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ORIGINAL ARTICLE

Continuous Versus Intermittent Nebulization of Salbutamol in Acute Severe Asthma

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ABSTRACT

Introduction: Asthma exacerbation is one of the most common causes of hospitalization among children. It was observed that severe asthma exacerbation is increasing in children with asthma.

Objectives: The main objective of the study is to find the continuous versus intermittent nebulization of salbutamol in acute severe asthma.

Material and methods: This randomized control trial study was conducted pulmonology department of DHQ Hospital Faisalabad and the duration of this study was from January 2019 to July 2019. Data was collected with the permission of ethical committee of hospital. The data was collected through random sampling technique. Patients were allocated by means of random table to receive salbutamol either by continuous or intermittent nebulization.

Results: The data was collected from 100 asthma patients of both genders. The mean age of patients continuous nebulization was 34.56±2.34 years and in intermittent nebulization 39.89±4.76 years. Hypoxemia was present in all patients with a mean PaO2 is 198±78 mmHg in continuous nebulization. Demographic and clinical values are presented in table 01.

Practical implication: We can easily apply this method in hospital treatment of continuous and intermittent nebulization of salbutamol in acute severe asthma.

Conclusion: It is concluded that there is no difference in continuous and intermittent nebulization of salbutamol in acute severe asthma. In this regard, repeated nebulizations of salbutamol at 20-minute intervals should be regarded as almost identical to continuous nebulization.

keywords: Nebulization, Intermittent, Patients

INTRODUCTION

Asthma exacerbation is one of the most common causes of hospitalization among children. It was observed that severe asthma exacerbation is increasing in children with asthma. Intermittent nebulization with short-acting β_2-agonist (SABA), salbutamol 0.15–0.3 mg per kg, every one to 4 hours is the current first-line recommendation for hospitalized children with asthma exacerbation[1]. However, children with severe asthma exacerbation may have suboptimal responses to first-line treatment and eventually require an escalation to more aggressive therapy (e.g., continuous nebulization, intravenous salbutamol, or intravenous magnesium sulfate). Admission to the paediatric intensive care unit (PICU) is crucial for delivering and monitoring for side effects of these therapies2. When progression to life-threatening respiratory failure occurs, endotracheal intubation and mechanical ventilation are needed. The results are asthma complications, prolonged hospital stays, and increased expenditures[3].

Nebulized salbutamol has been known to be an effective treatment of asthma for almost two decades[4] and nebulized bronchodilator therapy has now become firstline treatment of severe acute asthma in the Emergency Departments of most British hospitals[2]. This treatment was recommended as the most effective in 1972. but after the advent of intravenous salbutamol and terbutaline the choice of administering these drugs in severe acute asthma by aerosol or by the intravenous route was considered to be contentious, because of conflicting results of clinical trials in which the efficacy of these two routes of administration had been compared. In mild asthma it has been reported that salbutamol was more effective when inhaled than when given intravenously[5], but in the report of a study of 10 patients with severe acute asthma it was concluded that sympathomimetics should be given intravenously if the response to nebulized therapy was poor[6]. Unfortunately, in this study all 10 patients were given aerosol before intravenous salbutamol instead of being allocated at random to the two forms of treatment, and the validity of the conclusions is, therefore, open to question. Recently it was concluded that intravenous salbutamol is more effective than nebulized salbutamol in severe acute asthma, but may have unacceptable cardiovascular effect[7].

A number of recent studies have attempted to demonstrate the superiority of continuous delivery of nebulized b_2-agonists as compared to the intermittent delivery systems we commonly use to treat asthma in the ED. Some investigators have found continuously delivered albuterol to be advantageous in selected populations, specifically adults and children with the most severe asthma exacerbations[8]. Evidence for superiority of the intravenous route of administration of be~ adrenoreceptor agonists is sparse and based mainly upon poorly designed studies. The case for nebulized salbutamol is much stronger[9].

In a double blind, parallel group study of 16 patients with severe asthma, nebulized salbutamol was considered to be superior to intravenous treatment because it produced fewer unwanted cardiovascular effects, but efficacy of the two routes of administration was similar. The same conclusion was reached after a double-blind, crossover study of 22 episodes of life-threatening asthma in which all patients received intravenous and nebulized salbutamol, the treatment order being randomized[10].

MATERIAL AND METHODS

This randomized control trial study was conducted in pulmonology department of DHQ Hospital Faisalabad and the duration of this study was from January 2019 to July 2019. **Inclusion criteria**

- All the patients diagnosed with asthma.
- Both male and female patients.
- Age > 18 years.

Exclusion criteria

- Patients with the history of hypersensitivity.
- Pregnant females
- Those who do not want to participate in the study.

Data collection: Data was collected with the permission of ethical committee of hospital. The data was collected through random sampling technique. Patients were allocated by means of random table to receive salbutamol either by continuous or intermittent nebulization. All patients received a total dose of 27.5 mg of salbutamol over the 6-hour study period. Patients received 15 mg of salbutamol during the first hour and 2.5 mg hourly thereafter. The reservoir of the pneumatic nebulizer was connected to a

standard infusion pump by an 18-gauge needle. Each patient received a nebulization of 5 mL every 20 minutes the first hour and 15 mL hourly thereafter. 5 Patients had continuous cardiac monitoring throughout the study period and ECGs were obtained at the sixth hour. Both primary and secondary outcomes were measured in every patient. The data was collected and analyzed using SPSS version 20. All the quantitative data were expressed in mean and standard deviation.

RESULTS

The data was collected from 100 asthma patients of both genders. The mean age of patient's continuous nebulization was 34.56±2.34 years and in intermittent nebulization 39.89±4.76 years. Hypoxemia was present in all patients with a mean PaO2 is 198±78 mmHg in continuous nebulization. Demographic and clinical values are presented in table 01.

Table 1:

Variable	Continuous Nebulization	Intermittent Nebulization
Age	34.56±2.34 years	39.89±4.76 years
Duration of asthma	7±2 years	8±3 years
Previous medication Inhaled corticosteroids (n) Methylxanthines (n)	 5 7	 10 9
Mean respiratory rate (breath/min)	34±3	36±5
Mean heart rate (beats/min)	121±2.65	122±3.10
Pulsus paradoxus <15 mm Hg (n)	6	11
Pa CO_2 (mmHg)	43±2.1	44±1.98
PaO_2 (mmHg)	198±78	201±56

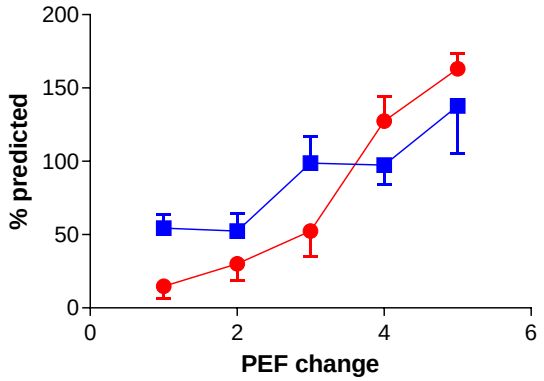

Figure 1: Clinical severity score changes for continuous and intermittent nebulization groups.

DISCUSSION

Asthma is one of the most common emergencies throughout the world, where an estimated 300

million individuals are affected. The prevalence of asthma in Pakistan is 23%. Most asthma is uncontrolled and it is estimated that up to 64% of patients have uncontrolled asthma. Morbidity related to asthma has also increased in recent years. In addition, hospitalization for asthma has increased[10]. However, mortality due to asthma is decreasing worldwide. Asthma is one of the main causes of health care utilization and the costs related to asthma are increasing. Approximately 50% of pediatric asthma cases are still uncontrolled in Saudi Arabia, even in

tertiary centers[11].

In the present study, no appreciable difference was observed between continuous and intermittent nebulization of salbutamol in patients presenting to the ED with acute severe asthma in regard to spirometry (PEF), clinical symptoms (clinical score), or disposition (hospitalization rate)[12]. However, this was a small study with limited power to detect differences in failure and hospitalization rate. Accordingly, the decision to use intermittent or continuous nebulization should be made on the basis of logistical considerations[13].

Most clinical trials dealing with acute asthma used spirometric improvement as the main outcome measure[14]. However, the change in pulmonary function is not directly related to clinical improvement and other relevant outcome measures such as the rate of hospitalization or discharge from the ED[15]. In the current study, we compared both nebulization modalities with spirometry, as well as change in clinical status and the rate of hospitalization. In addition, because the early physiologic and clinical response to nebulized β2-agonists has been recently shown to be an important factor in the prediction of the need of hospitalization and the potential for relapse, both nebulization modalities were compared with regard to their rapidity of action[16].

Continuous nebulization of β2-agonists might be expected to enhance the pulmonary function of patients with acute asthma and ameliorate their clinical status more rapidly than intermittent nebulization[17]. These effects should result in a reduced rate of hospitalization and the need for invasive procedures such as mechanical ventilation or intravenous β2-agonists. It has been speculated that these beneficial effects occur through an early deposition of β2-agonists in the distal bronchi as bronchoconstriction is alleviated proximally and a sustained stimulation of pulmonary β2-adrenergic receptors, thereby preventing the rebound bronchospasm that might occur with intermittent delivery[18-19].

CONCLUSION

It is concluded that there is no difference in continuous and intermittent nebulization of salbutamol in acute severe asthma. In this regard, repeated nebulizations of salbutamol at 20-minute intervals should be regarded as almost identical to continuous nebulization.

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