Niger J Paediatr 2016; 43 (2): 78 – 82

ORIGINAL

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Prevalence and pattern of asthma exacerbation in children seen at the University of Nigeria Teaching Hospital, Enugu

DOI:http://dx.doi.org/10.4314/njp.v43i2.3

Accepted: 15th January 2016

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Abstract*:* *Background:* Acute exacerbation is a major cause of morbidity in asthmatic children. It can occur even in well controlled asthma.
Aim: To determine the prevalence and pattern of acute exacerbation of asthma in children seen at the emergency room of the University of Nigeria Teaching Hospital (UNTH), Enugu.
Materials and methods: This was a descriptive, cross sectional study in which consecutive children with acute exacerbation of asthma presenting to the Children Emergency Room (CHER) of UNTH, Enugu were recruited. Information from the history and examination were documented with a structured questionnaire completed by the attending doctor. Severity of their exacerbation was determined using the Global Initiative for Asthma (GINA) guidelines. The children were treated using the written management protocol used in CHER, UNTH, Enugu which was adapted from GINA guidelines.
Results: There were a total of 114 presentations (episodes) of acute exacerbation asthma by 104 children within the study period with eight children having multiple episodes. This represented 6.5% of the overall number of emergency cases seen during the period. Nearly an equal number (ratio; 1: 1.04) of males and females were enrolled with the mean age of 7.9 ± 4.7 years. More children with asthma exacerbations were admitted during the rainy season months of May and June, while the dry season months of December and January recorded lower number of episodes. Most (86.0%) cases were mild to moderate exacerbations and 16 (15.3%) were severe. Three of the 22 (13.6%) children on controller medications were among the 16 that had severe exacerbation. No death was recorded during the period.
Conclusion: The prevalence of asthma exacerbation is relatively high in our tropical environment and the pattern is similar to those of the developed countries in terms of age and sex distribution, however, the peak period of presentation differ in our environment.

Key words: Asthma, exacerbation, children, prevalence, pattern

Introduction

Asthma exacerbation is said to occur when there is an acute or sub-acute deterioration in symptom control that is sufficient to cause distress or risk to health, and necessitates a visit to a health care provider or requires treatment with systemic corticosteroids.[1] They may also be referred to as "attacks", "episodes" or "flare ups".[1]
Asthma exacerbations appear to be quite common and may occasionally be the first presentation of asthma in a child.[2] The course and severity may be difficult to predict. Common respiratory viral infections and inhalant allergen exposure may induce prolonged periods (i.e., from days to weeks) of asthma exacerbations in sensitized asthmatics.[2] These exacerbations are characteristically worse at night and can progress to severe airflow obstruction, shortness of breath, and respiratory distress and insufficiency.[2] Rarely, severe sequelae such as hypoxic seizures, respiratory failure, and death can occur.[2] It has also been noted that severe asthma exacerbation can occur in children with mild or controlled asthma.[3]
Exacerbations of asthma symptoms produce significant cost to health care systems and seriously diminish the quality of life of patients and their families.[4,5] It also accounts for disproportionate health care costs when compared to the management of stable state asthma.[5] It is the most common cause of childhood emergency room visits, hospitalization and school absenteeism in

the United States, accounting for 867,000 emergency room visits, 166,000 hospitalizations and 10.1 million school days lost annually.[2] More so, asthmatics requiring emergency room visit or hospitalization are at significantly increased risk of future exacerbation which is independent of demographic and clinical factors, severity and level of asthma control.[6]

In Nigeria, it is estimated that about 5 – 10 % of the children in any given community have asthma.[7] This study was done to find out the prevalence and pattern of presentation of asthma exacerbation in our environment. This will help improve clinical practice and management of acute asthma in Nigeria.

Subjects and Methods

This was a cross-sectional study conducted at the Children Emergency Room (CHER) of the University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu between May 2013 and April 2014. The hospital is located in the rain forest region of Nigeria, with an average annual rainfall of 1520mm and 2030mm and average high and low temperatures of 22.4^{o}C and 30.8^{o}C respectively. CHER is open 24hours a day and handles all cases of emergencies in children. About one thousand two hundred patients are attended to annually in the Children Emergency Unit. The patients come from different parts of Enugu metropolis as well as neighbouring towns and states. The patient population is made up of children from diverse ethnicity, but predominantly Igbos.

Children presenting to the Children Emergency Unit of University of Nigeria Teaching Hospital Enugu over a period of one year with a diagnosis of acute exacerbation of asthma (based on GINA guidelines) were recruited in the study. Children with clinical features suggestive of alternative diagnosis such as bronchiolitis were excluded from the study. Ethical approval was obtained from the University of Nigeria Health Research and Ethics Committee before the commencement of the study.

Using a structured questionnaire, patient related data such as sex, age, place of domicile as well as other historical data like time of onset, duration of symptoms, other presenting clinical symptoms such as cough, catarrh, breathlessness and wheeze were ascertained from the caregiver and older children. Physical examination was done to document the vital signs such as pulse and respiratory rates. Oxygen saturation in room air was done and presence of dyspnoea, tachypnoea and presence of rhonchi sought. Using the Global Initiative for Asthma (GINA) guidelines, the children were categorized into mild, moderate and severe based the severity of the exacerbation.

Subsequently the patients were treated using the asthma management protocol recommended in the GINA guidelines. Treatment received as well as the child's response and final outcome were documented. On discharge, the children were followed up in the asthma clinic for further management.

Data collected was entered and analyzed using the IBM SPSS Statistics software version 20 (IBM Corp, Armonk, NY. USA, 2011). The proportion of children presenting with acute asthma exacerbation in relation to all childhood emergencies that were attended to during this period was calculated. The age, sex, clinical features were described with the aid of tables. The frequency of presentation was plotted against the months of presentation. Duration of hospital stay as well as outcome of treatment was described. The end point was discharge following disappearance of symptoms or death. The severity of presentation in relation to use of controller medication was analyzed. A p value of < 0.05 was regarded as significant. Results were presented in prose, tables and graph.

Results

The total number of children that presented at CHER during the study period was 1751, of which 114 were cases of acute asthma giving a prevalence rate of 6.5%. These 114 presentations were made by 104 children. There were eight multiple presentations; seven of them presented twice within the period, while one child presented four times. Fifty-six (49.1%) of the presentations were made by male children while the remaining were by females, giving a M: F ratio of 1: 1.04. The children were aged from one year to 18 years, with a median age of 7 years. Table 1 shows the ages and sex distribution of the children. The frequency of presentation decreased with age.

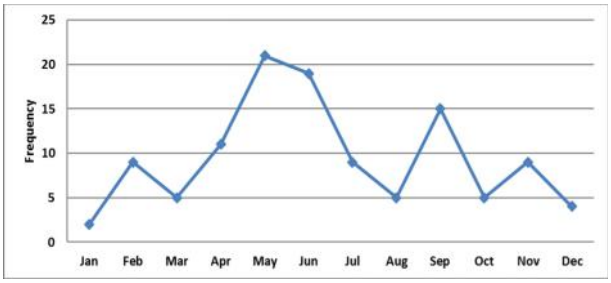
Most (88/114, 77.2%) of the presentations were children with previous diagnosis of asthma, while the remaining 26 (22.8%) were newly diagnosed at presentation.

Presentations were more in the heavy rainy season months of May (18.4%) and June (16.7%), while the dry season months of December (3.5%) and January (1.8%) recorded the least presentations, figure 1.

Table 1: Age distribution of the children with acute exacerbations

Age (years)	Frequency	Percentage	Males	Females
1 – 4	36	31.6	18	18
5 – 8	34	29.8	16	18
9 – 12	22	19.3	15	7
13 – 16	16	14.0	4	12
>16	6	5.3	3	3
Total	114	100.0	56	58

Fig 1: Pattern of annual presentation of acute exacerbations



The commonest symptoms were cough and breathlessness which were reported by 95.6% and 97.4% respectively, while the most common signs elicited were dyspnoea and expiratory rhonchi, which were present in all the children. Less than two thirds (61.4%) of the presentations were within 24 hours of onset of symptoms while 81.6% were within 48hrs. Table 2 shows the frequency of the symptoms and signs. The oxygen saturation (SpO_2) of the children at presentation ranged from 72% to 99% with a mean SpO_2 of 94.5 ± 5.4%. Most (98 /114, 86.0%) of the episodes were mild to moderate exacerbations while 16 cases (14.0%) were categorised as severe.

Table 2: Clinical features present in the children

Symptoms	Frequency	Percentage
Cough	109	95.6
Wheeze	65	57.0
Breathlessness	111	97.4
Chest pain	36	31.6
Catarrh	36	31.6
Fever	24	21.1
Signs		
Dyspnoea	114	100.0
Rhonchi	114	100.0
Cyanosis	0	-
Crepitation	13	11.4

Twenty two of the 88 previously diagnosed asthmatics (25%) were on controller medications. These were mainly steroid and long-acting beta2 agonist (LABA) combination for periods ranging from 4 months to 6 years. Three of the 22 (13.6%) children on controller medication had severe exacerbation as against 13/66 (19.7%) not on controller medications (χ =0.95, p = 0.63).

In 82.8% (83/114) of cases, a reliever medication was used at home prior to presentation. This included twelve (46.2%) of the 26 newly diagnosed cases. Medications used, either singly or in combination included; inhaled salbutamol (16.7%), Tablet salbutamol (33.3%), Prednisolone (16.7%), Aminophyline (16.7%), and Antihistamines (33.3%) In twenty two (19.3%) cases, antibiotics were commenced prior to presentation.

Most (74.6%) of the subjects spent less than 12 hours in the emergency room, only 3.5% spent over 48 hours on admission in the emergency room. Table 3. None of the children seen required admission into the intensive care unit and no death was recorded.

Table 3: Duration of admission for children with acute exacerbation

Duration (hrs)	Frequency	Percentage
< 12	85	74.6
12 to <24	18	15.8
to <48	7	6.1
≥48	4	3.5
Total	114	100.0

Discussion

The prevalence of acute exacerbation of asthma among children seen at the emergency room of the University of Nigeria Teaching Hospital, Enugu is 6.5%. Generally, data on asthma exacerbation are not very common. In the United States of America (USA), the acute exacerbation rate reported in 2005 was 5.2% when the overall asthma rate in children was 8.9%.[4] In another report also from USA, 2% of all outpatient visits and 2.3% of emergency room visits were for acute exacerbations among children less than 18 years. [8] In a retrospective survey of asthmatic children in seven European countries, 18% needed one or more emergency room presentation as a result of exacerbation within a one year period.[9]

Asthma may have its onset at any age. The ages of the children in the current study ranged from 1 to 18years. It has been documented that about 30% are symptomatic by one year of age.[2] The decreasing presentation with age shows that asthma exacerbation is more common among the younger age group. The rate of presentation decreased with age as observed in several other studies.[4,10] This may be explained by the fact that rhinovirus infection which is most prevalent in children under the age of 5 years play a significant role in asthma exacerbations in children.[4,11,12]

It has been shown generally that asthma is more prevalent in boys than girls.[11, 13] However, in the case of exacerbation, this trend only persist in early childhood but begin to reverse as the children get older with almost equal rate between 5 and 10 years and more girls between the ages of 11 to 17 years having more exacerbation than boys of same age group and females almost doubling the number of males by adulthood.[4,8] This change in trend have been postulated to be due to hormonal changes.[4]

Most of the children presenting were already known asthmatics but, over 20% were diagnosed at presentation despite some of them having symptoms for several years. Also, many of these children already received treatments which included antibiotics, oral salbutamol and theophylline before presentation. This brings to the fore the need for proper education on the need to seek proper treatment to curb the risks of misguided treatment and avoidable deaths.

Although controller medications does not prevent occurrence of acute exacerbation it reduces the severity and frequency of acute exacerbations and helps to achieve a better quality life.[3,4] In this study, three (13.6%) out of the twenty-two children on controller medications suffered severe exacerbation, although adherence to medication was not studied.

In high income countries in the Northern hemisphere as well as in Australia and New Zealand, asthma exacerbation in children is said to peak during the early autumn (September),[4] which is associated with lots of wind and

heavy rainfall driving pollen and respiratory viruses. In our study, the peak presentation occurred in May and June which are also associated with heavy rainfall and wind with the high prevalence of viral respiratory infections. Several studies [4,11,12] have implicated respiratory viruses especially rhinovirus as having a significant association with childhood asthma exacerbation. A review by Tan [12] suggests that viruses provoke asthma attacks by additive or synergistic interactions with allergen exposure or with air pollution.

Weather changes may affect the airways directly by cooling or irritating them or indirectly by influencing the level of airborne irritants and allergens. Exacerbations of asthma have been shown to correlate with low temperature and humidity, [14] which is similar to the climate during the early rainy season in our environment. Heavy rainfall associated with thunder has also been associated with increased prevalence of asthma exacerbation.[15,16] While Mark et al[15] attributed this observation to an outflow of colder air associated with the down draught of thunderstorm sweeping up pollen grains and particles and then concentrating them in a shallow band of air at ground level, Dales and his colleagues[16] attributed it to increased fungal spores released during storms. A second, though lower peak occurring in September coincided with the resumption of school after the long vacation in Nigeria. This trend which has also been reported in England and Canada[4,17] may not be unconnected with airborne substances including respiratory viruses and moulds and other allergens from abandoned classroom which can be triggers. Johnston et al[17] on this observation suggests that rhinovirus infections contracted from school mates may play a role in this exacerbation.

Expectedly, the commonest presenting symptoms were cough and breathing difficulty which are the two cardinal features that are often associated with asthma exacerbation. Chest pain/ tightness and audible wheeze were not frequent presenting symptoms. However, even in children with cough as their only complaint, examination revealed signs of dyspnoea. This means that some children and caregivers are either ignorant or not very observant about the symptoms and signs of asthma. Thus, continuous asthma education is necessary to help them identify early pointers to an acute exacerbation.
About 20% of the children had received antibiotics prior to presentation. Although antibiotics is occasionally prescribed in acute exacerbation, especially when there is fever or crepitation, studies suggest that there is little rationale for routine antibiotic use in children with acute exacerbation in the tropics.[4,11] This practice is however, not unconnected with the mentality of the caregivers that believe that every cough should be treated with antibiotics as well as the easy availability of antibiotics over the counters in medicine stores in the country. This practice can be a cause of delayed presentation.

The short duration spent in the emergency room by most of the children may be a pointer to the efficiency of good management plan which was used in all cases and the absence of mortality among the 114 case presentations supports the fact that although exacerbation is relatively common, mortality from asthma is quite rare in children.[2,3,7] A steady decrease in the mortality has been reported over the years.[18]

Conclusion

In conclusion, asthma exacerbation is relatively common in our tropical environment and the presentation is somewhat similar to those of the developed countries in terms of age and sex distribution, however, in our environment, presentation is highest during the rainy season and during school resumption from long vacation.

Conflict of interest: None
Funding: None

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