ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Symptoms of asthma and associated factors in adolescents from Salvador, Bahia

Sintomas de asma e fatores associados em adolescentes de Salvador, Bahia

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ABSTRACT: *Objective:* Identify the factors associated with asthma symptoms in adolescents. *Methods:* Cross-sectional study with the participation of 1,176 students between the ages of 11 and 17 years old, in Salvador, Bahia, Brazil. The asthma symptoms were identified by using the standardized questionnaire from *The International Study of Asthma and Allergies in Childhood Program* (ISAAC), phase III. The subjects' food intake data were collected by a semiquantitative food frequency questionnaire (FFQ) comprised of 97 food items. All of the information was collected during a single interview. Anthropometric, socioeconomic, and demographic data were collected from the study population. The robust Poisson model was adopted to obtain the raw and adjusted PR (prevalence ratio). *Results:* From the total number of adolescents, 57.6% are female and 83.71% of them were between 13 and 17 years old. The prevalence of asthma symptoms was of 7.6%, being higher among males (9.62%). The prevalence of wheezing in the last 12 months was 8.6%. Among the adolescents with rhinitis and eczema, the prevalence of asthma symptoms was of 15.2 and 14.3%, respectively. After an adjusted analysis, the following factors were identified: females PR = 0.64 (95%CI 0.42 – 0.96), rhinitis PR = 3.23 (95%CI 2.17 – 4.83) and the 2nd tertile of the healthy pattern (moderate consumption) PR = 0.61 (95%CI 0.37 – 0.99). *Conclusion:* Rhinitis and eczema were presented as risk factors for asthma symptoms. The healthy food intake pattern that had been stratified in tertiles, presented the 2nd tertile as a protector for asthma symptoms.

Keywords: Asthma. Adolescents.. Foods. Prevalence. Epidemiological survey.

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Confict of interests: nothing to declare – **Financial support:** Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Amparo à Pesquisa do Estado da Bahia (Fapesb).

RESUMO: *Objetivo:* Identificar os fatores associados a sintomas de asma em adolescentes. *Métodos:* Estudo transversal, com a participação de 1.176 alunos com idade entre 11 e 17 anos, em Salvador, Bahia, Brasil. Os sintomas de asma foram identificados utilizando-se o questionário padronizado do *The International Study of Asthma and Allergies in Childhood Program* (ISAAC), fase III. A avaliação do consumo alimentar dos adolescentes foi obtida por meio de questionário da frequência alimentar (QFA) semiquantitativo, com 97 itens alimentares, sendo as informações coletadas em uma única entrevista com os estudantes. Foram coletados dados antropométricos, socioeconômicos e demográficos da população do estudo. O modelo de Poisson robusto foi adotado para obtenção da razão de prevalência (RP) bruta e ajustada. *Resultados:* Do total de adolescentes, 57,6% são do sexo feminino e 83,7% tinham de 13 a 17 anos de idade. A prevalência de sintomas de asma encontrada foi de 7,6%, sendo mais elevada no sexo masculino (9,62%). A prevalência de chiado nos últimos 12 meses foi de 8,6%. Entre os adolescentes que tinham rinite e eczema a prevalência de sintomas de asma foi de 15,2 e 14,3% respectivamente. Após análise ajustada, os seguintes fatores se associaram à asma: sexo feminino RP = 0,64 (IC95% 0,42 – 0,96), rinite RP = 3,23 (IC95% 2,17 – 4,83) e o 2º tercil do padrão saudável (consumo moderado) RP = 0,61 (IC95% 0,37 – 0,99). *Conclusão:* Rinite e eczema apresentaram-se como fatores de risco para sintomas de asma. O padrão alimentar saudável estratificado em tercil apresentou o segundo tercil como protetor para sintomas de asma.

Palavras-chave: Asma. Adolescentes. Alimentos Prevalência. Inquérito epidemiológico.

INTRODUCTION

Asthma is a chronic inflammatory disease characterized by hyperresponsiveness of the inferior airwaves and by the varying limitation of airflow. It is reversible either spontaneously or through treatment, clinically manifesting through recurring episodes of wheezing in the chest, coughing, dyspnea, pressure on the chest, particularly at night or in the morning when waking up[1]. It is estimated that 300 million people around the world have asthma[2]. Epidemiologic studies, such as the *International Study of Asthma and Allergies in Childhood* (ISAAC), registered average world prevalence of 14.1% for asthma symptoms in adolescents between the ages of 13 and 14, varying from 5.1% in North and East Europe, 22% in Oceania, and 15.9% in Latin America[3]. In Brazil, asthma prevalence is considered one of the highest, if compared with the average of countries in Latin America, estimated at 20%[4,5]. However, the results of the study from phase III of ISAAC in Brazil revealed a prevalence of asthma symptoms varying from 11.8% in Nova Iguaçu, Rio de Janeiro, to 30.5% in Vitória da Conquista, Bahia, with a prevalence of 24.6% being observed for asthma symptoms in Salvador, Bahia[6,7].

Asthma is a disease with multiple causes that are related to various environmental, economic, demographic, social, genetic, and emotional factors[2,8]. The causes for asthma in Latin America have been associated with urbanization, migration, as well as the adoption of a "Western" lifestyle and the environmental changes that follow this process, including dietary changes, with the consumption of foods that are considered unhealthy, exposure to allergens, irritants and chemical pollutants, and the lack of physical activity and hygene[9,10].

It is important to point out that dietary changes, such as the ones that have occurred in modern society, characterized by a reduction in the consumption of fresh fruits, vegetables, fish, milk, whole foods, and the increase in the intake of foods rich in fats, simple carbohydrates, sugar, and chemical additives, can be connected to the increase in the prevalence of asthma symptoms[11-13].

To justify the present study, it is important to note that the majority of investigations with adolescents focus on those between the ages of 13 and 14 years, limiting the comprehension of the disease in this phase of life, and that asthma is a disease responsible for a large part of school absences and presents a high cost to health in Brazil. In addition, knowledge concerning the prevalence of asthma symptoms in the studied population and its associated factors is insufficient to contribute and aid in the planning of actions for the reduction and control of this event. The objective of this study was to identify the prevalence of asthma symptoms in adolescents in public schools in Salvador, Bahia, and the factors (sex, age, body mass index [BMI], and the food intake patterns) associated with the occurrence of these symptoms.

METHODOLOGY

STUDY POPULATION

A cross-sectional study was conducted in the urban area of Salvador, Bahia, from July to December 2009, involving 1,176 adolescents from 21 public state schools, who were identified through school records provided by the Ministry of Health and Education for the State of Bahia, in reference to 2009. This study is a part of an broader analysis whose sample was estimated based on the prevalence of 24.6% for asthma symptoms,[7] confidence interval of 95% (95%CI) and a maximum admissible error of 3%, totaling in 1,027 students. However, in this survey, 1,176 adolescents, between 11 and 17 years old, were actually surveyed in Salvador, Bahia, Brazil. These subjects were obtained from a population of 1,330 students, with a loss of 11.6%.

The sampling strategy consisted of the simple random sampling (SRS) technique and the selection of the students was through clustering in two stages: first the selection of the schools followed by the selection of the classes. Among the 207 existing schools, 21 were selected; next 3 classes were selected per school, from the 6th, 7th and 8th grades. For each class, an average of 30 students was chosen and all were interviewed.

EXCLUSION CRITERIA

The following adolescents were excluded from the study: those who were pregnant, nursing, those with a physical trauma who were immobilized during the interview, and those who did not sign the Term of Free and Informed Consent.

METHODOLOGICAL PROCEDURES

The data collection was conducted from July to December 2009. During this period, the student's parents answered the questionnaire regarding the respiratory problems (ISAAC questionnaire). The decision to have the parents answer the questionnaire was due to the fact that the adopted instrument contained questions concerning the first years of the child's life; therefore, students directly answered the survey regarding food intake (Food Frequency Questionnaire [FFQ]) and the parents, the respiratory questionnaire. Next, the anthropometric measures were taken (weight, height)[13]. Socioeconomic and environmental data (household and basic sanitation, family income, parents' education level) were collected from the students' families, recorded on a standard questionnaire, and answered by the parents or guardians, who answered them at school, during class, or in their own residence.

DEPENDENT VARIABLE

ASTHMA SYMPTOMS

The presence of asthma symptoms was assessed utilizing a questionnaire that has been previously validated internationally based on various studies, with the model adopted for this study having been obtained from the ISAAC[8]. To define if the individual has asthma symptoms, the following questions were asked:

1. In the last 12 months, has your child had chest wheezing?
2. In the last 12 months, how many cases of chest wheezing attacks has your child had?

When the answer to the first question was affirmative and the answer to the second question reported over 3 wheezing attacks in the last 12 months, asthma symptoms were considered to be present.

INDEPENDENT VARIABLES

Sex, age, parents' education level, family income, tobacco use in the family, BMI, mixed-pattern tertile, traditional-pattern tertile, healthy-pattern tertile, and clinical history for rhinitis, eczema, and food allergies were the independent variables.

FOOD INTAKE PATTERN

Food intake for adolescents was assessed through the semiquantitative FFQ that contained 97 food items; the FFQ was adapted from the study conducted by Borges et al.[14] and validated during the study. The frequency of intake of these food items was structured

into five categories: never / rare = 0; 1 to 3 times a month = 1; once a week = 2; 2 to 4 times a week = 3; ≥ 4 times a week = 4; and the number of times the food was consumed a day. The interview was conducted by nutritionists and properly trained personnel between July and December 2009. The questionnaire was standardized and applied in a single interview directly with the students, who informed their food intake in and outside the household. The data for the consumption frequency were transformed into daily consumption fractions with the objective of utilizing only a single time unit. A score was created for each food group.

SOCIOECONOMIC, DEMOGRAPHIC, AND ALLERGY-RELATED INFORMATION

Data were collected regarding sex (female and male – reference category), age (15 – reference category, 13 – 15, <15), parents' education level (secondary education to tertiary education reference category, 5th to 8th grade, up to the 4th grade), family income (> 2 minimum wage salaries (m.w.s.) – reference category, 1 – 2 m.w.s., < 1 m.w.s.), presence of a tobacco user in the family (no – reference category, yes). Suffer from rhinitis (no – reference category, yes), eczema (no – reference category, yes) and food allergy (no – reference category, yes) were the data collected utilizing the respiratory problem questionnaire adopted by the ISAAC with information regarding asthma symptoms.

ANTHROPOMETRIC STATE

The anthropometric measurements (weight and height) were collected at the school, in a standardized manner, following the procedures recommended by the Anthropometric Standardization Reference[15,16]. The weight was obtained with the help of a microelectronic scale, Marte brand, PP 200-50 model, and the height, utilizing a stadiometer from the brand *Leicester Height Measure*. Based on the weight and height measurements, the BMI index was calculated for all of the adolescents. To assess the anthropometric state, the percentage tables from the World Health Organization (WHO)[16] were utilized, which contained the following reference standards for classification: thinness or underweight (< 3rd percentile), eutrophic (≥ 3rd percentile and <85th percentile [reference category]), overweight (≥ 85th percentile and < 97th percentile), and obesity (≥ 97th percentile). The variable was categorized into thinness, eutrophic, overweight, and obesity. For the analysis, the categories overweight and obesity were combined (the individuals who were overweight presented a BMI ≥ in the 85th percentile).

DATA ANALYSIS PLAN

The food intake pattern was identified through a factor analysis, utilizing principal component analysis (PCA). Initially, the number of factors that would be extracted was

defined. This was established as the values above 1 for variance and the number of components retained through the graph screen plot[17].

Before applying the factor analysis, the food was grouped according to its nutritional characteristics, the consumption habits found in this population and the objectives of the study. Next, the frequency of the food intake by the individuals was added for each food group, constituting the numerator of the summary measure. The denominator corresponded to the maximum number of foods that the individual could consume for each group, multiplied by five[17]; next, a score was generated for each food group. After this procedure, a factor analysis was applied.

To adjust the data for the factor analysis, the Kaiser–Meyer–Olkin (KMO) criterion was applied. Orthogonal varimax rotation was adopted[17–19]. The scores for each food intake pattern were modeled in tertiles: 1st tertile (low consumption, reference category), 2nd tertile (moderate consumption) and 3rd tertile (high consumption)[20].

To evaluate the factor associated with asthma symptoms, initially the variables selected were those which represented a value of $p \leq 0.20$ in the univariate analysis according to the criteria suggested by Hosmer and Lemeshow.[21] Subsequently, these variables were a part of the model for robust multivariate Poisson analysis with adjustment of the following variables: sex; rhinitis; eczema; age; tertile from the standard 1, 2, and 3; income; and education level of the head of the family. The magnitude of the association between the associated factors and asthma symptoms was expressed by prevalence ratio (PR) and their respective values of 95CI%. The variables valued at $p < 0.05$ remained in the adjusted model[22].

For the processing and construction of the database, Epi Info, version 6.04 was utilized; subsequently, the data were analyzed using the software STATA (Data Analysis and Statistical Software) version 10. During all of the analyses the effect of the sample design based on complex outlines was taken into consideration, with the weights incorporated being found through analysis utilizing the commands from the SVY–STATA.

The parents or guardians of the student who agreed to the participation of their child signed the Term of Free and Informed Consent; the illiterate signed with their fingerprint. The study had its protocol approved by the Ethics Committee of the Collective Health Institute of the Universidade Federal da Bahia.

RESULTS

Of the 1,330 eligible students, 1,176 participated in this study, with 57.6% being female. More than half of the population was above the age of 13 years (83.7%). Regarding the socioeconomic conditions, 30.7% of the heads of family had completed up to primary education and 16.2% of the families had an income equivalent to a minimum wage salary. It was observed that 14.5% were overweight or obese. It was found that 8.6% of the adolescents presented chest wheezing in the 12 months prior to the study, and 7.6% had asthma symptoms. Regarding allergic diseases, it was observed that 27% of the study population presented rhinitis, 5.4%, eczema, and 9.6% reported having a food allergy (Table 1). In the factor analysis done

Table 1. Characteristics of the adolescent population between 11 and 17 years old, Salvador, Bahia, 2009 – 2010.

Variable	n	Total (%)
Gender		
Male	499	42.43
Female	677	57.57
Age (years)		
> 15	192	16.33
13 – 13	741	63.01
< 13	243	20.66
Education level of the head of family		
Secondary to tertiary level	434	36.90
5th to 8th grade	381	32.40
Up to the 4th grade	361	30.70
Family incomer		
> 2 m.w.s.	466	39.63
1 – 2 m.w.s.	519	44.13
< 1 m.w.s.	191	16.24
Asthma symptoms		
No	1,087	92.43
Yes	89	7.57
Wheezing in the last 12 months		
No	1,075	91.41
Yes	101	8.59
History of rhinitis		
No	854	72.62
Yes	322	27.38
Clinical history of eczema		
No	1,113	94.64
Yes	63	5.36
Food allergy (reported)		
No	1,063	90.39
Yes	113	9.61
Tobacco use in the household		
No	962	81.80
Yes	214	18.20
Tertile eating pattern (mixed)		
1st (low intake)	382	32.84
2nd (moderate intake)	393	33.42
3rd (high intake)	401	34.10
Tertile eating pattern (traditional)		
1st (low intake)	398	33.25
2nd (moderate intake)	394	33.50
3rd (high intake)	384	33.25
Tertile eating pattern (healthy)		
1st (low intake)	398	33.25
2nd (moderate intake)	394	33.50
3rd (high intake)	384	33.25

m.w.s.: minimum wage salaries

through the PCA technique, the KMO obtained was of 0.946, and the Bartlett's sphericity test, of 13044.43, p = 0.000; therefore, these results indicate the adequacy of the method for this analysis. The PCA extracted 3 factors with a root over 1, which explains 47.9% of the variance. The analysis of the FFQ allowed for the identification of three eating standards, which were labeled "mixed," "traditional," and "healthy" (Table 2). The result of the bivariate analysis of the factors associated with the occurrence of the asthma symptoms indicated that being the female sex reduces the chances of reporting asthma symptoms, PR = 0.63 (95%CI 0.42 – 0.94), while reporting rhinitis and eczema increases the chance of reporting asthma symptoms: PR = 3.25 (95%CI 2.18 – 4.84) and PR = 1.99 (95%CI 1.04 – 3.77), respectively.

Table 2. Distribution of factorial charges of the food intake patterns in adolescents from Salvador, Bahia, 2009 – 2010.

Variables	Mixed	Traditional	Healthy	h^2
Dairy	0.621	–	0.360	0.574
Grains	0.415	0.451	0.488	0.613
Tubers	–	–	0.644	0.508
Manioc flour	–	0.522	–	0.302
Breads/cakes	0.470	0.486	–	0.542
Fast food	0.779	–	–	0.670
Typical foods	0.630	–	0.344	0.536
Sugar/sweets	0.732	–	–	0.633
Fats/oils	0.409	0.500	–	0.421
Legumes	0.411	0.349	0.381	0.436
Fruits	0.398	–	0.685	0.659
Fruit juice	0.331	–	0.300	0.246
Vegetables	–	–	0.728	0.619
Beef	0.337	0.596	–	0.544
Poultry	–	0.607	–	0.449
Fish	0.390	–	0.378	0.351
Sausages	0.360	0.602	–	0.492
Eggs	–	0.585	–	0.390
Coffee	–	0.513	–	0.294
Tea	–	–	0.568	0.330
Artificial drinks	0.670	–	–	0.499
Carbonated drinks	0.665	–	–	0.445
Sauces	0.585	–	0.306	0.462
Accumulated variance	36.00	42.47	47.90	
KMO	0.946			
Bartlett coefficient	13044.43	(p = 0.000)		

KMO: Kaiser–Meyer–Olkin.

After adjusting for confounders, in the multivariate model, sex PR = 0.64 (95%CI 0.42 – 0.96) and reported rhinitis PR = 3.23 (95%CI 2.17 – 4.83) continued to be associated with asthma symptoms. The "healthy" food intake pattern, which in the univariate analysis was found to be unassociated to the asthma symptoms, after adjustments, the 2nd tertile from the healthy pattern (moderate consumption), PR = 0.61 (95%CI 0.37 – 0.99), presented a protective association to asthma symptoms, perhaps because the fruits, vegetables, and leafy vegetables currently contain a high level of pesticides and these, in turn, are allergenic and immunosuppressive, possibly raising the exposure of an individual to respiratory diseases[23] (Table 3).

DISCUSSION

The prevalence of asthma symptoms defined as reported chest wheezing in the last 12 months and over 3 wheezing attacks in the last 12 months, found in this study among adolescents in Salvador, Brazil, was of 7.6%. This prevalence resembles those mentioned in other studies involving adolescents, such as those conducted by Silva et al[24]. in São Francisco

Table 3. Prevalence and raw and adjusted prevalence ratio for the determinants of the asthma symptoms in adolescents, Salvador, Bahia, 2009 – 2010.

Variable	n	Prevalence	Crude PR	95%CI	Adjusted PR	95%CI
Gender						
Male	499	9.62	1		1	
Female	677	6.06	0.63	0.42–0.94	0.64	0.42–0.96
History of rhinitis						
No	854	4.68	1		1	
Yes	322	15.22	3.25	2.18–4.84	3.23	2.17–4.83
EP Tertile (mixed)						
1st (low intake)	382	8.90	1	0.39–1.09	1	0.44–1.20
2nd (moderate intake)	393	5.85	0.66	0.56–1.42	0.72	0.60–1.51
3rd (high intake)	401	7.98	0.90		0.96	
EP Tertile (traditional)						
1st (low intake)	391	7.93	1		1	
2nd (moderate intake)	394	7.61	0.96	0.59–1.55	1.01	0.63–0.64
3rd (high intake)	391	7.16	0.90	0.55–1.47	0.92	0.57–0.50
EP Tertile (healthy)						
1st (low intake)	398	9.05	1		1	
2nd (moderate intake)	394	6.09	0.67	0.41–1.11	0.61	0.37–0.99
3rd (high intake)	384	7.55	0.83	0.52–1.33	0.69	0.44–1.14

EP: eating pattern; PR: prevalence ratio (considering complex sampling); 95CI%: confidence interval of 95%, adjusted by sex, rhinitis, eczema, age, tertile for standards 1, 2, and 3, income and education level of the head of family utilizing Poisson's multivariate regression.

do Conde, Bahia, who detected the prevalence of 10.6% utilizing the response of the presence of chest wheezing in the 12 months and the report of asthma or wheezing at some point in life to define asthma symptoms. The majority of studies involving more than one answer, in addition to the presence of wheezing in the last 12 months to diagnose the presence of chest wheezing, can have reduced prevalence, as the response regarding other symptoms are incorporated into the analysis, possibly reducing the possibility of exposure of the individual to the disease. As was the case with the study developed by Chatkin and Menezes,[25] who found, in Pelotas, Rio Grande do Sul, prevalence of wheezing in the last 12 months of 16.8% and over 4 wheezing attacks in the last 12 months was 3.6%. In the study by Jucá, Takano, and Moraes[26], with adolescents from 13 to 14 years old in Cuiabá, Mato Grosso, a prevalence of 19.1% was recorded for reported sibilant rhonchi in the last 12 months, 15.5% for reports of less than 4 attacks of sibilant rhonchi, and 2.7% for those with over 4 cases of sibilant rhonchi in the last 12 months. With this, it can be concluded that one of the factors that also contribute to the fluctuation in the prevalence rates is the form in which the obtainment of this diagnosis was planned.

The prevalence of chest wheezing in the last 12 months found in this study was 8.6%, near 7.6%, lower than those registered in Nova Iguaçu, Rio de Janeiro (11.8%), Maceió, Alagoas (12.3%), Itajaí, Santa Catarina (14.8%), Feira de Santana, Bahia (20.7%), and Salvador, Bahia (24.6%), observed in the last large-scale survey in various regions of Brazil[7]; nevertheless, it is near the prevalence of 9.1% found by Sousa et al[27]. in São Paulo. In addition to those registered by ISAAC[28] in Mexico (9.1%), Argentina (12.4%), and Chile (12.8%), these results, as with those obtained in this study, show a tendency in the prevalence of asthma symptoms in this age group, differing in some locations such as Feira de Santana and Salvador, where the rates are more elevated because they are large urban centers with a higher level of exposure to various determinants for asthma symptoms.

It is possible that the prevalence variability found in various regions of Brazil and the world are related to the Western lifestyle, the socioeconomic development, urbanization, and the increase in the population density, as well as variations in the nature and magnitude of environmental factors in that location, with an emphasis on climate and air pollution factors, especially in urban areas[10,28].

Although the prevalence observed in this study among adolescents has been below expected, in other studies these differences can be 20 times in the rates for asthma symptoms in the last 12 months; however, there is a great variability, oscillating from 1.9% to 34.1%[4,5,29]. This variability has been explained through multicausality, which involves the lives of the individuals, including climate conditions from each region to the characteristics intrinsic to each individual, as are the cultural aspects and the modern, Western lifestyle.

A smaller proportion of asthma symptoms was found among female adolescents, when compared to that of males, with this finding also being reported by Casagrande et al. [30],who observed a risk 2.4 times higher among male adolescents when compared to female adolescents. Other studies have evidenced differences regarding asthma when genders are compared[31,32]. However, the results of the present study differ from those found in other studies in which

authors have found the opposite, i.e., in early childhood, the asthma symptoms are more prevalent in males, but during adolescence this phenomenon is inverted – they are more prevalent in females[27,33].

It can be highlighted, in this population, that the prevalence of asthma symptoms is 3.2 times higher among those who have rhinitis. These results are in agreement with those observed by other researchers who point to the influence of rhinitis and eczema in the development of asthma symptoms[7]. Still in the present study, a smaller proportion of people with asthma symptoms was found among those with a higher adherence to healthy food intake patterns. The fact is that adhering to a healthy pattern protects adolescents, reducing the frequency of asthma symptoms by 39%. These results are plausible, as there is evidence that a diet with a high rate of antioxidants, obtained from fresh fruits, vegetables, or polyunsaturated fatty acids, obtained from fish and their by-products, be a protective factor for the development of inflammatory response associated with asthma and its symptoms[34].

A study developed in the United States of America between 1984 and 2000 points to the benefits of adhering to a food intake pattern named "prudent" (high intake of fruits, vegetables, fish, and whole grains) in the reduction of respiratory problems, when compared to other patterns (predominance of unhealthy foods, rich in refined grains, red and cured meats, desserts, and French fries)[21]; despite having distinct nomenclatures, they present a similar distribution in the grouping of foods regarding the association obtained in this study.

Although in the present study no significant association has been observed between the mixed and traditional patterns and the asthma symptoms; many studies point to the fact that as the frequency of food intake pattern made up of fast food, carbonated drinks, and sugar/sweets increases, so does the risk of having asthma symptoms. In a study developed by Silva et al.[35] in São Francisco do Conde, Bahia, it was found that the Western pattern was associated with asthma symptoms. The authors found that the Western pattern was associated with the increase in asthma risk, unlike the healthy and traditional food intake patterns, in which it was observed that as the intake increased the presence of asthma symptoms decreased.

We can observe in Table 3, that the second tertile, moderate food intake for the healthy pattern, was a protector for asthma symptoms. This can be related to the fact that the moderate consumption has a higher and more balanced variability of foods, including foods such as beans, rice, and meat, among other types that are important to good health. Although for the third tertile there is a higher intake of fruits and vegetables, even being considered healthier, it ends up not having the protective effect for asthma due to the high presence of pesticides in the vegetables (fruits, legumes, leafy vegetables), which can increase the predisposition for individuals to develop respiratory diseases[23]. Currently, this is one of the great paradigms of world food and the consumption of fruits and vegetables, but mostly it is contaminated with pesticides, insecticides, and fungicides.

This study presents some limitations, namely the approaches associated with cross-sectional studies. Memory, classifying, and quantifying approaches can also be found in the studies related to food intake pattern identification. However, regarding the definition of

asthma symptoms, the ISAAC questionnaire presents good specificity and sensitivity for the utilization in epidemiologic studies all over the world[4].

CONCLUSION

It can be concluded that the prevalence of asthma is found below the world average, and that of Brazil, in Salvador, Bahia. The asthma symptoms were more prevalent in male adolescents and among those who have rhinitis and less prevalent among adolescents who have a moderate intake of foods that are a part of the healthy eating pattern. The results of the adjusted multivariate analysis estimates point to a higher prevalence of asthma symptoms among male individuals, with allergic rhinitis and moderate consumption of foods that are a part of a healthy food intake pattern. With this, it can be concluded that the consumption of foods considered to be healthy acts as a protection against asthma symptoms. It is expected that studies that investigate factors associated with asthma symptoms allow for a better understanding of their origin, permanence and, thus, help in the decisions regarding its

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