



A COMPARATIVE STUDY OF USAGE OF FUROSEMIDE INFUSION IN CHILDREN WITH DENGUE FEVER WITH HYPOXEMIA AT A TERTIARY CARE CENTRE AT HYDERABAD, INDIA

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ABSTRACT

Objectives: To study the role of furosemide infusion and outcome in the management of hypoxemia in children with dengue fever 48 hours after the onset of critical phase.

Methods: Children between the ages of 1 month to 18 years, who are positive for NS1 antigen assay by ELISA and developed signs and symptoms of hypoxemia were evaluated and included in the study. Patients were studied as group A (receiving diuretic therapy) compared to a group B (treated with only oxygen). Furosemide infusion was administered at 0.05-0.1 mg/kg/hour for 48 hours, maintaining a urine output of 3-5 mL/kg/hour.

Results: Significant difference was noted for duration of requirement of oxygen therapy and the number of days of hospitalization among the two groups ($p=0.03$).

Conclusion: Diuretic infusion improves outcome with fast recovery and less duration of hospital stay in children with dengue with hypoxemia.

KEYWORDS : Hypoxemia, Dengue, Diuretics, Outcome

INTRODUCTION

The dengue virus is a flavivirus having four distinct serotypes; DEN-1, DEN-2, DEN-3 and DEN-4. The incidence of disease and its severity varies between primary and secondary infections and possibly also across different dengue virus serotypes [1]. The clinical presentation of dengue fever varies from simple febrile illness to dengue hemorrhagic fever and dengue shock syndrome which may sometime lead to death. Pleural effusion is one of the respiratory complications. Determination of the nature and clinical course of pleural effusion is important. Severe Dengue with massive pleural effusion and hypoxemia constitute important causes of death in those infected with the dengue virus. The mortality rate with severe forms of dengue infection may approach 47% [2].

The World Health Organization (WHO) guidelines [3] and National guidelines by Government of India [4] offer a useful approach to immediate fluid resuscitation in various stages of the disease. Kabra, *et al.* [5] and Soni, *et al.* [6] have described difficulties in fluid management in children in the Indian context.

Diagnosis is largely clinical and is supported by serology and identification of viral material in blood. No specific methods are available to predict outcome and progression. Careful fluid management and supportive therapy is the mainstay of management. Pleural effusion is one of the complications of dengue fever resulting from the plasma leakage into the pleural cavity. In dengue fever it is one of the severity markers and is of exudative type. It can be detected clinically and can be confirmed radiologically through ultrasound. The objective of the present study is to study the role of furosemide infusion and outcome in the management of hypoxemia in children due to pleural effusion and ascites with dengue fever 48 hours after the onset of critical phase.

METHODS

This comparative study was conducted in Paramitha children hospital, a tertiary care pediatric referral centre at Hyderabad with a 20 bedded pediatric intensive care unit (PICU). Ethical clearance from the Institution's ethical committee was obtained to conduct this study. Participants included children of either gender between the ages of 1 month to 18 years, who are positive for NS1 antigen assay by ELISA, admitted between June 2019 to September 2019 and having signs and symptoms of hypoxemia after 48 hours of critical phase were

evaluated and included in the study. Ultrasonography was used for quantifying the pleural effusion and ascites for all of them then they are randomly assigned into either of the two groups after shifting into PICU as group A (receiving diuretic therapy along with oxygen) compared to a group B (treated with only oxygen). ABG analysis was done and started on oxygen therapy with titrating IV fluids with continuous BP, SPO₂ and urine output monitoring. Furosemide infusion was administered for those in group A at 0.05-0.1 mg/kg/hour for 24 to 48 hours titrating to maintain a urine output of 3-5 mL/kg/hour. Those requiring inotropic support and complicating as HLH (Haemophagocytic syndrome) were excluded from the study. Duration of requirement of oxygen therapy and total duration of stay in hospital were compared among both the groups. Chi-square test was used to compare and p value less than 0.05 was considered significant.

RESULTS

Of the 2550 children admitted with dengue fever, 320 developed signs and symptoms of hypoxia and confirmed by ABG analysis, accounting for an incidence of 12.5%. All the children were even positive for dengue IgM. Each group consist of 150 children with 20 of them excluded from the study (Table 1 and 2). The mean time of onset of hypoxemia from the first symptom was 7 days. Females were most commonly affected gender group developing severe symptoms. The mean age of children developing hypoxemia due to massive pleural effusions was 8 years but there is a biphasic mode of involvement with peak age groups of 1 to 5 years and 10 to 15 years. The mean duration of oxygen requirement was for 2 days in group A and 4 days in group B. The duration of stay in hospital was for 6 days in group A while it is 10 days for group B. Chi-square test analysis was applied for the results. The role of outcome with usage of furosemide is significantly beneficial with a P value of 0.03.

DISCUSSION

The present study demonstrated the advantage of usage of furosemide infusion in children with severe dengue infection complicating as massive pleural effusion and developing hypoxemia. A significant decrease in duration of supplemental oxygen requirement and total duration of stay in hospital was noted following furosemide infusion, thus demonstrating an improvement in overall clinical outcome. Dey *et al* [7] suggests for usage of furosemide only for those children with fluid overload but in this study furosemide was

used for group A with signs and symptoms of hypoxemia and ultrasound quantified pleural effusion and ascites.

Our results are similar to the report by Ranjit, *et al.* [8] who demonstrated the efficacy of fluid removal using diuretics or dialysis in children with dengue fever. Reddy, *et al.* [9] reported in their study about the benefit of using furosemide for children developing ARDS and getting ventilated. In a study performed by Balasubramanian *et al.*, ultrasonography was found to be superior to radiography in detecting pleural effusion [10]. Ultrasonography monitoring was used in this study also. The efficacy of furosemide infusion with respect to changes in the arterial blood gas demonstrates its role in respiratory function. It is known that in the recovery phase of dengue fever, there is reabsorption of fluid from the extra vascular compartment. In these patients, diuretics should be tried, which could improve oxygenation and avoid the need for mechanical ventilation. Early intervention can help improve case management and optimise the use of resources such as hospital staff, beds, and intensive care equipment.

CONCLUSION

Furosemide infusion improves survival in the management of severe Dengue fever with hypoxemia, with significant improvement in oxygenation and decrease in need for ventilation and duration of hospitalization.

Limitations:

This study was limited due to the insufficient data as we did not consider factors regarding associated confounding factors such as different caregivers and a different support structure.

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Conflicts of interests: None stated.

What This Study Adds: Furosemide infusion improves survival in the management of severe Dengue fever with hypoxemia, with significant improvement in oxygenation and decrease in need for ventilation and duration of hospitalization.

TABLES

Table 1. Baseline characteristics of study population.

Total children admitted with dengue in hospital	2550
Total children shifted to PICU	320
Total study population	300
Mean age group	8
Most severe affected gender	Female
Peak age groups affected	(1 to 5 and 10 to 15)

Table 2. Comparative observations in the study

	Oxygen	Total Stay	P = 0.03
GROUP A	2 DAYS	6 DAYS	
GROUP B	4 DAYS	10 DAYS	

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