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MECHANICAL VENTILATION IN NEONATES

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ABSTRACT

OBJECTIVES: *To analyse the indications, complications and outcome of babies requiring mechanical ventilation* ***STUDY DESIGN:*** *Prospective study done at Basaveshwar and sangameshwar hospital attached to M.R medical college, gulbarga.* ***METHODS****: 132 Neonates ventilated in NICU from Dec 2009-may 2011 are included in this study.* ***INCLUSION CRITERIA****: Birth asphyxia, hyaline membrane disease, septicaemia, meconium aspiration syndrome and neonatal pneumonia* ***RESULTS****: Among 132 ventilated neonates birth asphyxia 80 (41.60%) was the commonest indication followed by hyaline membrane disease 53(28.7%), septicaemia 28(14.39%), and meconium aspiration syndrome 23(13.6 %) and 2 cases of neonatal pneumonia. Out of them improved and discharged were 63, and deaths were 60, total survival rate is 47.8%.*

KEY WORDS

Ventilation; Neonates; Hyaline membrane disease; Birth asphyxia; Meconium aspiration syndrome; Septicemia; Neonatal pneumonia.

INTRODUCTION

Mechanical ventilation is the corner stone of present day pediatric intensive care. In the recent years this modality has evolved into a highly specialized discipline. From the iron lungs used in the past primarily to treat respiratory paralysis in poliomyelitis, modern day ventilator have evolved into microprocessor based sophisticated devices capable of a large number of functions with many modes and alarms to make them as physiological and safe as possible for the patients.

Assisted ventilation may be defined as the movement of gas into and out of the lung by an external source connected directly to the patient. Attachment to the patient can be by way of a facemask, a head box, an endotracheal tube, nasal prongs, a tracheostomy or a negative pressure apparatus surrounding the thorax.

Mechanical ventilation was started in the west in early 60's and became widely accepted in 70's and 80's. In India, mechanical ventilation was started in early 80's. It is still in its infancy but is a fast developing area, especially in the last few years as evidenced by increasing number of literature. The results reported by the few centers across the country are promising.

AIMS AND OBJECTIVES OF THE STUDY

Ventilatory therapy in the neonatal period is in its infancy in India but a fast developing one. In

our study we would like to prospectively evaluate neonatal ventilation its indications, short term survival and complications in various disease states. We also like to look at the influence of gestational age and weight on immediate outcome of neonatal ventilation.

1. To study the various indications for neonatal ventilation.
2.To study the immediate outcome of neonatal ventilation in various disease states.

MATERIALS AND METHODS

This was a prospective observational study conducted on 132 consecutive neonates admitted in neonatal intensive care units of Basaveshwar and Sangameshwar Teaching & General Hospitals, attached to M.R. Medical College, Gulbarga between December 2009 to May 2011 who required ventilatory therapy. During admission, the details of antenatal, natal and postnatal history, the birth weight, gestational age, type of delivery, APGAR score, onset of respiratory distress, distress scoring and other details were recorded in a predefined proforma. On the basis of this Diagnosis was made with the help of clinical, laboratory and/ or radiological criteria. Intermittent positive pressure ventilation was initiated on babies who satisfy the inclusion and exclusion criterias. Time cycle, pressure limited, continous flow ventilator was used and the initial settings varied with the underlying disease and arterial blood gas analysis. The aim was to use minimum possible pressure and FiO2 to maintain normal blood gases.

Babies were nursed under servo control open care system. Arterial blood gas (ABG) was done whenever indicated. Continuous non-invasive oxygen saturation monitoring was done. Babies were managed according to the unit protocol. All babies were monitored for any complications like air leak, congestive cardiac failure; patent ductus arterioses etc. chest physiotherapy was given during and after ventilation. Babies were weaned of the ventilator if they showed clinical, radiological and blood gas improvement with bare minimum ventilatory support. Steroid was started 24 hours before expected extubation time. After extubation the child was placed under oxygen hood until indicated.

The endpoint of the study was

1) Hemodynamically stable neonate accepting feeds.
2) Fit to be shifted out of NICU.
3) When the baby succumbs during ventilatory care.

Inclusion Criteria:

This study was done on sick neonates, admitted in NICU of Basaveshwar and Sangameshwar Teaching & General Hospitals, attached to M.R.Medical College, Gulbarga from December 2009 to May 2011 whether inborn or outborn, having signs and symptoms of:

1. Hyaline membrane disease (HMD)
2. Meconium aspiration syndrome (MAS)
3. Birth asphyxia (BA)
4. Septicemia
5. Neonatal pneumonia (NP)

Exclusion Criteria

1. Surgical cases like tracheo oesophageal, fistula, congenital, diaphragmatic hernia, etc.
2. Necrotizing enterocolitis
3. Kernicterus
4. Congenital heart disease
5. Persistent pulmonary hypertension of newborn
6. Patients unwilling to give informed consent.

Ethics: Ethical clearance is obtained from the ethical committee of the institution.

Statistical Analysis: Statistical analysis was done by SPSS 11.5 version Software and non-test of χ^2 (chi-square) has been applied for significance test.

RESULTS

Table-1: Survival rate in relation to sex, weight and gestational age

Parameters	Total	Survived		Expired	
		No.	Percent	No.	Percent
Sex					
Male	92	47	51.08	45	48.92
Female	40	16	40.00	24	60.00
Weight (kg)					
<1	3	2	66.7	1	33.3
1-1.5	24	7	29.16	17	70.84
1.5-2.0	21	9	42.85	12	57.15
2.0-2.5	28	13	46.42	15	53.58
>2.5	56	32	57.14	24	42.86
Gestational age(weeks)					
<28	13	7	53.8	6	46.2
29-32	19	8	42.1	11	57.9
33-36	27	12	44.44	15	55.56
>37	73	36	49.31	37	50.69

Male babies had a better survival rate 51.08% as compared to females (40%). In the table showing survival rate in relation to weight, 3 babies were less than 1 Kg, out of which 2 survived. Babies between 1-1.5 Kg, 1.5-2 kg, 2-2.5 Kg and more than >2.5 kg, the survival rate was 29.16%, 42.85%, 46.42% and 57.14% respectively.

The gestational age wise, survival was 53.8% for <28 weeks, 42.1% for 28-32 weeks, 44.4% for 32-36 weeks and 49.31% for >36 weeks. Owing to very less number of cases, in <1 Kg and <28 weeks category, otherwise survival rate improved proportionally with increasing birth weight and gestational age.

Table-2: Relationship between place of birth and survival

Parameters	Total		Improved		Expired	
	No.	%	No.	%	No.	%
In born	49	37.12	25	51.0	24	49.0
Out-born	83	62.83	38	45.78	45	54.22

37.12% of babies were born in our institution and 62.83% of babies were referred to us. Survival rate was better in inborn cases (51%) as compared to 45.78% in out-born babies.

Figure-1: Relationship between place of birth and survival

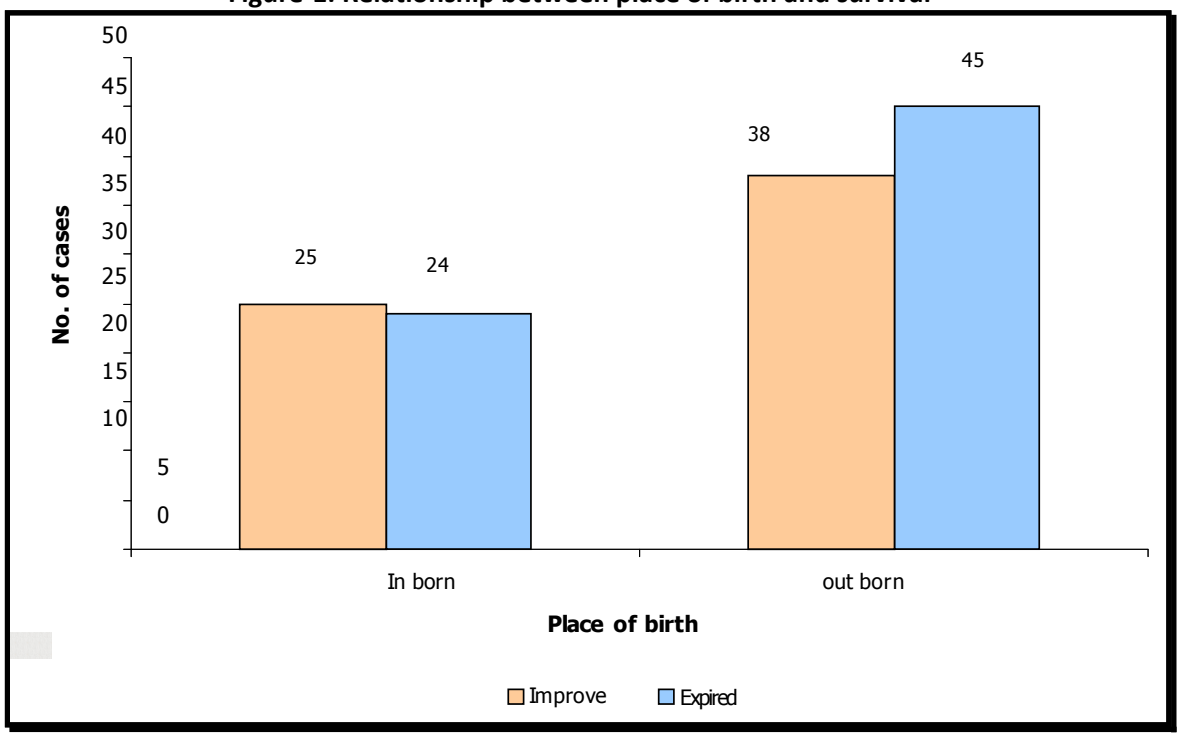
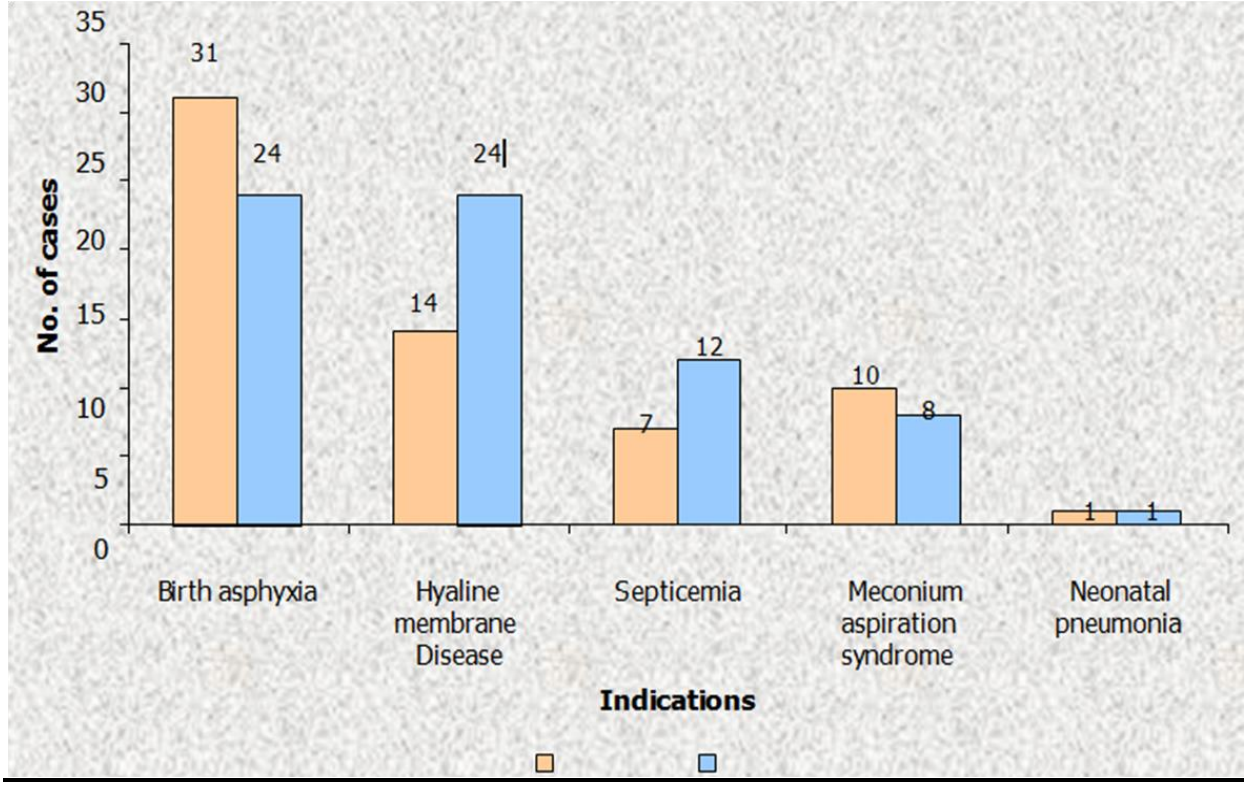


Table-3: Survival rate by indication

Indication	Total		Survived		Expired	
	No.	%	No.	%	No.	%
Birth asphyxia	55	41.6	31	56.36	24	43.63
Hyaline membrane disease	38	28.78	14	36.84	24	63.16
Septicemia	19	14.39	7	36.84	12	63.12
Meconium aspiration syndrome	19	13.6	10	55.55	8	44.46
Neonatal pneumonia	2	1.5	1	50	1	50

Out of the 55 ventilated babies with birth asphyxia, 56.36% survived HMD and septicemia constituted 36.84%, MAS 55.55% and NP 50%. Birth asphyxia has the best survival rate with 56.36%, followed by MAS (55.55%) and neonatal pneumonia (50%). HMD and septicemia have comparatively poor outcome with both accounting for 36.84%.

Figure-2: Survival rate by indication



DISCUSSION

The use of mechanical ventilation in neonates has resulted in improved survival, in many nurseries, of the developed world in last three decades. Prolonged mechanical ventilation of the newborn infant was first described by Donald and Lord[1]. Since then Mechanical ventilation of the neonate has been used widely and has become a routine procedure in NICU in western world. Current survival rates reported from well developed NICUs in USA are 95-97%.[2] in babies more than 1000 gm with almost 80-90% infant survivals. The Indian scenario is comparable with reports from the developed countries in 1980s.[3]

In our 18 months study, out of 1584 admissions in the NICU, 168 babies (10.6%) were given assisted ventilation. 24 babies were excluded from the study according to the exclusion criteria and 12 babies were withdrawn from support on request of the parents citing personal reasons and excluded from the study. This is comparable with the study done by S.Nangia et al[4] (9.3%).

The Drager and SLE, time cycled, pressure limited, continuous flow infant ventilators with varying peak inspiratory pressure (PIP), positive end expiratory pressure (PEEP), flow rates, inspiratory time and FiO_2 were used in all babies.

The sex distribution in our study was 69.69% (92/132) males and 30.31% females. In a study reported by Trotman et al, 55% babies were males and 45% were females.

Indications

The commonest indication for mechanical ventilation in our study was birth asphyxia (41.6%), followed by hyaline membrane disease (28.78%), whereas those reported in other studies by S.Nangia[4], M.Singh[5],

M.C.Mathur[6], L.Richard[7] and Maiyya PP[8] are HMD followed by apnoea of prematurity and birth asphyxia.

In a study conducted by Ruchi Rai et al[9], sepsis (41%) was the commonest indication followed by meconium aspiration syndrome (21%).

In L.Krishnan[10] series the commonest indication is septicemia followed by hyaline membrane disease (23%), birth asphyxia (16%) and apnoea (15%). Septicemia constituted (14.39%) in our study. Many of the cases had more than one indication (34/132), which is also reported by few others.[4,8]

The indications in the present study can be compared with that of the study done by Riyas et al[11] (birth asphyxia – 37.25%, hyaline membrane disease –31.37%, septicemia – 14.7%).

CONCLUSION

Neonatal mechanical ventilation had a definite impact on the survival of sick neonates. Our study done on 132 neonates admitted to NICU, who required mechanical ventilation over a period of 18 months is comparable with various reports across the country. The commonest indication was birth asphyxia, followed by HMD whereas those reported in other studies are HMD followed by APNEA of prematurely and then birth asphyxia. 132 consecutive neonates who required mechanical ventilation to NICU, of Department of Pediatrics, M.R. Medical College, Gulbarga formed the study group. 62.83% of babies were outborn and 37.12% inborn. Survival rate was better in the inborn group (51%) compared to 45.78% in out born group. Males constituted 69.69% and females 30.31%. Males had a better survival rate (51.08%) by compared to females 40%.

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