ORIGINAL ARTICLE

Nebulized Magnesium Sulphate as an Adjunct Therapy in the Management of Children Presenting with Acute Exacerbation of Asthma

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ABSTRACT

Aim: To compare the mean SPO2 with nebulized magnesium sulphate as an adjunct with standard treatment versus placebo for management of children presenting with acute exacerbation of asthma

Methods: This study was conducted in the Department of Paediatrics, Mayo Hospital, King Edward Medical University, Lahore, from October 2016 to March 2017. Total 100 cases were selected by non-probability, consecutive sampling. Children of age 5-12 years of either gender presenting with acute exacerbation of asthma of less than 6 hours duration were included, while children requiring immediate intubation and ventilation and children with complications of asthma on chest X-ray were excluded. Children were randomly divided in two groups by using computer generated random number table. All children received nebulization of salbutamol 3 times at 20 minutes interval. In group A, children were given additional nebuliazation with 3ml $MgSO_4$ and in group B, children were given additional nebulization with 3ml of normal saline. All children were followed-up in ward for 90 minutes.

Results: SPO2 was significantly higher in children who were nebulized with MgSO4. i.e., SPO2: MgSO4: 89.76 vs. Placebo: 82.52, (p-value= 0.000).

Conclusion: Nebulized magnesium sulphate, as adjunct with standard treatment is effective in the management of children with acute asthma exacerbation.

Keywords: Acute asthma, Exacerbation, SPO2, Nebulized magnesium sulphate

INTRODUCTION

Asthma and wheezing in children is a very common problem and its prevalence has risen from 5% to about 20% of the pediatric population of Pakistan in last 20 years. In that time, in spite of increased use of inhalers and better medications delivery by aerochambers and spacers, Hospitalizations have increased eightfold[1,2].

Having bronchodilator and anti-inflammatory properties, magnesium is a good adjuvant therapy for pediatric patients who do not respond to conventional treatment in acute exacerbations of severe degree.[3] Inhaled $MgSO_4$ is recommended during an asthma attack when patient does not respond adequately to bronchodilators and steroids. Studies show better results from intravenous magnesium sulfate ($MgSO_4$).[1, 4] But some studies observed the insignificant role of nebulized $MgSO_4$ in children with acute severe asthma.[5] One randomized trial has reported that nebulized $MgSO_4$ group (n=30) showed higher values of post-bronchodilator (post-BD) SpO_2 (92±4% vs. 88±5%, p<0.006) than the placebo group (n=30) when given as adjunct with standard treatment.[6]

The objective of this study was to compare the mean SPO2 with nebulized magnesium sulphate, as adjunct with standard treatment, versus placebo for management of children with acute asthma exacerbation.

MATERIALS AND METHODS

This was a randomized controlled trial. It was conducted in Department of Pediatrics, King Edward Medical University, Mayo Hospital, Lahore from October 2016 to March 2017. A total of 100 cases were included. (50 cases in each group). The sample size was calculated with confidence level of 95%, power of test 80% and magnitude of SpO_2 i.e.92±4% with nebulized $MgSO_4$ and 88±5%[6] with placebo, in children with acute asthma exacerbation. Cases were selected by non-probability, consecutive sampling from Paediatric emergency. Children of age 5-12 years of either gender presenting with acute exacerbation of asthma(as per operational definition) of less than 6 hours duration were included, while children requiring immediate intubation and ventilation, and children with complications of asthma e.g., Pneumothorax on chest X-ray were excluded. Acute exacerbation of asthma was defined as acute or subacute episodes of progressively worsening shortness of breath, cough, wheezing, and chest tightness any 1 or more of these symptoms and decrease in expiratory airflow i.e., FEV1 <60% and SPO2 <88%. Informed consent was taken from parents and demographic variables (name, gender, age, weight and contact no.) were recorded. Then children were randomly divided in two groups by using computer generated random number table. All children received nebulization of SALBUTAMOL 3 times at 20 minutes interval. In group A, children were given additional nebuliazation with 3ml (150mg) of $MgSO_4$ as an adjunct and in group B, children were given additional nebulization with 3ml of normal saline solution as placebo. All children were followed-up in ward for 90 minutes. Outcome was measured after 90minutes of treatment in terms of SpO2- measured as oxygen saturation in blood by using pulse oximetry in terms of '%'. All data was collected through specially designed Performa. The data was analyzed by SPSS version 20. Quantitative variables like age, weight, and SpO_2 were presented as mean and standard deviation. Qualitative variables like gender presented as frequency and percentage. Both groups were compared for SpO_2 by using independent sample t-test.

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RESULTS

The mean age of patients in MgSO4 group was 9.30±2.16 and in Placebo group mean age of patients was 8.32±2.33. In MgSO4 group 28(56%) male 22(44%) female children were included while in placebo group 30(60%) male and 20(40%) female children were included. Mean weight of patients in MgSO4 group was 29.42±6.21 and in Placebo group mean weight of patients was 27.92±6.54 kg. SPO2 value was significantly higher in children who were nebulized with MgSO4 as compared to the children who were treated with placebo. i.e., MgSO4: 89.76 vs. Placebo: 82.52, (p-value=0.000).

Table-1: Demography of children

	Nebulized $MgSO_4$	Placebo
Age (Mean±SD)	9.30±2.169	8.32±2.334
Male	28(56%)	30(60%)
Female	22(44%)	20(40%)
Weight (Mean±SD)	29.42±6.211	27.92±6.549

Table-2: Mean SPO_2 in treatment groups stratified for age

Age Gps	Nebulized $MgSO_4$	Placebo	p-value
5-7	89.00±2.73	81.60±5.18	0.000
8-10	90.38±3.02	83.53±5.08	0.000
11-12	89.13±3.66	82.45±4.27	0.000

Table-3: Mean SPO_2 in treatment groups stratified for gender

Gender	Nebulized $MgSO_4$	Placebo	p-value
Male	89.68±3.05	81.03±4.76	0.000
Female	89.86±3.41	84.75±4.42	0.000

Table-4: Mean SPO_2 in treatment groups stratified for Weight of children

Weight	Nebulized $MgSO_4$	Placebo	p-value
19-27	89.50±2.84	82.46±5.45	0.000
28-35	89.40±3.58	82.31±4.64	0.000
>35	90.82±3.40	83.13±4.22	0.000

DISCUSSION

A stepwise approach is recommended for management of acute exacerbations of asthma, first-line standard therapy initially and then additional treatment options[7]. Response towards the standard therapy is quite variable, affected by multiple factors, which cannot be assessed urgently e.g., genetic polymorphisms[8,9]. For patients, with poor response to first-line therapy, improvement can be observed using other additional therapeutic measures e.g. inhaled $MgSO_4$, IV Medications like terbutaline, aminophylline, or magnesium sulfate. Although other second-line agents also produce bronchodilatory effects, magnesium has advantages of easy availability, fewer side effects and cost effectiveness[3].

In this study it was observed that mean SPO2 both was significantly higher in children who were nebulized with MgSO4. Stratification of age, weight and gender of children showed that mean SPO2 was significantly higher in MgSO4 group as compared to placebo group.

Role of Inhaled MgSO4 is controversial. Studies done on this topic vary widely in their methodology and are hetreogenous in nature. These studies cannot be compared due to difference in therapeutic interventions and measures of outcomes. In spite of all, the GINA (Global Initiative in National Asthma) guidelines support the use of MgSO4 during acute exacerbation of asthma[10,11].

Gallegos-Solorzano M in his randomized trial has reported that in nebulized $MgSO_4$ group (n=30) showed higher values of post-bronchodilator (post-BD) SpO_2 (92±4% vs 88±5%, p<0.006) than the placebo group (n=30) when given as adjunct with standard treatment[6]. Tassalapa Daengsuwan in his study showed that nebulized MgSO4 and intravenous $MgSO_4$ are both clinically beneficial and safe for children suffering from severe asthma exacerbation[12]. Results of this study are consistent with the findings of Gallegos-Solorzano M , Tassalapa Daengsuwan showing the efficacy of nebulized MgSO4[13,14].

CONCLUSION

Nebulized magnesium sulphate as an adjunct to standard treatment is effective for management of children presenting with acute exacerbation of asthma.

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