



PARTICULARITIES OF ASTHMA AMONG ADOLESCENTS IN THE CITY OF FIANARANTSOA

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Abstract: Asthma is the most common chronic illness in children. It represents a major public health problem worldwide. Being the first study on asthma in Fianarantsoa, the aim of the study is to determine the prevalence, assess the severity and determine the risk factors of adolescent asthma in the city of Fianarantsoa. A prospective cross-sectional study, based on written questionnaires from the ISAAC I survey, among school children aged 13 and 14, over a period of 6 months from February to July 2017 was carried out. The choice of establishment was made randomly. Sociodemographic data, asthma symptoms, other atopic conditions, and students' lifestyle were collected using a standardized questionnaire. Nine hundred and thirty students agreed to participate, giving a participation rate of 81%. Five hundred and fifty-four (59.19%) were girls and 382 (40.81%) were boys. The sex ratio was 0.6. The lifetime prevalence of asthma was 13.26% and asthma in the past 12 months was 3.31%. The wheezing during or after exercise and nocturnal cough during the last 12 months were found respectively in 7.48% and 21.7% of cases. Concerning the severity of asthma, 32.26% presented 4-12 times of wheezing during the last 12 months and 19.35% more than 12 times. Waking up at night more than once a week due to wheezing was found in 25.81% of cases. For the severity of the asthma attack, 35.48% had difficulty speaking, 77.96% absenteeism from school for more than 1 to 5 days. Hospitalization for asthma attack once or twice in the last 12 months was found in 16.12%. The factors associated with asthma and asthma symptoms found were gender ($p=0.022$), passive smoking ($p=0.041$), presence of humidity or mold ($p=0.003$), use of biofuel (wood or charcoal).) ($p=0.017$), familial asthma (0.0001) presence of cockroaches at home (0.025).

Asthma is relatively common among adolescents in schools in the city of Fianarantsoa. The rate of severe asthma is high. According to our study, many factors are associated with asthma in adolescents.

Keywords: adolescent asthma, Fianarantsoa, Madagascar.

Introduction

Asthma is the most common chronic inflammatory disease of the airways in children [1]. Asthma constitutes a real public health problem worldwide. It has repercussions not only on the socio-professional level but also psychologically and on school life for children and adolescents. In Fianarantsoa, no studies have been carried out among adolescents. Our objectives were to determine the prevalence of asthma and asthma symptoms among school adolescents in the urban area of Fianarantsoa, to assess severity and to investigate factors associated with asthma.

Materials and methods

This is a prospective cross-sectional study, based on the written questionnaire of the ISAAC (International study of Asthma and

Allergic in Childhood) phase I survey, among school children aged 13 and 14, over a period of 6 months ranging from February to July 2017. The choice of establishment was made randomly. All students aged 13 and 14 who agreed to participate were included. Sociodemographic data, asthma symptoms, other atopic conditions, and students' lifestyle were collected using questionnaires. Current asthma is defined as participants experiencing wheezing in the past 12 months. Lifetime asthma is defined by the presence of wheezing in the chest during life. Asthma is said to be severe if there is a recurrence of wheezing attacks more than 3 times in the last 12 months and responsible for waking up at night more than once a week. An asthma attack is said to be severe if it interferes with speech, requiring hospitalization and causing absence from school. The statistical test was carried out using the CHI2 test. The multivariate analysis is carried out by logistic regression with the

XLSTAT 2018 software. A difference is considered significant if $p < 0.05$. The study was carried out after obtaining authorization from the Directors of private and public schools, and also from the Regional Director of National Education (DREN), and the Head of School District (CISCO).

Results

Nineteen (19) schools were drawn at random, resulting in a total of 1,156 students. Nine hundred and thirty students agreed to participate in our study and the participation rate was 81%. Five hundred and fifty-four (59.19%) were girls and 382 (40.81%) were boys. The sex ratio was 0.6. The lifetime prevalence of asthma was

13.26% and asthma in the past 12 months was 3.31%. Wheezing during or after exercise and nocturnal cough during the last 12 months were found in 7.48% and 21.7% of cases respectively (table 1). Concerning the severity of asthma, 32.26% presented 4-12 times of wheezing during the last 12 months and 19.35% more than 12 times. Waking up at night more than once a week due to wheezing was found in 25.81% of cases. For the severity of the asthma attack, we found that 35.48% had difficulty speaking, 77.96% absenteeism from school for more than 1 to 5 days. Hospitalization for asthma attack once or twice in the last 12 months was found in 16.12% (table 1).

Variables	Number of employees (%)
Number of schools	19
Total number of children	1156
Participants	936 (81)
Gender	
-Feminine	554 (59.19)
-Masculine	382 (40.81)
Asthma Prevalences and Asthma Symptoms	
- Whistling over the course of life	124 (13.26)
- Whistling for the last 12 months	31 (3.31)
- Have you ever had asthma attacks?	63 (6.73)
- Whistling during or after exertion	70 (7.48)
- Nocturnal cough for the past 12 months	203 (21.7)
Frequency and severity of asthma attack	
- Whistling in the last 12 months	
1-3 times	15 (1.60)
4-12 times	10 (1.06)
≥12 times	6 (0.64)
- Number of whistling-related awakenings in the last 12 months	
Never	13 (1.38)
<1 time a week	10 (1.06)
>1 or more per week	8 (0.85)
- Severe seizure that interferes with speech	11 (1.17)
- Absence from school due to asthma attack (1-5 days)	24 (2.56)
- Hospitalization for asthma attack (1-2 times)	5 (0.53)
- Asthma diagnosed by a doctor	24 (2.56)
Familial atopy	
- Asthma	117 (12.51)
- Allergic rhinitis	399 (42.67)
-Eczema	102 (10.01)
-Food allergies	215 (23.00)
- Drug allergy	103 (11.01)

Table 1: general characteristics of students, prevalence of asthma and symptoms suggestive of asthma, severity of asthma and asthma attack
Several factors have been found to be associated with asthma and asthma symptoms. The association is presented in table number 2.

	Whistling over the course of life		Asthma attack		Severe asthma attack		Straining whistling		Dry cough at night	
	n(%)	p	n(%)	p	n(%)	p	n(%)	p	n(%)	P
Gender										
Feminine	76(13,71)	NS	38(6,85)	NS	3(0,54)	0,022	39(7,03)	NS	116(20,93)	NS
Masculine	48(12,71)		25(9,97)		8(2,09)		31(8,13)		87(22,83)	
Passive smoking	43(11,74)	NS	17(4,64)	0,041	3(0,81)	NS	30(8,19)	NS	82(22,40)	NS
Damp or mold	34(15,24)	NS	18(8,07)	NS	2(0,89)	NS	27(12,10)	0,003	49(21,90)	NS
Fuels										
-Charcoal	118(12,8)	0,017	63(6,88)	NS	11(1,20)	NS	68(7,43)	NS	193(21,09)	0,032
-Wood	9(17,64)		0(0,00)		0(0,00)		0(0,00)		20(39,21)	
-Gas	10(71,42)		3(21,42)		-		7(50,0)		6(42,85)	
-Electricity	5(45,45)		2(18,18)		-		5(45,45)		7(63,63)	
Pets										
-Cat										
-Dog	30(19,10)	NS	7(4,45)	NS	1(0,63)	NS	13(8,28)	NS	31(19,74)	NS
-Tortoise	16(15,23)		2(1,90)		0(0,00)		8(7,61)		25(23,80)	
-Poultry	2(22,22)		2(22,22)		-		0(0,00)		6(66,6)	
	45(11,39)		20(5,06)		3(0,75)		22(5,56)		84(21,26)	
Usage										
-Upholstery and double curtain	29(16,66)	NS	15(8,62)	NS	3(1,72)	NS	23(13,21)	NS	63(36,12)	0,004
-Tapestry	19(15,96)		7(5,88)		1(0,84)		10(8,40)		21(17,64)	
-Double curtain	42(19,44)		26(12,03)		3(1,38)		13(6,01)		50(23,14)	
-No	34(8,03)		15(3,54)		4(0,94)		24(5,67)		69(16,31)	
Presence of cockroaches	88(13,83)	NS	45(7,07)	NS	8(1,25)	NS	56(8,80)	0,025	142(22,32)	NS
Familial asthma	44(37,60)	0,0001	36(30,76)	0,0001	8(6,83)	NS	22(18,8)	0,0001	50(52,7)	0,0001

Table 2: Factors associated with asthma and asthma symptoms

Discussion

The methodology adopted in the ISAAC study consisted of carrying out an epidemiological survey based on questionnaires. Ours has been simplified and has similar advantages to previous protocols, with a Malagasy translation. However, it should be emphasized that this questionnaire has limitations, which are moreover common to all questionnaires of its kind. The first limit relates to the risk of memory errors in relation to the events about which the students are questioned. This often results in an overestimation or underestimation of prevalence. The second limitation of our study was related to the difficulties in understanding certain terms of the questionnaire by the students. However, to compensate for this problem, an explanation was given to the adolescents according to the schools where they studied. The participation rate was high in our study 81%. Participation rates higher than ours were found in Algeria (97.8%), Belgium (97.4%), Pakistan (100%) [2]. For our study, this participation rate could be due to the explanations given to adolescents on filling out the questionnaires, on the medical terms used, the interest of the study and the confidentiality of the result. Our study as well as other studies carried out in other provinces of Madagascar [3,4] reported a female predominance of participants. Several studies carried out in different countries were also comparable to our study [5,6]. On the other hand, a male predominance was found in Ivory Coast [7], Guadeloupe [8] and India[9].

Asthma is the leading chronic childhood disease with a global cumulative prevalence of 11.3% in children aged 13 to 14 years [10]. The prevalence of asthma varies from country to country and region to region. In Madagascar, studies carried out in Antananarivo [4] and Mahajanga [3] according to the ISAAC protocol found respectively a prevalence of instantaneous asthma of 4% and 5.6% and cumulative asthma of 16% and 7%. 5%. In the city of Fianarantsoa, the prevalence of instantaneous asthma was 3.31%, corresponding to a low prevalence (less than 10%) at the African and global level [11]. In Africa, a study carried out in Cameroon [5] also reported a low prevalence (8.5%) of current asthma among adolescents. In children aged 4-16 years, the ISAAC phase I study carried out in 55 countries found high prevalences in Anglo-Saxon, England (32.2%), Australia (25.3% to 29.4%), New Zealand (13.5% to 30.2%), Ireland (29.1%)[12]. In France in 2010 [13], the latest national surveys showed a cumulative prevalence of asthma of more than 10% in children aged at least ten years and a prevalence of current asthma of 6 to 7% in the adult. For asthma symptoms, 7.48% had exercise-induced asthma and 21.7% had asthma-equivalent cough. The prevalence of asthma and asthma symptoms are not negligible. IT could be linked on the one hand to the climate. Fianarantsoa is among the mountainous region of Madagascar, high altitude 1100m. The climate is subtropical with a cool and dry period from June to August and a hot and rainy period from November to March. And on the other hand, as our study was carried out in the city, air pollution from road traffic could be one of the factors which intervenes in the appearance of asthma in adolescents but

also linked above all to domestic air pollution through overuse of biomass, the most accessible fuel for the majority of the population. According to the PSACI group (Problematic Severe Asthma in Childhood Initiative Group), severe asthma in children is defined by the persistence of poor control, and/or frequent severe exacerbations, and/or an obstructive ventilatory disorder, and/or the use of long-term general corticosteroid therapy to maintain control, despite maximum treatment including high doses of inhaled corticosteroids [14]. A frequency of wheezing attacks greater than four over the last 12 months, and/or the presence of one or more nighttime awakenings per week due to wheezing attacks is considered severe asthma [12].

In our study, 1.06% presented with wheezing 4-12 times in the last 12 months and 0.54% more than 12 times. Waking up at night more than once a week due to wheezing attacks was found in 0.85% of cases. One point seventeen percent had difficulty speaking during the attack and 2.56% had a school absence rate linked to the asthma attack. We have a low rate of severe asthma like that found in Antananarivo (1.35%) [4] but high rates have been found in New Zealand 9.9%, Australia 10%, Ireland 8.1% and 9.3% in the United Kingdom [2]. In Guadeloupe, school absenteeism due to an asthma attack is high [8].

Asthma is a multi-factorial disease. The genesis of asthma is the result of the conjunction of several factors, some genetic (field) and others environmental [15]. For genetic factors, the most predisposing risk factor for asthma (and respiratory allergies) is the existence of identical cases in the family [15]. Studies have shown that the attributable risk of atopy in asthma could be calculated at 50% and atopy seems to occur mainly for sensitizations before the age of three but not for those after the age of eight. at ten years [16]. In our study, the presence of familial asthma atopy is associated with wheezing in the chest ($p < 0.0001$), asthma attack ($p < 0.0001$), wheezing on exertion ($p < 0.0001$) and nocturnal dry cough ($p < 0.0001$). In Mahajanga [3], family history of asthma was found as a risk factor for asthma ($p < 0.0001$). Concerning environmental factors, several factors are known to cause asthma. A Djiboutian study [16] reported that asthma was associated with passive smoking, prematurity, the use of insecticides, the use of charcoal as a cooking method, and the use of incense. In Abidjan [17], the factors were different such as class, sex, socio-economic conditions, change of residence, rhinitis, rhino-conjunctivitis and skin allergy. Passive smoking is a trigger for childhood asthma and poor disease control: higher risk if the mother smokes compared to the father, higher risk if both parents smoke [18]. A Lebanese study also reported that passive smoking was associated with asthma [19]. For our study, it was associated with asthma attack ($p=0.041\%$). Recent studies [20-22] have shown that prenatal and postnatal exposure to different pollutants increases the risk of asthma incidence associated with exposure: NO₂ and PM₁₀ for prenatal exposures, "black carbon" (soot), NO₂, PM 2.5 and PM₁₀ for postnatal exposures. In our study, several factors are associated with asthma and asthma symptoms, namely passive smoking, the use of wood and charcoal as fuel, a history of family asthma, humidity and mold, presence of intra-domestic cockroaches, use of tapestries and double curtains.

Conclusion: asthma is relatively common among adolescents in schools in Fianarantsoa. Taking into account the factors associated with asthma could make it possible to raise the diagnosis early and ensure proper management.

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