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Original Article

Outcome of HFNC Oxygen Therapy in Infants and Children Presenting in PICU with Acute Respiratory Distress

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ABSTRACT

High flow nasal cannula is an emerging treatment option in paediatric intensive care units for paediatric patients In acute respiratory distress. Yet there is a paucity of literature describing its clinical application in various presenting pathophysiology. It can avoid invasive method of mechanical ventilation and offers a safe practical approach to oxygen delivery and support. Aim is to describe 9 cases with acute respiratory distress with differing underlying pathophysiology and their response to high flow nasal Cannula oxygen therapy. Patients admitted in PICU with acute respiratory distress with acute encephalitis, congenital heart disease, laryngomalacia etc and treated with HFNC oxygen therapy were chosen to review. 4 infants and 6 children were reviewed. All were commenced on high flow nasal cannula therapy in PICU and all demonstrated an improvement in their work of breathing. 2 patients were referred to higher Centre in view of CHD with improvement on HFNO. There was also a substantial improvement in their haemodynamic status. HFNO Therapy is an viable treatment option for a range of patients presenting to PICU With acute respiratory distress. More invasive method of respiratory support may be avoided by use of HFNC oxygen therapy.

Key Words: *High flow nasal cannula, acute respiratory distress, PICU, interfacility transfer, Congenital heart disease*

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INTRODUCTION

Respiratory illness is the leading cause of admissions of infants and children[1]. Bronchiolitis, pneumonia, asthma comprise the majority of non-elective admissions in PICU due to respiratory insufficiency or acute respiratory failure[2]. For many of these patients, management with mechanical ventilation is well-established and often lifesaving.More recently many have been managed non-invasively using continuous positive airway pressure to avoid intubation[3]. Mechanical ventilation can include complications such as ventilation, associated pneumonia, ventilator induced lung injury, airway injury[4]. Among cardiac patients, mechanical ventilation can further comprise left ventricular function, especially in presence of cardiac failure[5,6]. Heated and humidified high flow nasal cannula oxygen therapy is an emerging treatment option for respiratory support[7]. It draws gas, heats it up to 37°C with 100% relative humidity and allows delivery of inspired gas up to 60 L/min[8]. It washes out CO2 in or oropharyngeal dead space and enriches with oxygen, resulting in better oxygenation and ventilation[9,10]. It decreases dead space from upper airway and decreases CO2 rebreathing[11]. It helps in keeping the airways open and preventing alveoli from collapsing by maintaining functional residual capacity of lungs and helps in conditioning of inspired gases which improves mucociliary clearance and decreases airway resistance[12].

MATERIALS AND METHODS

Study design – Prospective observational study
Place of study – Paediatric ICU, PVPGH Sangli
Sample size – 9
Material – High flow nasal cannula oxygen therapy unit
Inclusion criterion – children of age 1month to 10 yrs presenting in PICU with increased respiratory efforts
Exclusion criterion – craniofacial malformation, ENT surgeries, GCS <6, <1month, >10yrs

RESULTS AND DISCUSSION

Results

Four infants and five children were reviewed. All were commenced on high flow nasal cannula therapy in PICU and all demonstrated an improvement in their work of breathing. One patient was referred to higher centre in view of congenital heart disease with improvement on HFNO. There was also a substantial improvement in their haemodynamic status.

CASE	AGE	SEX	DIAGNOIS	At initiation of HFNO HR	RR	After 2 hrs of HFNO HR	RR	OUTCOME	
1	6yrs	F	Lobar pneumonia	120	52	92	44	Discharged	
2	9 mnt	M	Severe Bronchopneumonia	140	58	134	50	Discharged	
3	3 yrs	F	Severe Bronchopneumonia in k/c/o CHD	176	72	160	64	Referred to higher centre	
4	1 mnt	M	Severe Bronchopneumonia with Grade -1 Laryngomalacia	166	68	152	50	Discharged	

Figure: 1

CASE	AGE	SEX	Diagnosis	At start of HFNO HR	RR	At 2 hrs after HFNO HR	RR	Outcome	
5	5 yrs	M	Acute encephalitis with severe Bronchopneumonia	134	62	112	48	Discharged	
6	8yrs	F	Acute encephalitis with DKA with Severe Bronchopneumonia	128	54	136	56	Succumbed	
7	4 mnt	F	Lobar pneumonia	164	74	122	48	Discharged	
8	1yr	F	Bronchopneumonia	122	60	108	36	Discharged	
9	5 mnt	M	Bronchopneumonia	172	76	164	66	Referred to higher	

Figure: 2

DISCUSSION

In all cases mentioned above HFNC oxygen therapy was implemented within one hour of PICU admission. Flow and Fio2 was set according to weight of the child. Proper monitoring of patients was required after implementation. Out of nine patients on HFNC, eight responded well to HFNC therapy and only one patient required mechanical ventilation. Two patients with k/c/o CHD were referred to higher centre for further cardiac management after improvement in work of breathing .Responder shows improvement in heart rate, respiratory rate, work of breathing, gas exchange and decrease in FIO2 within 60 to 120 minutes of implementation .Oral nutrition was well tolerated on HFNC

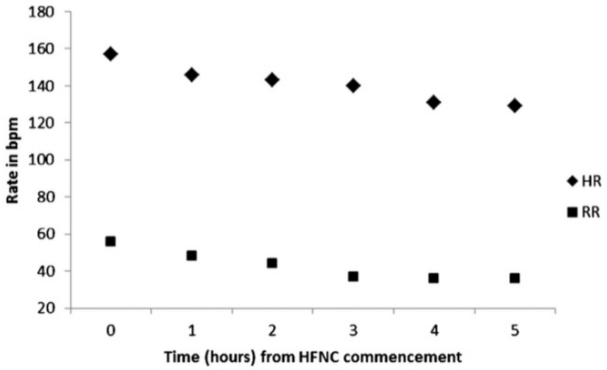

Figure: 3

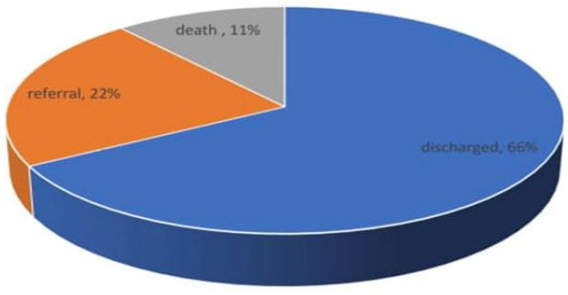

Figure: 4

CONCLUSION

HFNO Therapy is a viable treatment option for a range of patients presenting to PICU with acute respiratory distress. More invasive method of respiratory support maybe avoided by use of HFNC oxygen therapy. This case series highlights a range of conditions in paediatric patients where HFNC oxygen therapy may be beneficial. It is an effective and emerging treatment option for cases with severe bronchopneumonia, acute respiratory insufficiency with congenital heart disease, in operated case of congenital heart disease, for interfacility transfer and it may prevent invasive ventilation. HFNC oxygen therapy is less invasive and more intensive preferred method of oxygenation in PICU

Conflicts of Interest: The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

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