

Nebulization Practice and use of Antibiotic in the Treatment of Childhood Asthma at the Rural Area

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Abstract

Background : Management of childhood asthma is not optimum in our country especially at the community level.

Objectives : The study was conducted to see the nebulization practice in the management of moderate and severe acute asthma in children at the community level.

Methodology : This cross-sectional observational study was conducted in different private clinics and pharmacy of Daudkandi Upazila of Cumilla during the period of November 2017 to March 2018. Total 30 doctors' diagnosed cases of acute exacerbation of moderate and severe asthma between 2-15 years of age were included in this study. Each patient's treatment advice was followed up to see whether the use of nebulized Salbutamol and Antibiotic in the management of acute asthma was appropriate or not. All data were recorded in to a pretested proforma. Data were analyzed manually, and values were expressed as frequency and percentage.

Results : Among the cases 25 (83.33%) cases had moderate and 5 (16.67%) cases had severe exacerbation of asthma. For nebulization, salbutamol was used to all cases and ipratropium bromide was added to 11 (36.7%) cases. Nebulization frequency was as per national guideline but the ratio of salbutamol respiratory solution to normal saline was not appropriate in most of the cases. Antibiotic was given to all cases and among them parenteral Ceftriaxone was given to 22 (73.3%) cases.

Conclusion : Frequency of nebulization was appropriate but ratio of Salbutamol respiratory solution to normal saline was inappropriate. Antibiotic was given to all cases.

Key words : Acute asthma, Nebulization, Antibiotic.

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Introduction

Asthma is a global health problem affecting about 300 million people. It is estimated that an additional 100 million people may be affected with asthma by 2025. Worldwide, asthma accounts for about 1 in every 250 deaths. Modern management, which includes patient education, can prevent 80% of death.¹

Very few studies on epidemiology of asthma are available from Bangladesh. About 7 million Bangladeshi people (5.2%) has been suffering from current asthma, more than 90% of whom do not take modern treatment.² Prevalence of asthma in children 7.4 % in contrast to 5.3% in adults.³

Bronchial Asthma is a chronic inflammatory disorder of the airways associated with airway

hyper responsiveness to various stimuli that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning.⁴ These episodes are often reversible either spontaneously or with treatment and are usually associated with widespread and variable airflow obstruction.⁵

In childhood asthma, there is a wide variation in the symptom prevalence. Severe symptoms are more commonly found in children from less affluent countries and there are more children with any of the symptoms of asthma are found in wealthy countries.⁶

Most of the children with asthma have mild or moderate disease. Adequate control of symptoms is possible through avoidance of

triggering factors and/or with the help of medications, such as inhaled short-acting β_2 -receptor agonists (SABA), inhaled corticosteroids (ICS) and, when needed, the addition of long-acting β_2 -receptor agonists (LABA) and leukotriene receptor antagonists (LTRA).^{7,8}

Exacerbations of asthma are episodes characterized by a progressive increase in shortness of breath, cough, wheezing, or chest tightness, or some combination of these symptoms, accompanied by progressive decreases in lung function i.e., they represent a change from the patient's usual status that is sufficient to require a change in treatment.⁹ Acute exacerbation has been clinically classified as mild or moderate, severe and life threatening exacerbation in children aged 6-11 yrs. and in children aged 5 yrs. and younger as mild or moderate and severe or life threatening exacerbation.⁹

Most of the mild or moderate exacerbation cases can be managed well at home with judicious use of nebulized salbutamol and oral corticosteroid and a few cases may require hospitalization for high level care. Patients with severe or life-threatening condition require hospitalization but while waiting nebulized salbutamol, Oxygen inhalation, oral prednisolone, and if needed inhaled ipratropium bromide can save life. Therefore, aerosolized salbutamol is the main stay of treatment of acute exacerbation of asthma.

Mortality rate in different countries is increasing despite many advances take places in the management of asthma. Worldwide deaths from this condition have reached over 180,000 annually.¹⁰ Death occurs at two peak age groups in children: pre- school children and teenagers. The most common reason of death from asthma has been delay in seeking medical care. With the early initiation of effective treatment death due asthma is unusual.¹¹⁻¹³

Management of childhood asthma in rural health care system of our country is not optimum still now. Therefore, the study was conducted in the rural area to see appropriateness of the use of nebulized Salbutamol and Antibiotic in the management of acute asthma.

Materials and Methods

This cross sectional observational study was conducted in different private clinics and pharmacy of Daudkandi Upazilla of Cumilla during the period of November 2017 to March 2018. Total 30 children with acute asthma were included in this study with purposive sampling. All of them were between 2-15 years of age. Child aged below 2 years and above 15 years of age and having coexisting chronic disease in addition to asthma has been excluded. Cases were classified as moderate and severe exacerbation of acute asthma according to the symptoms criteria and treatment advices given by the physicians.

All relevant data were collected in to a pretested proforma of structured questionnaire. Data including age at onset, exacerbating factors, family history, treatment history, current treatment with nebulization, use of antibiotics were recorded. Data were analyzed manually, and values were expressed as frequency, and percentage. In this study we consider the following operational definitions.

Operational Definitions

Acute exacerbation : The GINA (Global Initiative for Asthma) guidelines define "acute exacerbations" (asthma attacks or acute asthma) as "episodes of progressive increase in shortness of breath, cough, wheezing, or chest tightness, or some combination of these symptoms, accompanied by decreases in expiratory airflow that can be quantified by measurement of lung function.⁹

Mild or Moderate acute asthma : Clinically mild or moderate acute asthma is considered on the basis of presence of following symptoms: breathlessness, agitation. Pulse rate ≤ 200 bpm (0-3yrs) or ≤ 180 bpm (4-5 yrs.) Oxygen saturation $\geq 92\%$. in patient's aged 5 yrs. and younger. In patients aged between 6-11 yrs. symptoms included: talks in phrases, prefers sitting or lying, not agitated, respiratory rate increased, accessory muscle not used, pulse rate 100-120 bpm O₂ saturation (on air) 90-95% PEF $>50\%$ predicted or best.⁹

Severe or Life-threatening asthma : Clinically severe or life-threatening asthma is considered based on the presence of following symptoms: unable to speak or drink, central cyanosis, confusion or drowsiness, marked sub -costal and/or sub-glottic retractions, oxygen saturation $\geq 92\%$, silent chest on auscultation, pulse rate >200 bpm (0-3) or >180 bpm (4-5 yrs.) in patient's aged 5 yrs. and younger.

In patients aged between 6-11 yrs. symptoms included: talks in words, hunched forwards, agitated, respiratory rate >30 /min. use of accessory muscles, pulse rate >120 bpm, O₂ saturation (on air) $<90\%$ PEF $\leq 50\%$ predicted or best.⁹

Proper dose and technique: Proper dose and technique was considered when salbutamol solution of .15-.3 mg/kg or .05ml/kg or 2.5 mg nebulizer for 5 years and younger was diluted with normal saline to make it at least 2-3 ml and was given with proper face mask or nasal cannula. For ipratropium bromide appropriate dose was considered 250 mcg was given by nebulizer.

Results

In our study, among 30 cases 12 (40%) patients were male and 18 (60%) were Female. Thirteen (43.3%) cases were in between 2-5 years of age, 15 (50%) cases were between 6-10 years and 2(6.7%) cases were in between 10-15 years of age. (Table I)

Table I: Age distribution of study children (n=30)

| Age | Cases | Percentage |
|--------------|-----------|-------------|
| 2-5 yrs | 13 | 43.3% |
| 6-10 yrs | 15 | 50% |
| 11-15 yrs | 2 | 6.7% |
| Total | 30 | 100% |

In this study cases 13 (43.3%) patients had been suffering from acute asthma in 2-5 years age group, 15 (50%) in 6-10 years age group, 2 (6.7%) patients were in 11-15 years of age. (Table II)

Table II : Study children according to severity of acute exacerbation of asthma (n=30)

| Age group | Severe or life-threatening asthma n (%) | Mild or Moderate asthma n (%) | Total n (%) |
|------------|--|----------------------------------|----------------|
| 2-5 yrs. | 1(3.3%) | 12(40%) | 13(%) |
| 6-10 yrs. | 2(6.7%) | 13(43.3%) | 15(50%) |
| 11-15 yrs. | 2(6.7%) | 0(.0%) | 2(6.7%) |

Among the precipitating factors, acute respiratory tract infections showed the highest incidence (53.3%). Remaining were exposure to dust, smoke, cold waves (30%), emotional upset (10%), exercise (6.7). (Table III)

Table III : Precipitating factors of acute exacerbation Of asthma (n=30)

| Factors | Number | Percentage (%) |
|------------------|-----------|----------------|
| ARI | 16 | 53.3 |
| Cold dust, smoke | 9 | 30.0 |
| Emotion | 3 | 10.0 |
| Exercise | 2 | 6.7 |
| Total | 30 | 100.0 |

In this study all the cases were treated with nebulized Salbutamol. Among them 19 (63.3%) patients were treated with only Salbutamol solution. 11 (36.7%) cases were treated with nebulized Salbutamol and Ipratropium Bromide. (Table IV)

Table IV : Pattern of nebulization with salbutamol and ipratropium bromide (n=30)

| Drugs for nebulization | Number | Percentage (%) |
|--------------------------------|-----------|----------------|
| Salbutamol | 19 | 63.3 |
| Salbutamol+Ipratropium bromide | 11 | 36.7 |
| Total | 30 | 100.0 |

In this study we found that the frequency of nebulization, which was given 6 hourly in 26 (86.7%) patients and 8 hourly in 4 (13.3%) patients. (Table V)

Table V : Frequency of nebulization (n=30)

| Frequency of nebulization | Cases | Percentage (%) |
|---------------------------|-----------|----------------|
| 6 hourly | 26 | 86.7 |
| 8 hourly | 4 | 13.3 |
| Total | 30 | 100 |

Among the 30 cases, nebulization solution was appropriate in 6(20%) cases and correct technic was found in only 10 (40%) cases. (Table VI)

Table VI : Appropriateness of solution and technic of nebulization

| Nebulized with | Severe or life-threatening asthma n (%) | Mild or Moderate asthma n (%) | Total n (%) |
|--|--|----------------------------------|----------------|
| Appropriate solution (Measured amount of respiratory sol. mixed proper amount of normal saline) | 1(20 %) | 5 (2 0%) | 6 (20 %) |
| Appropriate technic | 2(40 %) | 8(32 %) | 10(4 0%) |

In our study we found that among the 30 cases, 28 (93.3%) patients were treated with antibiotic according to the advice of the doctor. Out of them 22 (73.3%) patients were treated with Ceftriaxone, 5 (16.7%) cases were treated with Amoxicillin, 2 (6.7%) cases were treated with Ampicillin and Gentamicin, 1 (3.3%) patient was treated with Cephradine. (Table VII)

Table VII : Antibiotic given to study children (n=30)

| Antibiotic | Number | Percentage (%) |
|-----------------------|-----------|----------------|
| Ceftriaxone | 22 | 73.3 |
| Amoxicillin | 5 | 16.7 |
| Ampicillin+Gentamycin | 2 | 6.7 |
| Cephradine | 1 | 3.3 |
| Total | 30 | 100.0 |

Discussion

In the present study female cases were more than males. Male to female ratio was 2:3 though before puberty boys are more commonly affected than the girls.¹⁴ considering precipitating factors, acute respiratory tract infection was the most predominant factor. Respiratory Syncytial Virus (RSV) infection of the airway is one of the major precipitants of childhood asthma.¹⁵ Remaining precipitants are: exposure to dust, cold wave, and emotional upset.

In the present study we found that nebulized salbutamol, and antibiotic were frequently used in treating acute asthma. It is universally recognized that inhaled β_2 agonist (nebulized or MDI) is the mainstay of treatment.¹⁶ Nebulization was given to all cases with salbutamol and in addition ipratropium bromide was given to 11 (36.7%) cases. Nebulization was given 6 hourly in 26 (86.7%) cases and 8 hourly in 4 (13.3%) cases and the

doses and ratio of Salbutamol solution to normal saline was not as per national guidelines in most of the cases 6 (80%), but the frequencies were as per national guideline. The technic of nebulization was correct in 10(40%) cases.

β_2 agonist inhalation is an important basic component of management of asthma exacerbation. It can be given in nebulized form through metered dose inhaler (MDI).¹² Studies have found that metered dose inhaler with spacer is as effective as salbutamol delivered by nebulizer.¹⁷⁻¹⁹ According to national guidelines nebulized salbutamol should be given in a dose of 2.5-5 mg mixed with 2-3 ml normal saline.⁹ It is given as stat dose and at an interval of 20 minutes, three such doses can be given in the first hour. Then it can be given at 1-4-hour interval as per need.¹⁰

In children aged 2-5 years with intermittent viral wheezing, one study showed that a short course of an oral leukotriene antagonist (LTRA) (for 7-20 days commenced at the start of an Upper Respiratory Tract Infection or the first sign of asthma symptoms) reduce symptoms, health care utilization and time off work for the carer.⁹ In contrast another study showed no significant effect on episode free days (primary outcome), Oral Corticosteroid use, health care utilization, quality of life for hospitalization in children with or without a positive Asthma Predictive Index (API). However, activity limitation and a symptom trouble score were significantly improved, particularly in children with a positive API.⁹

All most all the cases were treated with antibiotic (Ceftriaxone, Amoxicillin, Ampicillin, Gentamycin), about three fourth of the cases received Ceftriaxone. Antibiotic therapy is not indicated universally in the management of acute exacerbation of asthma. Antibiotic is indicated in asthmatics in condition like fever with purulent sputum, suspected bacterial sinusitis, concomitant pneumonia, frequent exacerbation of asthma (may be associated with mycoplasma or chlamydial infections).¹² Use of antibiotic with or without indication was found in the present study.

Conclusion

The study concluded that nebulized salbutamol with or without ipratropium bromide was given to treat the patient of acute asthma but the dose and ratio of Salbutamol to normal saline was not as per national guideline in all most all the cases. Use of antibiotic was inappropriate. Limitation of the study was that our sample size was small and was taken from only one upazila.

Recommendation

Appropriate dose and ratio of Salbutamol solution to normal saline is necessary to get the better benefit in treatment of acute asthma.

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