Research Article

Asthma in Pediatrics: A Biopsychosocial Analysis of Factors Influencing Control in Northwest Mexico

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Abstract

Background: Asthma is a chronic disorder of airways in which many factors play a major role. Chronic inflammation is associated with airway hyperresponsiveness that leads to recurrent episodes of wheezing, dyspnea, chest tightness and coughing. Asthma treatment requires a therapeutic intervention developed between doctor, patient and family.

Aim: So the purpose of this study is to determinate factors associated with asthma uncontrolled in pediatric patients in Northwest México.

Design and Setting: Comparative cross-sectional study.

Methods: In 116 pediatric patients with asthma in the Regional General Hospital #1, Cd. Obregon, Sonora, Mexico. There were two groups (controlled and uncontrolled) based on asthma control questionnaire (CAN) test results, surveys were conducted to obtain demographic, medical and family information; it was used 90% statistical power and 95% interval confidence; association was established by calculating odds ratios, chi-squared test for statistical significance (p<0.05) and logistic regression analysis.

Results: 69% were men, mean age 9.9 years (±2.6), mean points in CAN 6.9 (DE±5.0). The association between asthma uncontrolled and associated factors reported the following results: immunotherapy (OR=10.2, p<0.001), socioeconomic status (OR=9.5, p<0.001), pets (OR=7.2, p<0.001), therapeutic adherence (OR=6.3, p<0.001), nutritional status (OR=5.9, p<0.001), smoking (OR= 4.7, p<0.001), family functionality (OR=4.7, p<0.001), acute rhino sinusitis (OR=4.3, p=0.004), eosinophilia (OR=4.2, p<0.001), food allergens (OR=2.9, p=0.006) and gender (OR=2.7, p=0.016). However, to clarify the results, we submitted these 11 factors to logistic regression analysis, reporting only five variables as the main factors influencing uncontrolled asthma.

Conclusion: Immunotherapy and characteristics such as gender, socioeconomic status, adherence and comorbidities are key factors for asthma control in pediatric patients.

Keywords: Asthma; Pediatrics; CAN

Introduction

Asthma is a chronic inflammatory disease of the airways in which different immune and cellular elements are involved. Chronic bronchial inflammation is related to a hyperresponsiveness of the airways manifested by recurrent episodes of cough, dyspnea, wheezing and chest pain, particularly at night. These episodes are almost always accompanied by variable obstruction of pulmonary airflow that may be reversible spontaneously or with treatment [1]. It is estimated that asthma affects 300 million people worldwide. It is a serious global health problem, affecting all age groups, with an increasing prevalence in many developing countries, an increasing cost of treatment and a growing burden for patients, their families and society. Asthma represents a heavy burden on health care systems and society through loss of productivity at work, especially in the case of pediatric asthma with disruption of school and family life [2].

Asthma is the most common chronic disease in childhood; it is a public health problem in several countries [3]. Overall, the prevalence of asthma in the population is 1% to 18%. In pediatric patients of Mexico, the prevalence of asthma fluctuates between 4.5% and 12.6%. In general, the annual incidence of asthma has been estimated to be 4.6 to 5.9 per 1,000 in women and 3.6 to 4.4 per 1,000 in men. According to WHO, the worldwide asthma mortality rate in 2001 was 3.73 per 100,000 inhabitants; In Mexico, the death rate in 2003 was 1.8 per 100 000 inhabitants [4].

Asthma is the leading cause of school absenteeism, urgent consultations with pediatricians, emergency services and hospitalization. The impact of this disease is high, not only because of its high morbidity, but also because of the economic and social impact associated with it. Often, illness and nocturnal symptoms accompanied by sleep disturbances in both children and their parents result in poor school performance and lost work days. It is more prevalent in children with a family history of allergy, symptoms and exacerbations are caused by a variety of initiating factors such as viral infections, allergens, cigarette smoke and environmental air pollution. Many patients have recurrent episodes of bronchial

symptoms, especially wheezing, cough and respiratory infections that begin from the first months of life [5].

Rhinitis and asthma are very common diseases that often coexist. Its high prevalence is associated with high morbidity and high economic costs. In children, rhinitis is associated with risk of suffering asthma. Also, long-term studies show similar results and asthma is associated with allergic rhinitis and non-allergic rhinitis, which indicates that the interrelation between both entities occurs independently of the presence of atopy [6]. Asthma has been divided according to the degree of control, arbitrarily, in poorly controlled asthma, partially controlled asthma and controlled asthma, according to the Global Initiative for Asthma (GINA) symptom questionnaire [2]. Despite being a useful tool in the monitoring of control, these questionnaires are not validated globally and may vary depending on the language. In this situation, there are symptom control questionnaires that are widely recommended by the international guidelines in monitoring the control of asthma in children [7].

In recent years, several questionnaires have been published to measure asthma control in children less than 12 years of age. Of these, four are the most recognized: Asthma Therapy Assessment Questionnaire for Children and Adolescents (C-ATAQ), Childhood Asthma Control Test (C-ACT), Asthma Control Questionnaire in children (ACQ) and Asthma Control Questionnaire (CAN) [8]. CAN is the only questionnaire validated in Spanish and English, has two versions, one for children from 2 to 8 years old with questions that must be answered by the primary caregiver and another from 9 to 14 years old, which the child must answer [9]. The overall treatment strategy is not based exclusively on pharmacological therapy; is based on 4 basic pillars: patient and family health education; Allergen control and environmental control; the use of objective measures of lung function to assess the severity of asthma and control of treatment (pharmacological maintenance treatment, rescue treatment and crisis management plan) [10].

The support offered by the family is the main resource for health promotion and prevention of the disease and its damages in chronic diseases, as well as the most effective aid that the individual feels and perceives in all the changes and contingencies throughout the vital cycle [11]. The lack of control of asthma causes serious changes in the daily life of the family, the quality of life of the caregiver and patient, with important repercussions on normal family functioning. That is why asthma is a condition with a high psychosomatic component [12]. Based on the above, the main objective of this study was to determinate factors associated with asthma uncontrolled in pediatric patients in Northwest México.

Materials and Methods

A comparative cross-sectional study was carried out, in the Regional General Hospital #1, of the Mexican Institute of Social Security, located in Obregon City, Sonora, Mexico; in pediatric patients with asthma, which were selected by a consecutive sampling techniques; that met the following inclusion criteria: age between 6 to 15 years, that accepted and signed the informed consent, in the company of an adult family member, which they lived with; patients with psychiatric illness and another pneumopathies were not included and eliminated those who did not complete the survey.

The following data were obtained directly from the patients or medical records: age, gender, socioeconomic level, adherence to treatment, comorbidities (atopic dermatitis, rhino sinusitis and allergic rhinitis), pets, smoking, family functionality, blood levels of eosinophils and immunoglobulin E, nutritional status and treatment with immunotherapy. Patients were assigned to two groups based on their asthma control determined by the result of the CAN test application considering controlled those who had a score lower than eight and uncontrolled those with a score equal to or greater than eight.

The Graffar-Méndez-Castellanos method was used to classify the socio-economic level [13], it was developed in France by Dr. Graffar and adapted by Dr. Hernan Méndez Castellanos, which consists of a stratification of the population from the following five variables: profession of the head of the family, level of instruction of the parents, source of income and housing and neighborhood aspect. From the sum of the variables five strata are identified: high level (stratum I), medium-high level (stratum II), medium level (stratum III), labor (stratum IV) and marginal level (stratum V). The instrument is validated to Spanish with a Cronbach´s alpha of 0.706.

Adherence to treatment was determined by the Morinsky Green test [14], which consists of four clear and simple questions. This test considers good adhesion to that person who correctly answers the 4 questions made (no, no, no and no). It has 49% sensitivity and 68% specificity; it's validated in Spanish with a Cronbach´s alpha of 0.617. Doctor-patient relationship was measured by applying the PDRQ-9 questionnaire, consisting of 9 questions with a 5-point Likert-type scale, where: 1= very inappropriate and 5= very appropriate, it´s validated in Spanish with a Cronbach´salpha of 0.95. It is considered a successful physician-patient relationship with a score of 35 and above [15].

To evaluate family functionality the family Apgar score was used, which was created by Dr. Smilkstein in 1978. It´s a questionnaire that consists of five questions, with three answer options ranging from 0-2 points, validated in Spanish with a Cronbach´s alpha of 0.8010.To determine nutritional status, body mass index (BMI) was calculated for which the patients were weighed and measured, on a scale with stadiometer (Transcell technology model TI-540-SL), it was calculated based on the Quetelet index (BMI = weight/talla2) and then were evaluated according to the CDC charts of BMI for age, it was considered obese patients who were above the 95th percentile and without obesity those below the 95th percentile.

The data obtained was integrated into data collection sheets and analyzed using the SPSS program version 20 in Spanish, where we applied descriptive statistics; for qualitative variables frequencies and percentages were used and for quantitative variables mean and standard deviation were used. It was considered statistically significant a p <0.05, with a 95% confidence interval, all variables were dichotomized to apply odds ratio and chi square. A multivariate binary logistic regression model was used in which all the statistically significant variables of the Chi squared result were analyzed, expressing the results with odds ratios and 95% confidence intervals. The robustness of the model was evaluated on the basis of the area under the ROC curve and the assumptions of the model were verified by calculation of residues. The Protocol was authorized by the Local

Table 1: Descriptive statistics of quantitative variables.

Variable	N	μ	SD	Minimum	Maximum
Age	116	9.9	±2.6	7	15
Asthma control (CAN test)	116	6.9	±5.0	0	20
Familiar functionality	116	8.2	±1.9	3	10
Nutritional status (BMI)	116	20.40	±3.6	14.26	30.96
Immunoglobulin E	116	464.41	±514.3	10	1830
Eosinophils in peripheral blood	116	636.94	±349.9	25	2400

μ: Mean, SD: Standard Deviation, N: Frequency.

Table 2: Association between sociodemographic factors and asthma control.

Variable	Subtype	Uncontrolled Group N	Uncontrolled Group %	Controlled Group N	Controlled Group %	OR	p
Socioeconomic level	Minor to medium level	37	63.7	9	15.5	9.5	0.001
	Same or higher at medium level	21	36.3	49	84.5		
Smoking	With Smoking	27	46.5	9	15.5	4.7	0.001
	Without Smoking	31	53.5	49	84.5		
Pets	With pets	46	79.3	20	34.5	7.2	0.001
	Without pets	12	20.7	38	65.5		
Type of pet	Dog	32	71.1	11	55	0.87	0.605
	Another (Cat, bird)	13	28.9	9	45		

N: Frequency; %: Percentage; OR: Odds Ratio; p: Chi Square.

Committee of Research and Ethics in Health Research from the Regional General Hospital #1, where the study took place.

Results

A sample of 126 patients was analyzed, 10 of whom had incomplete information (8.0%), obtaining a total of 116 patients, mostly men with 69.0% compared to 31.0% women, the mean age was 9.9 years (SD±2.6), finding the majority of patients in the group of 7-10 years old (56.0%). The CAN control questionnaire had a mean score of 6.9 points (SD±5) and the majority of the patients had a medium-low socioeconomic level (46.6%) (Table 1,2). The mean body mass

index was 20.4kg/m² (SD±3.6); 52.6% of the patients had a normal weight according to BMI for age compared to 2.6% overweight and 44.8% with obesity. 91.4% had at least one comorbidity: allergic rhinitis (91.4%), atopic dermatitis (0%) and rhinosinusitis (19%). It was found that 62.1% were under treatment with immunotherapy compared to 37.9% who did not receive immunotherapy (Table 1-4).

In skin tests, 97.4% of the patients had positive skin tests compared to 1.6% who did not present an antigenic reaction. Of the 97.4% with positive reaction, 57.8% were aeroallergens, 9.5% were food allergens and 30.2% were both. Laboratory studies showed the following: mean immunoglobulin E value was 464.41 IU/ml, the majority of patients (93.1%) had high values; mean value of eosinophils in peripheral blood was 636.94 10³/ml, with 46.6% of patients with eosinophilia; only 6 patients had positive coproparasitoscopic (5.2%) (Table 1). The APGAR test presented a mean of 8.2 points (SD±1.9). Of the total families, 69% were functional compared to 31% of dysfunctional families. Mostly were without adherence to their treatment (62.9%) and had a satisfactory relationship with their treating physician (81.9%) (Table 1-5). The majority of patients had a pet (56.9%) compared to those who did not (43.1%); most frequent pet was the dog (37.1%). 69% of the patients did not present exposure to tobacco smoke compared to 31% that were exposed at home (Table 1-2).

The following results were obtained for the association of sociodemographic variables with asthma control (Table 2): socioeconomic level (lower at medium level) [OR=9.5, 95%CI (3.9-23.3), p <0.001], pets [OR=7.2, 95%CI (3.1-16.7), p <0.001], type of pet (dog) [OR=2.0, 95%CI (0.67-6.0), p 0.20], smoking [OR=4.7, 95%CI (1.9-11.4), p 0.001]. As a result of the association of asthma control with family variables (Table 5), the following results were obtained: physician-patient relationship (not satisfactory) [OR=1.4, 95%CI (0.54-3.6), p= 0.46], family functionality (dysfunctional family) [OR=4.7, 95%CI (1.9-11.4), p <0.001], therapeutic adherence (without adherence) [OR=6.3, 95%CI (2.6-14.9), p <0.001].

When comparing asthma control with clinical variables (Table 3-4), we found the following: age (7-10 years) [OR=1.4, 95%CI (0.68-2.9), p 0.35], gender (man) [OR=2.7, 95%CI (1.1-6.1), p

Table 3: Association between clinical factors and asthma control (part 1).

Variable	Subtype	Uncontrolled Group N	Uncontrolled Group %	Controlled Group N	Controlled Group %	OR	p
Age	7-10 years	35	60.4	30	51.7	1.4	0.35
	11-15 years	23	39.6	28	48.3		
Gender	Man	46	79.3	34	58.6	2.7	0.016
	Woman	12	20.7	24	41.4		
Nutritional status (Obesity)	With Obesity	38	65.5	14	24.1	5.9	0.001
	Without Obesity	20	44.5	44	75.9		
Comorbidities	With Comorbidities	53	91.3	53	91.3	1.0	1.0
	Without Comorbidities	5	8.7	5	8.7		
Allergic rhinitis	With allergic rhinitis	53	91.3	53	91.3	1.0	1.0
	Without allergic rhinitis	5	8.7	5	8.7		
Atopic dermatitis	With atopic dermatitis	0	0	0	0	D/A	D/A
	Without atopic dermatitis	58	100	58	100		

N: Frequency, %: Percentage, OR: Odds Ratio, p: Chi Square, D/A: does not apply.

Table 4: Association between clinical factors and asthma control (part 2).

Variable	Subtype	Uncontrolled Group		Controlled Group		OR	p
		N	%	N	%		
Rhinosinusitis (RS)	With RS	17	29.3	5	8.6	4.3	0.004
	Without RS	41	70.7	53	91.4		
Immunotherapy	Without immunotherapy	36	62.0	8	13.7	10.2	0.001
	With immunotherapy	22	38.0	50	86.3		
Aeroallergens	Positive	49	89.0	53	91.3	0.77	0.68
	Negative	6	11.0	5	8.7		
Food allergens	Positive	29	52.7	16	27.5	2.9	0.006
	Negative	26	47.3	42	72.5		
Immunoglobulin E	High	53	91.3	55	94.8	0.57	0.46
	Normal	5	8.2	3	5.2		
Eosinophils in peripheral blood	With eosinophilia	37	63.7	17	29.3	4.2	0.001
	Without eosinophilia	21	36.3	41	70.7		

N: Frequency, %: Percentage, OR: Odds Ratio, p: Chi Square.

Table 5: Association between family factors and asthma control.

Variable	Subtype	Uncontrolled Group		Controlled Group		OR	p
		N	%	N	%		
Family functionality (APGAR)	Dysfunctional family	27	46.5	9	15.5	4.7	0.001
	Functional family	31	53.5	49	84.5		
Therapeutic Adherence (Morisky-Green test)	Without adherence	48	82.7	25	43.1	6.3	0.001
	With adherence	10	17.3	33	56.9		
Doctor-patient relationship (PDRQ-9 test)	Not Satisfactory	12	20.6	9	15.5	1.4	0.46
	Satisfactory	46	79.4	49	84.5		

N: Frequency, %: Percentage, OR: Odds Ratio, p: Chi Square.

0.01], treatment with immunotherapy (without immunotherapy) [OR=10.2, 95%CI (4.0-25.5), p <0.001], BMI (with obesity) [OR=5.9, 95%CI (2.6-13.4), p <0.001], comorbidities [OR=1.0, 95%CI (0.27-3.6), p 1.0], allergic rhinitis (with rhinitis) [OR=1.0, 95%CI (0.27-3.6), p 1.0], atopic dermatitis (with AD) [OR=1.0, 95%CI (0.27-3.6), p 1.0], rhino sinusitis (with rhino sinusitis) [OR=4.3, 95%CI (1.4-12.9), p 0.004], skin test (aeroallergens) [OR=0.77, 95%CI (0.22-2.6), p 0.68], skin tests (food allergens) [OR=2.9, 95%CI (1.3-6.4), p 0.006], immunoglobulin E [OR=0.57, 95%CI (0.13-2.54), p 0.46], eosinophils in peripheral blood (with eosinophilia) [OR=4.2, 95%CI (1.9-9.2), p <0.001].

We introduced 11 independent variables that were statistically significant (Chi squared) to the multivariate binary logistic regression model; where, for block one, the ROA statistical efficiency score indicates that there is a significant improvement in the prediction of the dependent variable (asthma control) when entering the nine independent variables (Chi square 88,622, p <0.001). The Nagelkerke R-square value indicates that the proposed model obtained five statistically significant variables, which represent 72.5% of variance of the asthma control variable (Hosmer and Lemeshow p 0.452).

When obtaining the final result of the logistic regression model (Table 6) the following results were found: immunotherapy (without immunotherapy) Standardized beta coefficient [B(SE)] 3.3 (0,759), OR 28.0 (95% CI 6.3-124.2), Wald 19.33, p <0.001; socioeconomic level (lower at medium level) B(SE) 1.6 (0,677), OR 5.1 (95% CI 1.3-19.5), Wald 5.9, p 0.015; gender (man) B(SE) 2.7 (0,920), OR 15.3 (95% CI 2.5-93.2), Wald 8.8, p 0.003; therapeutic adherence (without adherence) B(SE) 2.3 (0,718), OR 10.2 (95% CI 2.5-41.8), Wald 10.4, p <0.001; smoking (with smoking) B(SE) 2.7 (0,760), OR 14.9 (95% CI 3.3-66.4), Wald 5.9, p <0.001; nutritional status (with obesity) Wald 3.6, p 0.054; family functionality (dysfunctional family) Wald 0.36, p 0.54; rhino sinusitis (with rhino sinusitis) Wald 0.53, p 0.46; eosinophils in peripheral blood (with eosinophilia) Wald 0.37, p 0.53; food allergens (Positive) Wald 0.25, p 0.61; pets (with pets) Wald 0.21, p 0.64. With an assertiveness matrix model of 86.7% knowing the five independent variables.

Discussion

In the research study we found that the majority of the patients were males with 69%, which is different to reported by Del Rio-Navarro et al in a study carried out in 2006 where they looked for the prevalence of asthma in children of northern Mexico and regions of Latin America, they found that the majority (55%) of the patients were female [16]. However, our results are similar to reported by Alaniz-Flores et al in Mexico in 2013 where they sought the association of obesity and asthma control, they found that the highest prevalence of asthma was in men with 64.7% and the majority were between 6-7 years of age with an average age of 8.4 years [17], which is consistent with our results where the majority of the population (56%) were in

Table 6: Multivariate binary logistic regression analysis of factors associated with asthma control.

Variable	B (SE)	Wald	OR	95% CI	p
Immunotherapy (Without immunotherapy)	3.3 (0,759)	19.33	28.0	6.3-124.2	0.001
Socioeconomic level (Minor to medium level)	1.6 (0,677)	5.9	5.1	1.3-19.5	0.015
Gender (Man)	2.7 (0,920)	8.8	15.3	2.5-93.2	0.003
Therapeutic Adherence (Without adherence)	2.3 (0,718)	10.4	10.2	2.5-41.8	0.001
Smoking (With Smoking)	2.7 (0,760)	5.9	14.9	3.3-66.4	0.001
Nutritional Status (With Obesity)	---	3.6	---	---	0.054
Family Functionality (Dysfunctional family)	---	0.36	---	---	0.54
Rhinosinusitis (With rhinosinusitis)	---	0.53	---	---	0.46
Eosinophils in peripheral blood (With eosinophilia)	---	0.37	---	---	0.53
Food allergens (positive)	---	0.25	---	---	0.61
Pets (With pets)	---	0.21	---	---	0.64

B(SE): Standarized Coefficient Beta, OR: Odds Ratio, CI: Confidence Interval, p: Logistic Regression.

that age group with an average of Age of 9.9 years.

The population showed a socioeconomic level with low tendency; the working class and low middle class comprised 86.3% of total, 10.3% had a high average socioeconomic level and only 3.4% had a high level, in terms of association with asthma control, the stratum worker is 9.5 times more likely to be out of control than a middle or high level patient, this result is similar to that reported by Barraza-Villarreal et al in a study carried out in Cd. Juarez in 2001, they sought prevalence of asthma and other allergic diseases, they found that the low socioeconomic level is a risk factor for asthma control [18].

Adherence to treatment was present in 37.1% of the cases, which is similar to that reported by the World Health Organization, which specifies that adherence to treatment in developing countries, including Mexico is below 50 percent, which translates that Sonora is found with very low numbers of therapeutic adherence in chronic diseases such as asthma [19]. The physician-patient relationship (PPR) was satisfactory in 81.9%, which shows good communication and empathy between the doctor, primary caregiver and patient; there is no other published study that determines the role played by PPR and asthma, so this research is the first of its kind in this country and will be a point of reference for future research.

The family functionality showed that 69% of the families were functional and 31% were dysfunctional. In addition, it was verified that 84.4% of the patients in asthma controlled group have functional families and 53.4% of the patients in asthma uncontrolled group have functional families, with the above we determined that having a dysfunctional family conditions 4.7 times more risk of being uncontrolled in asthma, the result in this variable is higher than reported by Hinojos-Gallardo et al in 2010 where they sought the association between family dysfunction and asthma control, they found that patients with dysfunctional family have 2.0 times more risk of experiencing asthma control than those without dysfunctional family [20].

It was found that in the nutritional status, 44.8% of the patients had some degree of childhood obesity and of these only 26.9% were

controlled, which is an alarming situation in the growing epidemic that obesity is representing from an early age. In the association of obesity with asthma control, obesity causes 5.9 times more risk of being uncontrolled, these findings are higher to reported by Alaniz-Flores et al in a study carried out in Mexico (2013) where they sought the association of obesity and asthma control, they found that 21.31% of their total sample had some degree of obesity, determining that there is an association and correlation between asthma control and body mass index [17].

In comorbidities, no patients with both atopic dermatitis and asthma were found; allergic rhinitis was the most frequent comorbidity in 91.4%, this result is similar to that described in the universal literature and Reyes P et al in a study in Mexico (2014), where they were looking for the prevalence of allergic rhinitis and asthma, they found that 93.3% of the patients had both allergic rhinitis and asthma, evidencing the high correlation of both pathologies [21]. Rhinosinusitis was found in 19% of patients and was associated with asthma uncontrolled (OR = 4.3 p 0.004), a result similar to described by Castillo-Vizuete et al in a study carried out in Spain (2008) where they sought asthma comorbidities, they found that 13.7% of asthma cases has rhinosinusitis as comorbidity and was a risk factor for asthma control [22].

With the use of immunotherapy as part of the treatment of asthma, we found that 37.9% of patients were not treated with this treatment and that was associated with uncontrolled asthma (OR=10.2 p <0.001), these findings are similar to reported By Sánchez J et al in a study carried out in Mexico (2016), where they sought the effect of immunotherapy on the control of asthma symptoms during treatment and after treatment, they found that in a sample of 1014 children, immunotherapy was associated with asthma control, reducing frequency of exacerbations, use of preventive and rescue drugs and at the end of the complete treatment with immunotherapy, the effects of treatment were lasting for several years after suspension [23].

When performing skin tests with aeroallergens and food allergens it was found that 57.8% were reactive to aeroallergens, 9.5% to food

allergens and 30.2% to both. In the association with asthma control, being sensitized to food allergens was associated with uncontrolled asthma (OR= 2.9 p 0.006) while being sensitized to aeroallergens showed no difference between groups (OR= 0.77 p 0.68); these results are similar to reported in universal literature where it is mentioned that patients with asthma are sensitized to at least one allergen in 40-79% of cases [24]. However, there are no published studies where they perform allergen association with asthma control as was done in this research, so we consider it will be useful in future references.

In the research conducted, it was found that 31% of the patients were exposed to tobacco smoke and 69% were not. Exposure to tobacco smoke was associated with uncontrolled asthma (OR= 4.7 p <0.001), this finding is similar to that reported by Hernández-Venegas et al in a study in Mexico (2011) describing the characteristics of the children with asthma and their association with control, they found that smoking is a risk factor for the lack of control and that caused 16.1% of the exacerbations of the disease [25].

Conclusion

With the present study, we can verify that asthma is a public health problem of high priority; asthma affects the development of patients at an early age and quality of life, among other things. Despite advances in pharmacological treatments and greater knowledge of its pathophysiology, asthma is still out of control by health institutions. This leads us to analyze the possible causes and we find a series of factors that influence in an important way.

These factors include: absence of immunotherapy in management, exposure to tobacco smoke, gender, lack of therapeutic adherence and lower socioeconomic level. Based on the above, we consider that it is possible to have better control of patients with asthma, if in addition to focusing on pharmacological therapy, we carry out programs where we integrate all these aspects and regulate those factors that can be modified such as the use of immunotherapy (allergic asthma), better therapeutic adherence and not exposing patients to tobacco smoke. However, further researches are required since there may be factors inherent in each in order to include more aspects that may be impacting on the pathology, such as specific family and psychological factors.

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