

ORIGINAL ARTICLE

Prevalence of asthma at a school-based health clinic in Nicaragua

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Abstract

Background: Worldwide, it is estimated that 235–334 million people have been diagnosed with asthma. In Nicaragua, the current asthma rate for children 13–14 years of age was 15.2%.

Purpose: The purpose of this study was to determine the prevalence of asthma at this school-based health clinic in Managua, Nicaragua, associated symptoms or diseases, determine asthma classification, medications, and hospitalization rates.

Methods: A retrospective chart review was performed on all pediatric patient's medical records seen in the clinic during a 5-day period ($n = 105$).

Results: A total of 23 patients (21.9%) had asthma documented in the medical chart and were included in the analysis. Of the 23 patients, 3 (13%) patients were classified with intermittent asthma while the rest of the patients (87%) were not classified. Albuterol was prescribed for 19 (86%) of the patients with two patients who had both albuterol and QVAR[®] prescribed. Six (26%) patients had a family history of asthma.

Discussion: This study demonstrated the prevalence of asthma in school-aged children in Nicaragua is significant and higher than previously reported. The lack of a classification of asthma prevents patients from potentially being treated appropriately.

KEYWORDS

asthma, international, pediatrics, school-based health center

What is currently known?

In Nicaragua, the asthma rate for adolescents was 15.2% (Mallol et al., 2010). In Latin America, despite the recommendation from the Global Initiative for Asthma (GINA), asthma remains poorly controlled due to limited resources, limited access to health care, lack of adherence to medication, under-diagnosis of asthma, and knowledge deficit about asthma.

What does the article add?

This study demonstrated the prevalence of asthma in school-aged children at the school-based health centers in Managua, Nicaragua is

significant (22%). Only 13% had a classification of intermittent asthma. The lack of a classification of asthma prevents patients from potentially being treated appropriately. The World Health Organization recommends beclomethasone as a core essential medication. Classification is essential for controlling asthma symptoms, preventing recurrent exacerbations, reduce emergency department visits and hospitalization rates, and long-term sequela from untreated asthma.

1 | INTRODUCTION

The global burden of asthma is estimated between 235 and 334 million people who have been diagnosed with asthma (Asher & Pearce, 2014; World Health Organization [WHO], 2017a). Asthma is

a major health concern, affecting the quality of life of patients and their families (Global Initiative for Asthma [GINA], 2018; Sole, Aranda, & Wandalsen, 2017). The International Study of Asthma and Allergies in Childhood found the burden of asthma, rhinitis, and eczema are increasing globally with a prevalence rate of current asthma among children, aged 13–14 was 14.1% and 6–7-year-old age group was 11.7% (Mallol et al., 2013). In Nicaragua, the asthma rate for children (13–14 year old) was 15.2% (Mallol et al., 2010). In Latin America, despite recommendation from GINA, asthma remains poorly controlled due to limited resources, limited access to health care, lack of adherence to medication, under-diagnosis of asthma, and knowledge deficit about asthma (GINA, 2018; Østergaard, Nantanda, Tumwine, & Aabenhus, 2012; Sole et al., 2017).

Nicaragua, the largest country in Central America, has a population of 6.39 million people and is the second poorest country in Latin America behind Haiti (Banco Central de Nicaragua, 2017; Pan American Health Organization [PAHO], 2017). The capital of Nicaragua is Managua. The unemployment rate is low at 6.2% but the underemployed rate is 46.5% with 29.6% of people living below the poverty level and 8.3% living in extreme poverty (PAHO, 2017; Sequeira et al., 2011). Only 6.3% of the population have private insurance and while the government guarantees universal health care, in 2017 total expenditure on health was \$73.3 (United States Dollar) per capita (Banco Central de Nicaragua, 2017; PAHO, 2017; Sequeira et al., 2011). In 2012, the child mortality rate dropped from 53 to 25 per 1,000 live births (PAHO, 2017). Chronic malnutrition affects 17% of children under 5 years of age (Foundation for International Medical Relief of Children [FIMRC], 2018).

2 | LA ESCUELITA (LITTLE SCHOOL) PROJECT

In 2006, a partnership was explored and established between the Yale School of Nursing and a small school in Managua, Nicaragua. La Escuelita (The Little School) was established in 1998 to provide free education to the children whose parents work in the Oriental Market and can not afford public education (Allen, Meadows-Oliver, & Ryan-Krause, 2008). The collaboration was developed with the assistance of the Consejo de Iglesias Evangelicas Pro-Alianza Denominacional (CEPAD), the Counsel of Protestant Churches in Nicaragua, a nongovernmental organization. The mission of CEPAD is to “Facilitate transformative relationships and understandings between communities in Nicaragua and the U.S. Create opportunities for North Americans to learn of the political, social and economic realities of the Nicaraguan people. Provide financial and technical assistance to nongovernmental organizations in Nicaragua that work to empower communities and address issues of poverty, education and justice (CEPAD, USA, 2018).” The goals of the “La Escuelita Project” was to provide comprehensive primary care, design a medical record for each child, develop a plan of care for treatable diseases and conditions, educate the teachers on basic care, and establish relationships with local providers to continue care (Allen et al., 2008). Until recently, nurse practitioner faculty and nursing students travel to

Managua 1 week a year to provide needed care to students at a school-based health clinic (SBHC). When the SBHC was established, none of the children with asthma have albuterol for exacerbations due to cost (Allen et al., 2008). The physician, a pediatric pulmonologist, from the Ministry of Health agreed to visit the school monthly, review asthma control, provided albuterol to the students with asthma along with educational classes for the parents and teachers (Allen et al., 2008). Community health care workers were also involved in visiting the school weekly. Monthly reports from the teachers on health-related conditions were forwarded to the Yale faculty (Allen et al., 2008). The reports noted progress with follow up appointments, medication needs, changes in health conditions, and allow the faculty to plan for their future visits (Allen et al., 2008).

The purpose of this study was to determine the prevalence of asthma at this SBHC in Managua, Nicaragua, identify asthma classification and treatment, associated symptoms or diseases, exposure to environmental allergens, animal exposure, and hospitalization rates. The planned outcome of this study was to provide recommendations for diagnosis, treatment, and preventive measures with the goal of optimizing asthma management based on the international asthma guidelines from GINA.

3 | METHODS

3.1 | Design and sample

This study was a descriptive analysis of data collected through a retrospective chart review. The chart review was performed on all pediatric patient's medical records seen in the La Escuelita school-based clinic for a well child-care visit during a 5-day period. Children ranged in age from 22 months to 15 years (6.29). Well-child visits were conducted with a parent and child by supervised nurse practitioner students and certified nurse practitioners. Information collected during the well-child visit included the patient's past medical history (including current medications and allergies), family medical history, personal/social history, and review of systems related to any complaint. All information in the patient's chart was written in English. A total of 105 patients had well-child visits conducted and were included in this chart review during a 1-week period. One child with incomplete information was excluded from this review.

3.2 | Data collection

A data abstraction tool was created to ensure consistency when extracting data from the charts. All charts were reviewed, and data extracted by a doctorally prepared pediatric nurse practitioner. Data recorded from these patients included age, gender, ethnicity/race, weight, body mass index, past medical history including asthma comorbid conditions, that is, allergic rhinitis, eczema, gastroesophageal reflux disease (GERD), obesity and snoring, diagnosis of asthma, hospitalizations, allergies, current medications, family history, living

conditions including pets in home, number of people living in home, smoke exposure including cigarette, cooking and heating sources.

3.3 | Protection of human subjects

This study was deemed exempt from Institutional Review Board approval at the university. There was no anticipated risk or harm to the patients or families associated with the retrospective chart review. Data were deidentified before data analysis occurred. All patient information was collected and stored in a locked computer and office.

4 | RESULTS

The demographics of the participants are shown in Table 1. The mean age of the students at the clinic was 6.29 years, 100% Nicaraguan, with 59% male students. Almost half of the students were exposed to cigarette smoke, woodstove, open fire or charcoal as their cooking source, living in crowded conditions, and 23.8% had a family history of asthma.

TABLE 1 Descriptive statistics of the school-based health clinic in Managua, Nicaragua

	All student in the SBHC n = 105 (%)	Students with provider diagnosed asthma n = 23 (21.9%)
Age, years (mean, range)	6.29, 22 months to 15 years	7.43, 30 months to 15 years
Gender		
Female	43 (41)	10 (43.4)
Male	62 (59)	13 (56.6)
Ethnicity/race		
Nicaraguan	105 (100)	23 (100)
History of pneumonia	23 (21.9)	6 (23)
History of chronic cough	7 (6.67)	2 (8.69)
History of reactive airway disease	1 (0.95)	0
Exposure to cigarette smoke	52 (49.5)	10 (43.5)
>5 Persons living in house	70 (67)	13 (56)
Cooking source		
Woodstove/fire/charcoal	55 (52.4)	13 (56.5)
Gas/electric	48 (45.7)	10 (43.5)
Animals in home		
Cat/dog	60 (57.1)	10 (43.5)
Floor-type		
Concrete/tile/wood	63 (60)	13 (56.5)
Earth	42 (40)	10 (43.5)
Family history of asthma	25 (23.8)	7 (30.4)

Abbreviation: SBHC, school-based health clinic.

Of the 105 students, 23 patients (21.9%) had been diagnosed with asthma by the nurse practitioner or the physician and were included in the analysis. The mean age of the patients with a diagnosis of asthma was 7.43 years with a range of 30 months to 15 years of age including 13 (56.6%) males and 10 (43.4%) females (see Table 1). Furthermore, 3 (13%) patients were classified with intermittent asthma while the rest of patients 20 (87%) were not classified. Albuterol was prescribed for 19 (86%) of the patients while 2 (8.6%) patients had both albuterol and QVAR® (beclomethasone dipropionate), an inhaled corticosteroid, prescribed. Seven (30.4%) of the patients with asthma had a family history of asthma versus 23.8% without asthma. Past medical history included 6 (26.1%) patients were diagnosed with pneumonia of which two were hospitalized. Ten patients (43.4%) were hospitalized for an asthma exacerbation. Other comorbid conditions including allergic rhinitis, eczema, GERD, obesity, food allergies, and snoring are presented in Table 2. The atopy diseases of childhood, asthma, allergic rhinitis, and eczema, are important risk factor associated with the increase current and more severe asthma (Amaral, Carneiro, Wandalsen, Fonseca, & Sole, 2017; Thomsen, 2015). Seven (30%) of the patients also had allergic rhinitis and 1 (4.3%) had eczema. Moreover, approximately, 30.4% (7) had a family history of asthma, 43% (10) of the households had a parent or

TABLE 2 Patients with provider diagnosed asthma at the SBHC

Patients with diagnoses of asthma at the SBHC n = 23 (%)	
Classification of asthma	
Intermittent asthma	3 (13)
Not classified	20 (87)
Treatment	
Albuterol (SABA)	19 (86)
Albuterol (SABA) + QVAR® (beclomethasone)	2 (8.6)
Comorbid conditions	
Allergic rhinitis	7 (30)
Eczema	1 (4.3)
GERD	2 (8.6)
Obesity	0 (0)
Snoring	1 (4.3)
Past medical history	
Pneumonia	6 (26.1)
Premature	1 (4.3)
Ventricular septal defect	1 (4.3)
Hospitalizations	
Pneumonia	2 (8.6)
Asthma	10 (43.4)
Allergies	
Environmental	5 (22)
Smoke	2 (8.6)
Medication	1 (4.3)
Food	3 (13)
Milk	1 (4.3)

Abbreviations: GERD, gastroesophageal reflux disease; SBHC, school-based health clinic.

family member that smoked in the home, 30% (7) had outdoor plumbing, 56.6% (13) cooked with open fire, 56% (13) lived in a home with >5 persons, and 43.5% (10) had either a cat or dog or both in the house.

5 | DISCUSSION

This study demonstrated the prevalence of asthma in school-aged children at the SBHC in Managua, Nicaragua was significant (22%). The previous study in Nicaragua has reported asthma rates in children 13–14 years of age was 15.2% (Mallol et al., 2010). Other Latin American countries had similar asthma rates including Costa Rica 23.2%, Cuba 30.9%, Peru 33.1%, Venezuela 29.7% while Guatemala has an asthma rate of 2.6% (Forno et al., 2015; Roncada et al., 2016).

The population of the school served underserved, poor families without resources to attend public education and limited access to health care (Allen et al., 2008). The focus of the clinic was to provide primary care, develop a charting system, partnership, and relationship with local providers until the increased rates of asthma were noticed.

In 2007, the first year of the SBHC, none of the patients with asthma had any medication including albuterol (Allen et al., 2008). Albuterol and beclomethasone are over the counter medications but due to lack of financial means families were unable to purchase. The physician from the Health Ministry was able to purchase albuterol to allocate to the children (Allen et al., 2008). Fundraising at the university was also done for the teachers to purchase medications when needed. Since that time, 86% of the patients with asthma had albuterol to treat acute exacerbations with good effect.

Only 13% of the patients had a classification of intermittent asthma while 87% had no classification. The lack of a classification of asthma prevents the patients from potentially being treated appropriately with an inhaled corticosteroid such as QVAR[®] (beclomethasone dipropionate). Studies have found the cost of uncontrolled asthma is significantly more than for patients with well-controlled asthma (Gold et al., 2014; Neffen, Gonzalez, Fritscher, Dovali, & Williams, 2010; Sullivan et al., 2007). The WHO recommends beclomethasone as a core essential medication (WHO, 2017b). Classification is essential in adequately control asthma, prevent exacerbations, reduce emergency department visits and hospitalization rates, and long-term sequela from untreated asthma (Gold et al., 2014). Adding questions about daytime and nighttime symptoms, SABA use, interference with normal activity, and asthma exacerbations into the health record would be straightforward.

Pollution due to the burning of trash and diesel exhaust are a major problem in Nicaragua. Over half of the patients were subjected to cigarette smoke, wood stoves, and open fires. Household air pollutants have been associated with increased asthma symptoms and deaths (GBD Risk Factors Collaborators et al., 2013, 2015). Trigger avoidance and education were provided to the patients and their families to reduce exposure. Patients were encouraged to remain outside while open fire cooking was occurring in the home.

Smoking cessation, nutrition, and the importance of exercise were discussed during the health fair. Multiple studies are unclear of the relationship between outdoor air pollution, geoclimatic factors, and socioeconomics on asthma symptoms in Latin America with the need to study further (GBD Risk Factors Collaborators et al., 2013, 2015; Mallol et al., 2010; Mallol et al., 2013).

Assessing for asthma control is recommended at every health care visit to assist in asthma management (GINA, 2018; National Heart, Lung & Blood Institute [NHLBI], 2007). Several validated tools have been developed to evaluate for asthma control including the Childhood-Asthma Control Test (C-ACT; Liu et al., 2007) for child 4–11 years of age, ACT (Nathan et al., 2004) for children 12 and older, Asthma Control Questionnaire, Asthma Assessment Questionnaire, and Lara Asthma Symptom Scale (Alzahrani & Becker, 2016; NHLBI, 2007). The questionnaires are completed by the parent/guardian and/or child and focus on symptoms from the previous 4 weeks. Patients with a score of <20 are considered not well-controlled (NHLBI, 2007). The results of the standardized test should be included with the monthly report to follow asthma control.

6 | LIMITATIONS

Limitations of this study were the small sample of students that attend this school. We cannot be sure the asthma rate is representative of the country of Nicaragua. The School of Nursing was Nicaragua 1 week out of the year assessing patients. Since there is no nurse available at the school, carefully follow up by and education of the teachers is essential for controlling asthma. The teachers at the school were taught signs and symptoms of asthma exacerbations, medication administration, and when to refer to the physician. Parents also received similar education at her visit. A longitudinal study may provide more insight into asthma control.

7 | CONCLUSION

Nicaragua is the second poorest country in Latin America and the poorest in Central America. Asthma rates in Nicaragua are a major public health concern. Promoting health was a prior of the parents and teachers. Controlling asthma is essential for improving asthma outcomes and leads to a better quality of life, fewer missed days from school or work, reduce unscheduled emergency care, and decrease hospitalizations. Continuing to provide primary care to the patients at the clinic on an annual basis and include comprehensive asthma management by assessing for asthma control, determining asthma classification, access to appropriate medication, and education is the utmost importance. Due to unrest in Nicaragua, the project has been put on hold for 2 years.

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