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Prevalence of asthma and allergies in 13–14-year-old adolescents from Luanda, Angola

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SUMMARY

SETTING: The few epidemiological studies on asthma and allergic diseases performed in Africa have shown that the prevalence of these diseases is high or increasing. No such studies have been performed in Angola.

OBJECTIVE: To determine the prevalence of asthma and other allergic diseases in Angolan adolescents.

DESIGN: This was a descriptive, observational, cross-sectional study in the province of Luanda, Angola, using the International Study of Asthma and Allergies in Childhood study methodology in adolescents aged 13 and 14 years. Twenty-three (12%) public schools were randomly selected. Data were analysed using the Statistical Package for the Social Sciences version 22.0 software.

RESULTS: A total of 3128 adolescents were included. The prevalence of asthma (wheezing in the previous 12 months) was 13.4%. The prevalence of rhinitis (sneezing, runny or blocked nose in the previous 12 months) was 27% and that of eczema (itchy skin lesions in the previous 12 months) was 20%; both were more prevalent in girls. Rhinitis was associated with a greater number of episodes of night cough in adolescents with asthma. Rhinitis and eczema, a split-type air conditioning system, and frequent intake (more than once per month) of paracetamol were associated with a higher risk of having asthma.

CONCLUSION: Asthma and related allergic diseases are a public health problem in adolescents from Luanda. Preventive and control measures should be implemented.

KEY WORDS: adolescents; Angola; asthma; prevalence; risk factors

ASTHMA is an important cause of morbidity and mortality worldwide, and there is evidence that the global burden of asthma has been increasing over the past 20 years.[1] The International Study of Asthma and Allergies in Childhood (ISAAC), which was repeated within a 8–10 year interval (comparison between ISAAC Phases I and III) using a standardised and validated methodology, showed that despite clear differences in prevalence values of asthma and allergic diseases among participating countries, asthma prevalence is also increasing in children and adolescents, particularly in those countries that had a lower prevalence in Phase I.[2,3]

Few epidemiological studies have been performed in Africa, but ISAAC results in participating countries have shown that prevalence values for asthma also vary significantly. For the 13–14-year-old age group, the lowest values were found in Algeria (Phase I, 5.9%; Phase III, 8.7%), whereas the highest values were detected in South Africa (Phase I, 16.1%; Phase III, 20.3%).[2] The ISAAC Phase III study showed that, with the exception of Ethiopia and Morocco, the prevalence of asthma is also increasing in Africa, particularly among 13- and 14-year-olds.[2,3] In Angola, respiratory diseases are one of the leading causes for visits to emergency units, mostly among children and adolescents. However, no studies have previously been published on the prevalence of asthma and other allergic diseases in children or adolescents in Angola.

We decided to study the prevalence of asthma and allergic diseases in 13–14-year-old adolescents from the most populated city in Angola, Luanda.

METHODS

Population sample

This was a cross-sectional study performed in the province of Luanda, Angola, between August and November 2014, in 13–14-year-old adolescents. The province has 18 districts and a population of 6 542 944, representing 27% of the country's popu-

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lation. Luanda is the capital and includes seven boroughs, in which 97.5% of the population resides in urban areas. In Luanda, 23 (12%) public schools were randomly selected out of a total of 186, and an average of 4–5 classes in each school were randomly selected to analyse at least 3000 adolescents, in agreement with the ISAAC study protocol.[4]

Written questionnaires

Data were collected using the Portuguese version of the ISAAC questionnaire,[4,5] which includes questions on symptoms of asthma, allergic rhinitis and eczema. The ISAAC environmental exposure and risk factor questionnaire for 13–14-year-olds was also used.[6] All questions and explanations about the questionnaire were provided in a standardised fashion in Portuguese.

Current asthma was based upon positive replies to the question 'In the past 12 months have you had wheezing in your chest?', as defined in the ISAAC Phase III Protocol.[7] Study adolescents also answered questions on the number of wheezing episodes, whether these interfered with sleep or speech or were related to physical exercise, as well as on episodes of nocturnal cough in the previous 12 months.

Current rhinitis was based upon sneezing bouts, rhinorrhoea or nasal obstruction in the absence of influenza in the previous 12 months. Adolescents with symptoms of rhinitis and conjunctivitis were regarded as having rhinoconjunctivitis, and were asked whether symptoms interfered with their daily activities and whether they had ever had 'hay fever'.

Cutaneous lesions with pruritus which waxed and waned in the previous 12 months were regarded as eczema. Further questions were also asked in terms of the location of the lesions and interference with sleep.

The questionnaire on environmental exposure focused on the fuel used for cooking, type of indoor home-cooling device used, frequency of the passage of trucks in front of homes, presence of cats and dogs at home, passive exposure to tobacco smoke, frequency of use of anti-inflammatory drug paracetamol and number of siblings living in the home.

Measurement of lung function using a peak flow meter

Peak flow meter recordings (Mini-Wright Peak Flow Meter, Clement-Clarke, Harlow, UK) were made in adolescents with symptoms of current asthma. Those with signs or symptoms of infectious acute respiratory illness were excluded from this analysis. Readings were taken in triplicate with the adolescent sitting down, and the highest value was recorded only if the coefficient of variation was low. As there are no reference values for peak expiratory flow (PEF) in Angolan adolescents, we used values from Brazilian adolescents[8] to calculate per cent predicted values and compared them with ranges of reference values (>80%, 50–80% or <50%). We considered current asthma when current asthma symptoms were associated with PEF values below 80% predicted.

Height and weight measurements

Height was measured using a portable 200 cm stadiometer, accurate to 0.1 cm (SECA 123; SECA, Hamburg, Germany) and recorded in cm. Adolescents had their backs turned to the stadiometer and their heads were positioned in the Frankfurt horizontal plane. Weight was measured using portable calibrated scales with a 150 kg capacity and 0.1 kg precision (SECA 780 digital scale; SECA) and recorded in kg. For both measurements, adolescents were asked to stand upright with no shoes.

Calculation of body mass index

Body mass index (BMI) was calculated using the standard formula: weight (in kg)/height (in m^2). As there are no BMI reference values for Angola, adolescents were classified as 'underweight', 'normal weight', 'overweight' or 'obese', in accordance with World Health Organization definitions of BMI values.[9]

Ethical considerations

The study protocol was approved by the Ethics Committees of the Angolan Ministry of Health and the Faculty of Health Sciences, University of Beira Interior, Portugal. It was also approved by the Provincial Board of Education, Luanda, Angola, and by the Directors of the selected schools. All subjects and their parents signed a written consent form.

Statistical analysis

Data were analysed using the Software Package for Social Sciences (SPSS®) version 22.0 (IBM Corp, Armonk, NY, USA). Descriptive analysis was used to characterise the sample. Prevalence values were estimated by dividing the number of positive responses to the questions selected for the diagnosis by the number of completed questionnaires. Proportions were compared using the χ^2 test or Fisher's exact test, as appropriate. Odds ratios (ORs) were calculated to characterise the role of environmental factors as possible risk factors for asthma. A logistic regression model was developed using the *logit* function. For categorical variables, the 'normal' situation was defined as the reference category, and odds were estimated for other categories against the reference category. Quality and assumptions of the model were tested using the Omnibus and Hosmer-Lemeshow tests, as well as by analysis of residuals and outliers. A receiver operating characteristic (ROC) curve analysis of the model was also carried out. $P < 0.05$ was regarded as significant with all two-tailed statistical tests.

Table 1 Sociodemographic data of study sample of 13–14-year-old adolescents from Luanda, Angola

Parameter	Total *n* (%)
Boys:girls	1432 (45.8):1696 (54.2)
Urban:rural, %	100:0
Boroughs	
Luanda	1631 (52)
Belas	513 (16.4)
Cacuaco	104 (3.3)
Viana	443 (14.1)
Icolo e Bengo	70 (2.2)
Cazenga	367 (11.7)
Social status and income	
High	641 (20.5)
Medium	1408 (45.0)
Low	1079 (34.5)
Parental schooling	
Primary school (up to 4 years)	1555 (49.7)
Intermediate school (up to 10 years)	963 (30.8)
High school (up to 14 years)	607 (19.4)

RESULTS

Demographics

From the sample of 3317 adolescents from 23 selected schools, we obtained 3128 valid questionnaires (94% reply rate). There was no concentration of non-responders or responders with invalidated questionnaires in any specific school or set of schools. Of the 3128 validated questionnaires, 1696 (54.2%) responders were female and 1432 were male (45.8%). Sex and age distributions were similar to those in the 189 non-responders or responders with invalid questionnaires. Sociodemographic data are shown in Table 1.

Prevalence of asthma-like symptoms

Approximately 26% of the adolescents reported that they had already experienced wheezing episodes at some time in their lives (Table 2). However, based upon the presence of wheezing in the last 12 months, the prevalence of current asthma was 13.4% (95% confidence interval [CI] 12.3–14.7), with no significant differences between boys and girls. Overall, 22% of the adolescents reported experiencing wheeze during or after physical exercise, and 39% reported episodes of nocturnal dry cough, not associated with respiratory infections in the previous 12 months (Table 2).

The prevalence of symptoms such as 'wheezing ever', 'wheezing with physical exercise in the last 12 months' and 'nocturnal cough in the last 12 months' was significantly higher in girls than in boys.

No adolescent had ever been seen by a specialist physician for asthma symptoms. Only 5% of the adolescents reporting wheezing in the last 12 months had been prescribed a β_2-agonist at an emergency department.

Prevalence of rhinitis

The prevalence of current rhinitis was approximately 27% (95%CI 25.5–28.6), and that of current rhinoconjunctivitis was around 18% (Table 2); 18% of the adolescents reported that their nasal symptoms interfered with their daily activities, and this occurred more frequently in girls than in boys (62% vs. 38%, $P = 0.04$, χ^2 test). Around one third of the adolescents reported that they had ever experienced hay fever; this was also more frequent in girls.

Prevalence of eczema

Having an itchy rash or eczema 'ever' was reported by almost 28% of the adolescents (Table 2). Lesions affected specific areas of the body in 16% of the adolescents and disappeared, at least temporarily, in around 13% of the cases. Just over 20% (95%CI

Table 2 Prevalence of asthma, rhinitis and eczema

	Total *n* (%)	Female *n* (%)	Male *n* (%)	*P* value
Bronchial asthma				
Wheezing ever	817 (26.1)	485 (28.6)	332 (23.2)	<0.001
Wheezing in last 12 months	422 (13.4)	256 (15.1)	166 (11.6)	0.004
Asthma ever	482 (15.4)	271 (16.0)	211 (14.7)	0.337
Exercise-induced wheezing in last 12 months	685 (21.8)	422 (24.9)	263 (18.4)	<0.001
Nocturnal cough last 12 months	1233 (39.4)	726 (42.8)	507 (35.4)	<0.001
Rhinitis				
Sneezing, runny or blocked nose ever	1267 (40.5)	717 (42.3)	550 (38.4)	0.017
Sneezing, runny or blocked nose in last 12 months	844 (26.9)	503 (29.7)	341 (23.8)	<0.001
Rhinoconjunctivitis in last 12 months	570 (18.2)	378 (22.3)	192 (13.4)	<0.001
Interference with activities in last 12 months	573 (18.3)	353 (20.8)	220 (15.4)	0.044
Hay fever ever	952 (30.4)	593 (35.0)	359 (25.1)	<0.001
Eczema				
Itchy rash ever	868 (27.7)	508 (30.0)	360 (25.1)	0.003
Itchy rash in last 12 months	633 (20.2)	381 (22.5)	252 (17.6)	<0.001
Itchy flexural areas	493 (15.7)	303 (17.9)	190 (13.3)	<0.001
Clearance of rash in last 12 months	420 (13.4)	239 (14.1)	181 (12.6)	0.013
Interference with sleep in last 12 months	407 (13.0)	261 (15.4)	146 (10.2)	0.036
Eczema ever	769 (24.5)	479 (28.2)	290 (20.3)	<0.001

Table 3 Clinical features of asthma in adolescents with asthma symptoms ('wheezing in the last 12 months', $n = 422$)

	Total *n* (%)	Female *n* (%)	Male *n* (%)	*P* value
Wheezing episodes in last 12 months				
1–3	300 (71.1)	185 (72.3)	115 (69.3)	0.566
4–12	74 (17.5)	44 (17.2)	30 (18.1)	0.815
>12	48 (11.4)	27 (10.5)	21 (12.7)	0.506
Sleep disturbance episodes in last 12 months				
None	88 (20.9)	40 (15.6)	48 (28.9)	0.001
<1/week	234 (55.5)	153 (59.8)	81 (48.8)	0.027
⩾1/week	100 (23.7)	63 (24.6)	37 (22.3)	0.584
Speech affected in last 12 months	218 (51.7)	139 (54.3)	79 (47.6)	0.178
Asthma ever	150 (35.5)	89 (34.8)	61 (36.7)	0.678
Exercise-induced wheezing in last 12 months	242 (57.3)	154 (60.2)	88 (53.0)	0.147
Nocturnal cough in last 12 months	283 (67.1)	174 (68.0)	109 (65.7)	0.622
Peak flow recordings (% predicted)				
>80%	381 (90.3)	227 (88.7)	154 (92.8)	
50–80%	40 (9.5)	29 (11.3)	11 (6.6)	0.087*
<50%	1 (0.2)	0	1 (0.6)	

* Fisher's exact.

18.9–21.7) of all the adolescents reported that they had had pruritic lesions in the last 12 months, and about 13% reported that their lesions interfered with their sleep. Again, girls were more frequently affected than boys.

Details of respiratory symptoms and respiratory function in adolescents with probable current asthma

Of the 422 adolescents reporting wheezing episodes in the last 12 months (current asthma), most (71.1%) had had only 1–3 episodes (Table 3). However, almost 12% reported more than 12 episodes and only 21% of the adolescents reported not waking up during the night because of respiratory symptoms in the previous 12 months. Furthermore, a high proportion (52%) reported episodes of wheezing that interfered with speech, 57% had had wheezing episodes during or after physical exercise and 67% reported dry cough during the night, not associated with respiratory infections. Finally, PEF recordings showed that almost 10% had a moderate degree of obstruction and 1% had severe obstruction (Table 3), suggesting a prevalence of confirmed current asthma of 1.3%.

Table 4 Associations between the presence of rhinitis in the last 12 months and clinical asthma parameters in adolescents with asthma symptoms (wheezing episodes in the last 12 months, $n = 422$)

	Rhinitis in last 12 months			
	Yes	No	OR (95%CI)*	*P* value
Wheezing episodes in last 12 months				
0	1	0		
1–3	166	133	1	
4–12	42	32	1.05 (0.63–1.76)	0.848
>12	35	13	2.16 (1.10–4.24)	0.026
Sleep disturbance episodes in last 12 months				
0	43	45	1	
<1/week	136	98	1.45 (0.89–2.38)	0.137
⩾1/week	65	35	1.94 (1.08–3.49)	0.026
Nocturnal cough in last 12 months				
No	53	86	1	
Yes	191	92	3.37 (2.21–5.14)	<0.001
Peak flow recordings (% predicted)				
>80%	216	165	1	
50–80%	27	13	1.65 (0.83–3.28)	0.191
<50%	1	0		

* For each categorical variable, the 'normal' situation was defined as the reference category and odds were estimated for the other categories against the reference category.
OR = odds ratio; CI = confidence interval.

Influence of rhinitis symptoms upon asthma symptoms

Among the 422 adolescents with current asthma, the presence of rhinitis in the last 12 months was associated with a trend towards a higher number of episodes of nocturnal cough ($P = 0.084$, Fisher's exact; Table 4). Having current rhinitis symptoms increased the risk of having a high number (>12) of wheezing episodes by two-fold and the risk of having nocturnal episodes of dry cough by about three-fold (OR 3.37).

Risk factors for asthma

Using univariate analysis, the presence of symptoms of rhinitis in the previous 12 months, a history of eczema ever, the type of home cooling system, excessive intake of paracetamol and the presence of a dog at home were significantly associated with the presence of asthma (data not shown). However, logistic regression analysis only confirmed rhinitis, eczema, a split air-conditioning (AC) type of cooling system and high intake of paracetamol (more than once per month) as significant risk factors (Table 5). ROC analysis showed that the logistic model had an acceptable discriminatory capacity (ROC 0.735, 95%CI for true area 0.709–0.760, a maximal sensitivity of 73.5% and specificity of 65.2% for a threshold value of 0.094).

DISCUSSION

This was the first study on asthma prevalence in Angolan adolescents, and it yielded a value of 13.4%, with no statistically significant differences between boys and girls; 9% of asthma patients had moderate bronchial obstruction. The prevalence of rhinitis was 27%, and that of eczema was 20%; both were more prevalent in girls. Rhinitis was associated with more symptomatic asthma. Rhinitis and eczema, use of a split AC system for home cooling and frequent intake of paracetamol were significantly associated with an increased risk of asthma.

We followed the ISAAC methodology in a random sample of more than 3000 adolescents, obtaining a very high response rate (94%), and used the question on 'wheezing episodes in the last 12 months' for the diagnosis of current asthma, as it is known to have high sensitivity for the purpose.[10,11] The prevalence of asthma in our study (13.4%) is in the mid-range of values observed in the ISAAC study, which varied between 3.4 (Albania) and 31.2% (UK)[2] in Phase III, and is similar to the mean of African prevalence values (14.5%).[2,12] In Africa, asthma prevalence in Angola is higher than in Cameroon (5.7%) or the Democratic Republic of Congo (7.5%);[12,13] it is similar to that in Mozambique (13.3%),[14] but lower than that in South Africa (Cape Town 20.3%, Polokwane 18.0%), or Reunion Island (21.5%).[12,13] As these studies used the same questionnaire, genetic, environmental or lifestyle differences may account for the discrepancies observed.[13] However, we may have underestimated asthma prevalence, as some adolescents were unfamiliar with the concept of 'wheezing' and symptom recognition may be poor or not well accepted.[14] The prevalence of nocturnal cough in our study was higher than that in most African countries,[13–15] although it is likely that it was not always associated with asthma.

The prevalence of current rhinoconjuntivitis (18.2%) places Angola in the middle range of values for African countries, close to the mean prevalence (18.1%) in the top one third of participating countries.[2,13,16] In Africa, it is lower than in the Ivory Coast (27.6%) or Congo Brazzaville (33.3%),[13] but is higher than in Cameroon (8.9%) or Ethiopia (9.9%),[13] suggesting that the described relationship between income per capita and the prevalence of rhinoconjunctivitis[16] may not apply. One third of the adolescents reported having ever experienced hay fever, but this suggests that symptoms may have been overestimated because the term 'hay fever' is hard to understand in regions without a clear pollen season, as in Luanda.

The prevalence of current eczema in our study (20.2%) is higher than that observed in most African countries,[13] and much higher than the mean world prevalence of 7.3%,[2,12,17] although it is lower than in various Asian and South American countries.[17] In the ISAAC study, the highest prevalence of eczema came from scattered areas, including some in Scandinavia and Africa that were not among areas with the highest asthma prevalence.[18] Luanda seems to fit this pattern for reasons that remain to be ascertained. Although eczema is a significant public health problem in developing countries,[17] it is possible that non-eczema-related manifestations may have been reported, as observed in other studies.[14]

We further characterised the clinical aspects of adolescents with bronchial asthma. Almost 12% reported more than 12 episodes of wheezing in the previous year, and almost a quarter had frequent sleep disturbance episodes. Furthermore, a high percentage (52%) had episodes of wheezing that interfered with speech, as has also been reported in other countries.[5,7,12–15] The presence of rhinitis was associated with more episodes of nocturnal cough and wheezing. Finally, almost 10% had a moderate degree of bronchial obstruction. Our results show that a high proportion of adolescents with asthma in Luanda are symptomatic.

We identified disease-related risk factors for the presence of asthma. In the total sample of adolescents, rhinitis increased the risk of having asthma by almost five fold, as reported in other countries.[19–22] Rhinitis is a known risk factor for asthma.[23] We also identified eczema as another risk factor, in accordance with reports showing a relationship between the early onset of atopic eczema and subsequent respiratory disease in schoolchildren.[24,25]

We also identified environmental risk factors for asthma. Using a split AC system was a risk factor, possibly because cleaning these devices is difficult, which may lead to the accumulation of allergens and other substances.[26] In China, air conditioning systems are also significantly associated with asthma in schoolchildren,[27] although these systems may protect against traffic-related exposures at home, as reported in Singaporean children.[28]

Finally, a high frequency of paracetamol intake was a risk factor for asthma in our study, which is in agreement with global ISAAC findings.[29,30] This has also been described as a risk factor for rhinoconjunctivitis and eczema in a setting of multimorbidity,[30] probably due to various mechanisms.[31] In Angola, this association may be due to paracetamol being frequently taken not only for febrile respiratory problems, but also for malaria.

Our study had various limitations. It was based on self-reports of symptoms and is therefore subject to various types of bias, although the ISAAC approach ensures that reported symptoms significantly reflect the clinical situation.[32] Some adolescents were not familiar with some of the terms used in the questionnaire, as has been observed in some other ISAAC studies. Another source of bias may have been the fact that all children were from urban areas of the

Table 5 Risk factors for probable asthma (wheezing in last 12 months)

Risk factors	Total *n* (%)	Positive wheezing in last 12 months *n* (%)	No wheezing in last 12 months *n* (%)	OR (95%CI)* logistic regression	*P* value
Rhinitis in last 12 months					
No	2284 (73.1)	178 (42.2)	2106 (77.8)	1	
Yes	844 (26.9)	244 (57.8)	600 (22.2)	4.81 (3.89–5.96)	<0.001
Eczema ever					
No	2359 (75.4)	235 (55.7)	2124 (78.5)	1	
Yes	769 (24.6)	187 (44.3)	582 (21.5)	2.90 (2.35–3.59)	<0.001
Cooking fuel used at home					
Electricity					
No	2876 (91.9)	383 (90.8)	2493 (92.1)	1	
Yes	252 (8.1)	39 (9.2)	213 (7.9)	1.19 (0.83–1.71)	0.336
Gas					
No	2 (0.1)	0	2 (0.1)	—	0.576
Yes	3126 (99.9)	422 (100)	2704 (99.9)		
Coal					
No	2832 (90.6)	377 (89.3)	2455 (90.8)	1	
Yes	295 (9.4)	45 (10.7)	250 (9.2)	1.17 (0.84–1.64)	0.353
Other					
No	3128 (100)	422 (100)	2706 (100)	—	—
Yes	0	0	0		
Indoor home cooling system					
Split air conditioner					
No	1851 (59.2)	220 (52.1)	1631 (60.3)	1	
Yes	1277 (40.8)	202 (47.9)	1075 (39.7)	1.39 (1.13–1.71)	0.002
Window air conditioner					
No	2472 (79.0)	347 (82.2)	2125 (78.5)	1	
Yes	656 (21.0)	75 (17.8)	581 (21.5)	0.79 (0.61–1.03)	0.083
Fan					
No	1690 (54.1)	244 (57.8)	1446 (53.5)	1	
Yes	1436 (45.9)	178 (42.2)	1258 (46.5)	0.84 (0.68–1.03)	0.096
Other					
No	3128 (100)	422 (100)	2706 (100)	—	—
Yes	0	0	0		
None					
No	3034 (97.0)	410 (97.2)	2624 (97.0)	1	
Yes	94 (3.0)	12 (2.8)	82 (3.0)	0.94 (0.51–1.73)	0.834
Frequency of paracetamol intake					
Never	442 (14.1)	39 (9.2)	403 (14.9)	1	
⩾once/year	1289 (41.2)	175 (41.5)	1114 (41.2)	1.62 (1.13–2.34)	0.009
⩾once/month	1396 (44.6)	208 (49.3)	1188 (43.9)	1.81 (1.26–2.59)	0.001
Number of siblings					
Mean ± SD	4.5 ± 2.7	4.5 ± 2.8	4.5 ± 2.7	—	0.850†
Median (amplitude)	4 (0–24)	4 (0–17)	4 (0–24)		
Frequency of passage of trucks in front of home					
Never	374 (12.0)	40 (9.5)	334 (12.3)	1	
Seldom	1163 (27.2)	150 (35.5)	1013 (37.4)	1.236 (0.85–1.79)	0.261
Frequently in the day	1051 (33.6)	147 (34.8)	904 (33.4)	1.36 (0.94–1.97)	0.106
Almost the whole day	539 (17.2)	85 (20.1)	454 (16.8)	1.56 (1.05–2.34)	0.029
Pets at home					
Cat					
No	2626 (84.0)	348 (82.5)	2278 (84.2)	1	
Yes	502 (16.0)	74 (17.5)	428 (15.8)	1.13 (0.86–1.49)	0.371
Dog					
No	1317 (42.1)	159 (37.7)	1158 (42.8)	1	
Yes	1811 (57.9)	263 (62.3)	1548 (57.2)	1.24 (1.00–1.53)	0.048
Cat and dog					
No	2788 (89.1)	371 (87.9)	2417 (89.3)	1	
Yes	340 (10.9)	51 (12.1)	289 (10.7)	1.15 (0.84–1.58)	0.388
Smoking at home					
Mother					
No	3043 (97.3)	406 (96.2)	2637 (97.5)	1	
Yes	85 (2.7)	16 (3.8)	69 (2.5)	1.51 (0.87–2.62)	0.145
Father					
No	2878 (92.0)	382 (90.5)	2496 (92.2)	1	
Yes	250 (8.0)	40 (9.5)	210 (7.8)	1.25 (0.87–1.78)	0.226
Number of smokers >1					
No	2668 (85.3)	352 (83.4)	2316 (85.6)	1	
Yes	460 (14.7)	70 (16.6)	390 (14.4)	1.18 (0.89–1.56)	0.241

Table 5 *(continued)*

Risk factors	Total *n* (%)	Positive wheezing in last 12 months *n* (%)	No wheezing in last 12 months *n* (%)	OR (95%CI)* logistic regression	*P* value
BMI					
Normal weight, kg	714 (44.6)	187 (44.3)	554 (44.7)	1	
Mean BMI ± SD	20.4 ± 1.5	20.4 ± 1.5	20.4 ± 1.5		
Underweight, kg	854 (51.4)	212 (50.2)	642 (51.9)	0.978 (0.78–1.23)	0.850
Mean BMI ± SD	16.7 ± 1.4	16.8 ± 1.6	16.6 ± 1.3		
Overweight; kg	65 (3.9)	23 (35.4)	42 (3.4)		
Mean BMI ± SD	28.3 ± 3.3	28.1 ± 3.1	28.4 ± 3.4	1.62 (0.95–2.77)	0.076
Obese	0	0	0	—	

* For each categorical variable, the 'normal' situation was defined as the reference category and odds were estimated for the other categories against the reference category.
† Student's *t*-test.
OR = odds ratio; CI = confidence interval; SD = standard deviation; BMI = body mass index.

Luanda Province and from relatively wealthy families. Further studies should also incorporate adolescents from poorer, rural areas. In addition, we could not use the ISAAC video for comparison with the written questionnaire, and so may have missed some adolescents with asthma who failed to identify symptoms on the questionnaire but would have recognised them on the video.[33] Some potentially important risk factors, such as family history of asthma, other allergies or sensitisation to aeroallergens, were not included in our analysis, which may have impaired comparisons with similar studies in other populations. Although the ISAAC questionnaire on environmental exposure has been validated, the level of detail may not be sufficient for some of the risk factors, such as exposure to traffic fumes or the type of cooking (i.e., open fire cooking, which is associated with an increased risk of asthma[34]). Finally, the cross-sectional design of the study did not allow the clarification of the interrelationships between different diseases in terms of complex patterns of multimorbidity.[35]

CONCLUSION

Our results demonstrate that asthma and other allergic diseases are a public health problem in Luanda, and also that a high proportion of adolescents with asthma are frequently symptomatic but are not treated by physicians. It is therefore crucial to develop prevention and management plans as well as to increase accessibility to health care to adequately deal with these problems.

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RESUME

CONTEXTE : Les rares études épidémiologiques sur l'asthme et les maladies allergiques réalisées en Afrique ont montré que leur prévalence était élevée ou croissante. Aucune de ces études n'a été réalisée en Angola.

OBJECTIF : Déterminer la prévalence de l'asthme et des autres maladies allergiques chez les adolescents Angolais.

SCHÉMA : Étude descriptive, d'observation, transversale, avec la méthode International Study of Asthma and Allergies in Childhood, dans la province de Luanda, Angola, chez des adolescents âgés de 13 et 14 ans. Vingt-trois (12%) écoles publiques ont été sélectionnées au hasard. Les données ont été analysées avec le logiciel Statistical Package for the Social Sciences version 22.0.

RÉSULTATS : Au total, 3128 adolescents ont été inclus. La prévalence de l'asthme (wheezing au cours des 12 derniers mois) a été de 13,4%. La prévalence de la rhinite (éternuements, rhinorrhée ou nez bouché au cours des 12 derniers mois) a été de 27% et celle de l'eczéma (lésions prurigineuses de la peau au cours des 12 derniers mois) a été de 20%, les deux étant plus prévalents chez les filles. La rhinite a été associée à un plus grand nombre d'épisodes de toux nocturne chez les adolescents atteints d'asthme. La rhinite et l'eczéma, les systèmes de climatisation split-type et la prise fréquente (plus d'une fois par mois) de paracétamol ont été associés à un risque plus élevé d'avoir de l'asthme.

CONCLUSION : L'asthme et les maladies allergiques associées sont un problème de santé publique chez les adolescents de Luanda. Des mesures de prévention et de lutte devraient être mises en œuvre.

RESUMEN

MARCO DE REFERENCIA: Algunas investigaciones epidemiológicas realizadas en África sobre el asma y las enfermedades alérgicas han puesto en evidencia que la prevalencia es alta o tiende a aumentar. Ningún estudio sobre este tema se ha llevado a cabo en Angola.

OBJETIVO: Determinar la prevalencia de asma y otras enfermedades alérgicas en los adolescentes angoleños.

MÉTODO: Se concibió un estudio transversal descriptivo observacional con base en el diseño del estudio internacional, International Study of Asthma and Allergies in Childhood, con adolescentes de 13 y 14 años de edad de Luanda, en Angola. Se escogieron de manera aleatoria 23 escuelas públicas (12%). Los datos se analizaron con la versión 22.0 del programa estadístico informático, Statistical Package for the Social Sciences.

RESULTADOS: Se incluyeron en el estudio 3128 adolescentes. La prevalencia se definió por la presencia de signos en los últimos 12 meses. La prevalencia de asma fue 13,4% (sibilancias). La prevalencia de rinitis fue 27% (estornudos, rinorrea u obstrucción nasal) y la de eccema fue 20% (lesiones cutáneas pruriginosas); ambas entidades fueron más frecuentes en las niñas. La rinitis se asoció con un mayor número de episodios de tos nocturna en los adolescentes con asma. Se observó que existía una relación entre la presencia de rinitis y eccema, el sistema de aire acondicionado modular con varias unidades y la ingesta frecuente de paracetamol (más de una vez al mes) y un mayor riesgo de padecer asma.

CONCLUSIÓN: El asma y las enfermedades alérgicas afines en los adolescentes de Luanda representan un problema de salud pública. Es preciso adoptar medidas preventivas y de control.