

## COMPARATIVE EFFICACY OF INTRAVENOUS METHYLPREDNISOLONE VERSUS INTRAVENOUS HYDROCORTISONE IN ACUTE SEVERE ASTHMA

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### ABSTRACT

**Objective:** To compare the efficacy of intravenous methylprednisolone versus intravenous hydrocortisone in acute severe asthma

**Study Design:** It was a quasi-experimental interventional study, conducted on 60 patients of acute severe asthma, presenting to the emergency department of MH Rawalpindi.

**Place and Duration of Study:** Military Hospital Rawalpindi from Jan 2001 to Dec 2002.

**Patients and Methods:** Patients fulfilling the criteria were divided into two groups of 30 patients each by convenience sampling. Group-I received intravenous methylprednisolone sodium succinate 125 mg as a single dose within half an hour of admission while group-2 received intravenous hydrocortisone 200 mg bolus followed by three doses of 100mg at six hours interval for next 24 hours. In addition, both the groups received nebulized salbutamol 2.5 mg diluted with 5 ml of distilled water at an interval of 30 minutes for first hour then 4 hourly along with oxygen at a rate 4-5 liters /minutes. Pulse rate and peak expiratory flow rate (PEFR: best of three attempts) were recorded on admission and subsequently at interval of six, twelve, eighteen and twenty-four hours of admission. Significant improvement in pulse rate was defined as its fall below 100 per minute and that of PEFR as its rise above 65% of predicted.

**Results:** Out of sixty patients, 41 were males and 19 were females. Their mean age was 38 years (range 19-50 years). Significant improvements in pulse rate and PEFR were noted at interval of 24 hours in both groups, and this improvement was more marked in group-2. Target reduction (< 100/minute) in mean pulse rate was seen in 70% of patients in group-2 versus 26.7% in group-1. Target mean PEFR (> 65% of predicted) was achieved in 86.7% (group-2) and 40% (group-1). The differences of mean pulse rate and PEFR at 24 hours were statistically significant.

**Conclusion:** Intravenous hydrocortisone is more effective than intravenous methylprednisolone, at the dosages selected, in setting of acute severe asthma.

**Keywords:** Methylprednisolone; Hydrocortisone; Asthma; acute severe asthma

### INTRODUCTION

Bronchial asthma affects more than 5 percent of the population in industrialized countries [1] and severity of asthma is rising due to air pollution [2] and diesel exhaust [3]. The main causes of the fatal asthma attack are respiratory tract infections [4], fatigue of respiratory muscles and stress [5]. The morbidity and mortality of acute severe asthma can be improved in intensive care unit (ICU) settings [6]. Every patient with acute asthma should be treated with nebulized salbutamol as 1st line treatment in addition to systemic anti-inflammatory therapy and oxygen inhalation [7]. The prompt use of steroids in the emergency treatment of acute

severe asthma can significantly prevent morbidity; reduce the number of subsequent hospitalizations [8] and can cut the health care cost substantially [9]. Though the effects of steroids in acute asthma are not immediate but its use within first hour of reporting in emergency department reduces the need for hospital admission especially for patients in whom initial bronchodilator therapy fails to produce an adequate response [10]. Efficacy of steroids is not influenced by route of administration whether orally or intravenous [11]. Studies conducted in the west on adult asthmatic patients have produced conflicting results regarding efficacy of methylprednisolone and hydrocortisone in acute severe asthma. Parenteral use of

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methylprednisolone has been preferred over hydrocortisone because of more potent anti-inflammatory properties and for being less expensive [12]. It also has been considered better than other steroids for having a longer half-life and thus may maintain sustained therapeutic levels in the blood [13].

### Objective

To compare the efficacy of intravenous methylprednisolone versus intravenous hydrocortisone in early management of acute severe asthma

### Study Design

This was quasi-experimental interventional study.

## PATIENTS AND METHODS

Sixty patients admitted in respiratory unit of Military Hospital Rawalpindi (from Jan 2001–Dec 2002) were recruited in this study after formal approval of hospital ethics committee. Previously diagnosed cases of bronchial asthma, between age of 19-50 years, presenting with acute severe episode with the parameters of pulse more than 120/min and PEFr <50 % of predicted value were included in the study. Patients with immune deficiency states, critical illness, pregnant females, those having other lung diseases, and those receiving systemic steroids were excluded from the study. Patients fulfilling the criteria were divided into two groups (group 1 and group-2) by convenience sampling. Informed consent was obtained on a consent form. Group-1 received intravenous methylprednisolone sodium succinate 125 mg as a single dose within half an hour of admission, nebulized salbutamol 2.5 mg diluted with 5 ml of distilled water at an interval of 30 minutes for first hour then 4 hourly and oxygen at a rate of 4-5 liters per minute. Group-2 received intravenous hydrocortisone 200 mg as a bolus, then 100mg x 6 hourly for 24 hours (3 doses), nebulization with salbutamol 2.5 mg diluted with 5 ml of

distilled water at an interval of 30 minutes for first hour then 4 hourly and high flow oxygen. In addition to the baseline assessment including detailed examination of respiratory system and cardiovascular system, observations were recorded for 24 hours on a predesigned performa. In order to determine the efficacy of treatment in two group, two parameters like pulse rate and PEFr were assessed in the form of reduction in pulse rate and the increase in peak expiratory flow rate at the interval of six, twelve, eighteen and twenty four hours, since the time of administration of drugs. Condition at 24 hours was documented. A mini Wright Peak Flow meter (by Clement Clarke international Ltd. London) was used for peak flow rate measurements.

The targets were defined as fall of pulse rate below 100 and improvement in percent PEFr above 65% of predicted value.

The data was recorded on SPSS version 10. Descriptive statistics were used to calculate mean pulse rate and mean percent predicted PEFr in relation to time in both the groups. Independent samples "t" test was used to test the significance of difference between the means, while categorical variables were compared by using chi-square test.

## RESULTS

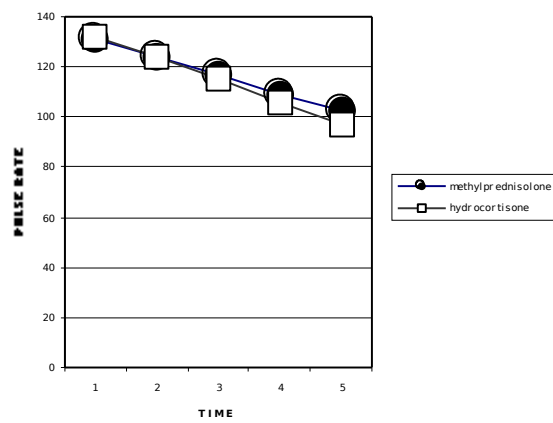
Out of 60 patients 41(68.3 %) were male and 19(31.7%) were female. Age ranges between 19 to 50 years (mean age- 38 years). Mean pulse rates of patients in group 1 and group 2 at 0hrs (base line), 6hrs, 12hrs, 18hrs and 24 hrs are given in figure 1. Significant reduction was found only at 24hrs in group-2 ( $p < 0.005$ ) (Fig. 2). Target pulse rate (< 100 /minute) was achieved by 70% of the patients in the hydrocortisone group while only 26.7% of patients achieved target pulse rate in methylprednisolone group. There was

## Efficacy of Intravenous Methylprednisolone

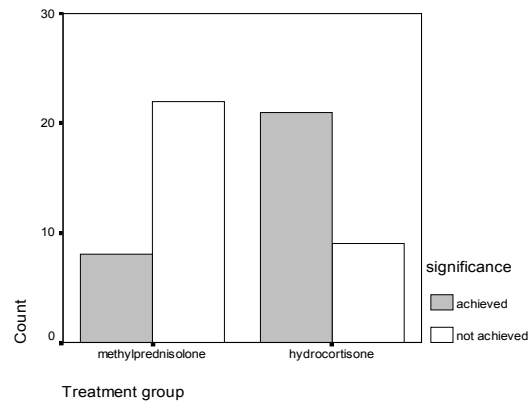
statistically significant difference between the two groups. Target improvement in mean percent predicted peak expiratory flow rate (> 65% of predicted) was achieved by 86.7% of the patients in the hydrocortisone group while 13.3% did not show significant improvement (Figure.3). In the methylprednisolone group 40% of the patients achieved significant level of improvement in percent predicted PEFR. The differences of mean PEFR at 24 hours between the two groups was statistically significant.

## DISCUSSION

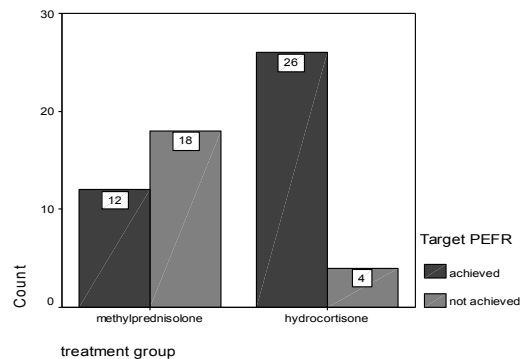
Systemic steroid has been a primary therapeutic approach for acute severe asthma in emergency room settings and its early use reduces hospital admissions compared with placebo in the emergency department [14]. This also has been proved that systemic steroids reduce relapse rate at 7-10 days and hospital admissions within 7 days. In a subsequent study it was found that parenteral steroids reduce hospital admission rate compared with placebo [15]. The preference of hydrocortisone over methylprednisolone for treatment of acute asthma has been a subject of considerable debate in the recent past. The efficacy of both drugs was compared by use of pulse rate [16] and PEFR as parameters of severity. Early improvement to these criteria is an important predictor of outcome.



**Fig ure1. Showing reduction in mean Pulse rates overtime in the two treatment groups (n=60)**



**Figure2. Showing significant reduction in pulse rates (Target achieved) (n=60)**



**Figure3. Showing significant reduction in %PEFR (Target achieved) (n=60)**

This study demonstrates that initial treatment with hydrocortisone in selected dosages results in more bronchodilatation by decreasing the mucosal adema than methylprednisolone in acute severe asthma. The increase in airflow as measured by increase in predicted PEFR showed an improvement over base line when hydrocortisone group is compared with the methylprednisolone group.

Despite a slightly higher mean base line pulse rate, mean values of pulse rate at the intervals of six, twelve, eighteen and twenty-four hours showed lower values for the hydrocortisone group compared with methylprednisolone group.

Liny et al. studied a group of asthmatic patients who were given intravenous methylprednisolone and he observed significant improvement in percent-predicted PEFR at 1 and 2 hours [17]. In my study similar results were noticed at 6, 12, 18 and 24 hrs.

Rodriqo and Rodriqo studied a group of asthmatic patients with percent predicted PEFR <50 % who were administered intravenous Hydrocortisone double the dosage given in my study [18] but there was no significant improvement in percent PEFR at 6 hrs but in my study there was marginal improvement in percent predicted PEFR at 6 hrs.

Hall et al. 1995, made similar observations in their comparative study that patients with more severe airflow obstruction had a greater benefit from the intravenous hydrocortisone [19]. They have conducted similar nature of study but they used only PEFR as a clinical parameter of measurement to judge the efficacy of drugs. Dosages used were double than my study to have maximum therapeutic response. The therapeutic response achieved by methylprednisolone was maximum at 23rd hours whereas hydrocortisone showed its effects at 19th hours, similar observation was made in my study.

## CONCLUSION

We conclude that, at the dosages selected, intravenous hydrocortisone is more effective than intravenous methylprednisolone during first twenty four hours of emergency treatment of acute severe asthma.

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