

## Evaluating the use of magnesium sulphate intravenous for the Asthma in pediatric patients

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### Abstract:

**Background:** One of the proposed mechanisms for the action of the magnesium sulphate includes relaxation of the bronchial smooth muscle by the inhibition of the calcium across the smooth muscle membranes. The present study was conducted to investigate the safety and efficacy of magnesium sulphate administration for the severity of acute asthma in pediatric patients.

**Methodology:** The present retrospective study was conducted at Department of Tuberculosis and Respiratory Medicine, GMERS Medical College, Gandhinagar, Gujarat. Inclusion criteria included the patients under the age of 18 years or younger and who were treated with intravenous magnesium sulphate for the treatment of asthma attacks in the department of emergency of the hospital. Data collection form was used to assess the details of the patients.

**Results:** Total of 60 paediatric patients were included in the present study. All the paediatric patients did received the magnesium sulphate through intravenous administration. Total of 40 patients required a PICU admission after the magnesium sulphate treatment. It was found that total of 96% of the patient did required the hospital admission. Around 5 patients were discharged directly from the emergency department. The serum concentrations of the magnesium sulphate were slight above the normal range that is 1.5 to 2.5 mg/dl.

**Conclusions:** Monitoring of the intravenous magnesium sulphate and the related practised in various medical institutions did vary. Further studies are required to determine the regimen of the dose of intravenous magnesium sulphate for the paediatric patients.

**Keywords:** Asthma; Intravenous; Magnesium sulphate; Paediatric patients.

### Introduction:

There is swelling and inflammation of the lining of the airways, as compared to normal there is production of thicker mucus during the attack of asthma. During the attack of asthma there is worsening of the symptoms of the asthma. The symptoms include the shortness of breath, coughing, difficulty in breathing and very difficulty in performing day to day activities [1].

In case of severity of the asthma the symptoms like shortness of breath, wheezing and coughing become severe. Less severity of the symptoms can be managed by rest however more severe symptoms require visit to the emergency department of the hospital [2]. In the report of 2007; in United States the total of 185 children died as result of asthma. The death rate in the children and adults because of the asthma has been doubled from 1975 to 1995 [3]. Although there are changes in the therapeutic strategies for the treatment of acute asthma, the hospital outpatient department and emergency department still continued to receive the cases of health related issue due to asthma [4].

There is the need to relax the muscle around the airways to open them which can be done with the help of bronchodilators and to reduce the inflammation there is need of corticosteroid drugs. Magnesium sulphate is the drug that has both effects that is to reduce the inflammation and also affect the muscles as well. The route of administration is intravenous [5,6].

The bio mechanism for the action of magnesium sulphate for the action of treating asthma is still largely unknown. One of the proposed mechanisms for the action of the magnesium sulphate includes relaxation of the bronchial smooth muscle by the inhibition of the calcium across the smooth muscle membranes [7,8]. The present study was conducted to investigate the safety and efficacy of magnesium sulphate administration for the severity of acute asthma in pediatric patients.

### Materials and Methods:

The present retrospective study was conducted at Department of Tuberculosis and Respiratory Medicine, GMERS Medical College, Gandhinagar, Gujarat. Prior to the conduction of the study, the review board of the medical centres were informed and ethical committee permission was taken from them. Inclusion criteria included the patients under the age of 18 years or younger and who were treated with intravenous magnesium sulphate for the treatment of asthma attacks in the department of emergency of the hospital. Data collection form was used to assess the details of the patients. Data was collected for information relate to the sex, height, weight, number of previous hospitalization, home medications.

After the administration of the serum magnesium, the levels were recorded and noted. Owing to the possibility of the adverse drug reaction, the infusion time required for the assessment for the safety of the

intravenous administration of magnesium sulphate. The dose, length of time of intravenous infusion, frequency and adverse reaction of magnesium sulphate related data were collected from the outpatient department and emergency department of the medical hospital institutions.

The main purpose of the present study was to assess and analyze the safety of the intravenous administration of the magnesium sulphate for the treatment of the attack of the asthma in the paediatric patients in various medical institutions.

### Results:

Total of 60 paediatric patients were included in the present study. All the paediatric patients did received

the magnesium sulphate through intravenous administration. Table 1 characterised the baseline features of the paediatric patients included in the study.

All the patients included in the study had previous history of asthma and were receiving proper treatment with medication and maintenance therapy on regular basis at home. Almost 97% of the patient did received standard therapy for the treatment of attack of asthma, which includes the administration of Albuterol, inhaled Albuterol, intra muscular Epinephrine, subcutaneous Epinephrine and systemic corticosteroids. The administration of the dose of intravenous magnesium sulphate was done on the base of weight of the patient and it differed for all the included medical institutions.

**Table 1: Baseline features of the included patients**

Characteristics	A (30)	B (30)	Total (60)
Age, (Years)	9	8	8
Weight, (Kg)	24	36	30
Male	20	18	38
Patients with unknown history	1	2	3
Previous hospital admission for asthma	0	0	0
Previous PICU admissions for asthma	0	0	0
Previous intubations due to asthma	0	0	0

The result of the outcome looking at the disposition of patients is as follows; four patients did required intubation after the treatment with intravenous magnesium sulphate. Total of 40 patients required a PICU admission after the magnesium sulphate treatment. It was found that total of 96% of the patient did required the hospital admission. Around 5 patients were discharged directly from the emergency department. The serum concentrations of the magnesium sulphate were slight above the normal range that is 1.5 to 2.5 mg/dl.

### Discussion

The individual could have a terrifying experience of the attack of asthma. One feels as if there are clouds in your lungs or like there is someone who is sitting on your chest. There is quick breathing, individual feels difficult in drawing full length breath due to all this there is tightening of chest [9]. Asthmatics patient feel all this because there is obstruction and inflammation of the tubes that allows the air to enter and leave the lungs; known as bronchial tubes. Whenever there is asthmatic attack the muscles that surrounds the bronchial tubes will narrow down and constrict the passage of the bronchial tubes, which make it extremely difficult to breathe [10].

Depending upon the cause of the asthmatic attack and duration of the inflammation of the bronchial tubules the asthmatic attack has been classified as from mild, moderate and severe. Mild attack will last for few minutes and can be resolved spontaneously with help of

few medication or quick acting inhaler, whereas severe attack are the one which lasts from hours to days and can resolve with proper hospitalization and methodological treatment [11].

Although there is lack of data for the usage of magnesium sulphate in the treatment of asthma patients, it is being used effectively since last 25 years. The first research on this aspect was published in year 1987 by Okayama [12]. The purpose of their study was to evaluate the intravenous administration of the magnesium sulphate of 250 mg and its effect on bronchodilatation, the study included 10 patients who were diagnosed with asthma. The evaluation was done with the help of lung function test. Later on the first randomized control trial was published in 1989 by the Skobeloff and his partners. 1.2 g of magnesium sulphate was administered over a period of 20 minutes [13]. Both the above mentioned studies concluded that after treatment with intravenous magnesium sulphate there is improvement in the lung function of the affect patients. There were no reports of the adverse drug reaction. Patients in the previous studies were classified as having moderate and severe asthma. Single dose over a period of 25–30 mins were administered to the patients.

The main concern during the intravenous administration of magnesium sulphate is the instability of the hemodynamic values; the main concern is the hypotension [14]. However none of the patients included in the present study did experience such hypotension. However when the patient becomes hypotensive the dose of 40 mg/kg was infused in the

period of 1 hour. However, it is still faster than what is recommended in the package insert and in the paediatric and neonatal dosage handbook for general intravenous magnesium sulphate administration.

Monitoring of the intravenous magnesium sulphate and the related practised in various medical institutions did varied. Further studies are required to determine the regimen of the dose of intravenous magnesium sulphate for the paediatric patients.

**Conflicts of Interest:** None declared

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