the symptoms and diagnosis of asthma, allergic rhinitis and pollinosis in the years 2007, 2012 and 2017 in 6–7 years old children from Santo Ângelo.

In this 10-year period (2007–2017) study, no significant changes were observed in the prevalence of asthma symptoms, rhinoconjunctivitis, diagnosis of allergic rhinitis, or pollinosis. An increase in the diagnosis of asthma from 2007 to 2012 was followed by a decrease from 2012 to 2017, therefore there were no changes if we consider the whole period of the study. Our results are different from those found in the city of Adana, Southern Turkey, with children aged 6–14 years, which reported an increase in the diagnosis of asthma and allergic rhinitis from 1994 to 2014 [1]. In another study analyzing the trend of the last 21 years, which included four cross-sectional analyses from 1993 to 2014 in children aged 7–10 years in the city of Chorzow in Poland, an increase in the diagnosis of allergic diseases was observed, however prevalence of symptoms and of disease diagnosis was maintained in the last 10 years [15]. In a study in the city of Cork in Ireland, the prevalence of asthma and allergic rhinitis in children 6–9 years old did not

change between 2002 and 2007, but rhinoconjunctivitis and eczema have become increasingly prevalent [16]. In Brazil, the prevalence of asthma and allergic rhinitis in children varies considerably depending on the region; the serial evaluations performed by the present study suggest that the prevalence of asthma is stable in Brazil, but additional measurements are necessary to confirm this trend [4].

Wheezing is a common symptom of asthma, hence when patients are investigated for this condition, the question about “having wheezing in the past year,” which indicates current wheeze, is of great sensitivity and specificity to the presence of asthma, being universally used to identify individuals with active asthma [5]. Of note, in the present study current wheeze was also assessed using this question, and we found prevalence values of 39.2% in 2007, 41.5% in 2012 and 37.7% in 2017; this is a high prevalence compared to the world average of current wheeze in 6–7 years old children (11.5%) [17]. In Brazilian children, the prevalence of current wheeze ranges from 16.1 to 31.2% [4]. In addition, in phase I and III ISAAC conducted in all regions of Brazil, with an application interval of approximately 7 years, the prevalence of current wheeze showed a national average of 23.1 and 23.5%, respectively [4]. For most geographic regions the prevalence of current wheeze is even lower: 17.2% in Latin America, 21% in English-speaking countries, 21.7% in Oceania and 6.8% in the Indian Subcontinent [17].

Though the overall prevalence of asthma symptoms has not changed significantly in the past years, the

percentage of children clinically diagnosed with asthma has increased worldwide; this could be due to a greater awareness of this condition and/or changes in diagnostic practice [3,17]. The increases in asthma symptom prevalence in Africa, Latin America and parts of Asia indicate that the global burden of asthma is continuing to rise, but the prevalence differences among different geographic regions are lessening [3].

As observed in our analysis, more children were diagnosed with asthma in Santo Ângelo in 2012 (26.2%) compared to 2007 and 2017 (10.2 and 10.1%, respectively). The values found for 2007 and 2017 are within the national prevalence for this age group, which ranges from 4.9% in Santo André (São Paulo, Southeastern Brazil) to 20.8% in Manaus (Amazonas, Northern Brazil), presenting an average in Brazil of 9.7% [4,17]; similarly, the average prevalence of asthma diagnosis in Latin America is 11.2% [17]. Higher prevalence for asthma, such as observed in 2012 in our study, has been reported in Oceania (29.2%), mainly in New Zealand (30.2%) [17].

Interestingly, even though we observed an increase in asthma diagnosis in 2012, asthma severity index was lower in that year (2.6%) than in 2007 (7.1%) and 2017 (6.5%). Possibly, more diagnosis of asthma in 2012 led parents to seek adequate treatment for their children, leading to less disease severity. It also coincides that in 2010, in Brazil, the rules for financing and implementing the Basic Component of Pharmaceutical Assistance were approved, which assigned to the program of asthma and rhinitis drugs for the National reference list in basic care, facilitating access to treatment [18].

Another allergic condition analyzed in this study was rhinitis, which was assessed based on reports of nasal symptoms (sneezing and runny nose) in the past 12 months [2,19]. Accordingly, symptoms of active rhinitis were reported by 55.5% of the children in 2007, 54.6% in 2012 and 51.8% in 2017. These values were significantly higher when compared to other ISAAC for the same age group of children at ages 6 and 7 years old. Accordingly, in a ISAAC conducted in the city of Salvador, Northeast Brazil, prevalence of rhinitis was 39.8%; moreover, the Brazilian average is 25.7% [19], with the lowest prevalence found in Itajaí (Southern Brazil, 19.3%) [19]. In ISAAC phase III study the average found for Latin America was 27.9%; the highest index found in the world was in Bangkok, Thailand (43.3%), and Taipei, Taiwan (42.0%) [20].

With regards to “associated nasal and ocular problems in the past 12 months,” which in other studies is termed “rhinoconjunctivitis” [2,19–21], we did not

find differences between the studied years, with values of 27.6%, 25.3%, and 29.1% for 2007, 2012, and 2017, respectively. These values were higher than those of a phase III ISAAC, performed in different cities in Brazil, where the national average was 12.6%, ranging from 10.3% in Aracaju to 17.4% in Salvador, both cities in Northeastern Brazil [19]. The world data were lower than our study, with a global average of 8.3%, a prevalence of 12.1% for Latin America, and similar prevalence values in Taipei, Taiwan (24.2%) [20].

In this study, clinically diagnosed allergic rhinitis in children of 6 and 7 years of age was based on an affirmative answer by parents when asked if their children “ever has or had hay fever.” Though we did not find differences between different years (45.3% in 2007, 45% in 2012, and 36.4% in 2017), the prevalence was higher than the average of studies performed in other centers in Brazil, where the mean prevalence of rhinitis was 19.9 and 19.3% in the ISAAC phase I and phase III studies [22]. In the world studies the global average is 11.8% for the diagnosis of allergic rhinitis, with average of 16.2% in Latin America; high prevalence was found in the city of David, Panama (39.2%), and in Taipei (39.4%) [20].

The factors that contribute to these high prevalence of allergic rhinitis and asthma symptoms may be rapid changes in temperature that occur in areas of high thermal amplitude, which may also contribute for the onset of health problems, including those affecting the respiratory tract [23]. Of note, during winter the temperatures in Santo Ângelo may vary between 2 and 20 °C in the same day [24]. On the other hand, no other information about possible risk factors associated with allergic disease have been collected in the geographic area where this study was undertaken; for instance, pollen dispersion in the region could have an impact on health conditions and influence our results.

The question addressed to individuals about pollen allergy in the Spring is not of diagnostic value, especially in regions where people do not have symptoms during the months of pollen dispersal [8,9]. Therefore, to actually determine the percentage of pollinosis, an adjustment was made to the values, considering nose and eyes symptoms that occur mainly during spring (October and November), combined with the specific question about pollinosis “has or ever had allergic to pollen in the Spring?” [8,9].

The prevalence of pollinosis differs according to the geographic position, vegetation, climate and age of the groups surveyed. The age is an important variable, since pollinosis mainly affects people between the ages

of 20 and 30 [9]. In a research conducted with soldiers [9] and college students [8] in our region, a high index of pollinosis in relation to other regions of the State was observed.

In Brazil, the plants of the family *Poaceae* are the main sources of allergens due to their great pollen production capacity. The most important species are *Lolium perene* (perennial ryegrass), *Poa pratensis* (blue grass) and *Phleum pratense* (timothy grass), but other species may also be important clinically depending on the geographic region. In Southern Brazil, *L. multiflorum*, known as annual ryegrass is the main pollinating grass [25]. *L. multiflorum* is used as pasture and forage is dried during its final cycle of development with the use of herbicide, serving as a soil cover basis for summer crops such as soybean and corn. The ryegrass remains in the soil throughout the year and has a natural resemination; its pollen is anemophilous and highly allergenic [8]. It should be noted that there are no studies of pollen dispersal intensity in the municipality of Santo Ângelo.

Considering the lack of diagnosis of asthma in some patients, our study included the concept of probable asthmatic suggested by Sologuren et al. [13]. Based on this concept, patients who deny having asthma but have symptoms such as wheezing and nocturnal cough that disturbs sleep can be considered as probable asthmatic. In our results, it was possible to infer that there was an increase in 2017 of children suffering from asthma symptoms without diagnosis of asthma (probable asthma). When we add up the values of probable asthmatics and the positive answers to the question “asthma ever in life,” we find significant changes from 2007 to 2012, and from 2007 to 2017, however we did not find differences in the last 5 years of the study. Possibly, in the year 2017 there was less access to medical assistance for clinically diagnosing allergic asthma, thus we see an increase in the prevalence of probable asthmatics. It is possible that some of the children have not yet had the medical diagnosis of asthma, or clinicians generally treat other terms such as “bronchitis,” “asthmatic bronchitis,” “tracheobronchitis,” then it has underdiagnosed of asthma [13]. In a worldwide average of 16.5% of patients with severe asthma symptoms present without diagnosis, in Latin America it reaches 18.9% and in Africa 40.2% [17].

Similarly, for allergic rhinitis, children with allergic rhinitis are considered likely, and when considering medical underdiagnosed. There was a significant reduction between the study periods of patients with probable rhinitis, but there was no reduction in the

question “have or had allergic rhinitis?” When we add up the probable rhinitis and the diagnosed rhinitis, we have a small reduction from 2007 to 2017.

Some limitations should be considered when interpreting our results. The prevalence of allergic diseases was measured based on questionnaires, without performing clinical examinations or allergy skin tests to confirm reported symptoms. Besides that, we did not have access to information about some factors associated with increased risk for respiratory allergic problems, such as exposition to tobacco and other indoor environment variables, which could be confounders in the present study, as has been discussed elsewhere [15,16].

Current asthmatic and allergic rhinitis symptoms were related to the past 12 months, which may involve further limitations of the study. Thus, the outcomes may have been over- or underestimated. The strength of this study is the comparability of the results. The authors used a standardized method triplicated in a repeat survey in identical schools, identical age groups, and covering ten years of study. In addition, other study that the parents or caregivers of children (6–7 years old) with or without asthma were interviewed in their homes on two occasions, with an interval of 15 days, and responded to the ISAAC written questionnaire by telephone, evaluating the reproducibility of responses to the questions, given by the same respondent. The question “wheezing in the past year” had a perfect concordance index, enhancing the reproducibility of the instrument administered via telephone [26].

Another limitation of our study is the relatively small sample number, approximately 220 interviews per year of the study, but it should be remembered that Santo Ângelo is a small city and presents a little more than 2000 students of that age, so that the number interviewed per year would exceed 10% of the total population. Our interest in studying in the city of Santo Ângelo lies in the continuous complaints that the population presents, especially in the symptoms of pollinosis.

Conclusions

Allergic rhinitis, pollinosis and associated symptoms are a Public Health problem not only in Santo Ângelo but also in worldwide, affecting different age groups. This study shows that the prevalence of these diseases is high in 6–7 year old children, although they do not show a tendency to increase. The prevalence of asthma observed in our study is within the national

and world average data; of note, the prevalence of probable asthma increased from 2007 to 2017. Furthermore, when we take into account probable asthma in combination with asthma diagnosis, we observed an increase in the first 5 years, standing to the following 5 years of the study.

Further studies are needed to elucidate the reasons for the high prevalence of allergic rhinitis and its symptoms, including others ages groups and an assessment of risk factors. Our results can provide insight to help in the planning of healthcare services for asthma and allergic diseases.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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