A Study Of Risk Factors and Outcome in The Ventilated Neonates

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Abstract: Background: Present study is taken to know the predictors and outcome of the ventilated babies. Methods and Material: This study was conducted at department of pediatrics at Rural Tertiary Care NICU from 1st january 2014 to june 2015. Study population were 50 neonates (31 were male and 19 were female) admitted in neonatal icu and required ventilator support during nicu stay. Variables selected were, age of neonates at the time of admission, sex, gestational age at the time of birth, underlying medical conditions, birth weight, mode of delivery and these variables were compared with outcome. We observed that preterm neonates, LBW (< 2.5 kg) neonates had higher mortality rate. Results: Maternal factors like gravida status , PROM, liquor, mode of delivery did not affect the outcome of ventilated neonates. Those who had taken antenatal care visits had better outcome. Meconium aspiration syndrome with birth asphyxia and pneumonia had 100 % survival rate. The commonest indication of ventilation was hyaline membrane disease. The results were statistically analysed. Conclusions: HMD was the common indication in preterm neonates followed by birth asphyxia which was commonest indication of ventilation in full term neonates with survival rate of 87.5% followed by meconium aspiration syndrome ,pneumonia & PPHN. Meconium aspiration syndrome with birth asphyxia and pneumonia had 100 % survival rate.[Parmar A Natl J Integr Res Med, 2019; 10(5):49-52]

Key Words: Assisted ventilation, LBW, HMD, Mortality rate Newborns

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Introduction Mechanical assisted ventilation in the neonates is being frequently used for management of respiratory failure. Assisted ventilation is defined as the movement of gas into and out of the lung by an external source connected directly to the patient. In the neonate, assisted ventilation is a modality for supporting pulmonary function until the patient can breathe adequately without help. The purpose of all mechanical ventilation devices is to facilitate alveolar ventilation and carbon dioxide removal, provide adequate tissue oxygenation, and reduce the work of breathing. Respiratory problems is the commonest cause of neonatal mortality requiring intensive care.

Liu etal 2014[1] reports that Globally under 5 mortality was 6.3 million in 2013, 44% (2.8 million) of which, died in the neonatal period, (the first 4 weeks of life). Data shows greater fall in under 5 mortality than NMR. Wang et al 2014 [2] suggests further improvement in NMR. The annual reduction rate (ARR) of global NMR of 1.3% in (1990- 2000) has increased to 2.7% in (2000-12). Lown J E 2014[3] mentions that there is a wide variation in the percentage of NMR amongst various countries though there is no doubt that in the wake of the action for the Millennium Development Goals, neonatal survival has improved significantly. Lawn J E 2014[3] says though Africa tops the list of neonatal mortality rates but taking population into account population, NMR of India is very high and it tops the over all number of neonatal deaths. Zodpey S, Paul VK[4] in their article State of India'a newborn have highlighted the slow reduction in NMR compared to that of countries like China, Bangladesh and Ethiopia during 2000 to 2014.

As per the Sample Registration System (SRS) 2011 report of Registrar General of India, the present Infant Mortality Rate of our country is 44 per 1000 live births as against targeted Millennium Development Goals-4 of 27/1000 live births which has to be achieved by 2015. According to Kushwaha A.S 2011[7] neonatal mortality constitutes nearly about two thirds of infant mortality and over half of all deaths under-5 years of age deaths. They also found a large variations in neonatal deaths between rural and urban[(7)] India. Low birth weight (LBW) contributes three-fourths of neonatal deaths. As per the study of Muthayya Sumithra 2009[8] 30 to 35 % of 1 million births LBW, out of this 6-7% are preterm babies. The common causes of neonatal deaths are prematurity, birth asphyxia, sepsis, birth trauma, congenital anomalies, tetanus. A three tier neonatal care is well known where 80-85% babies need Level-I basic neonatal care. Some 10-15% requires Level-II and 5% needs level III care. Meherban 2009[10] mentions that Stahlman et al described the use of positive pressure ventilation in treating HMD. The first description of providing pressure controlled

ventilation to newborns was made by Donald and Lord.

The term "neonate intensive care unit" sounds the ray of hope for the premature babies, babies facing problems after birth or the baby who is not healthy and remains in the hospital for long. A NICU is a unit that provides high quality skilled care to critically ill neonates by offering facilities for continuous clinical, biochemical and radiological monitoring and use of life support systems with the aim of improving survival of these babies.

The commonest morbidities are hyaline membrane disease, birth asphyxia, sepsis, pneumonia, apnea, congestive heart failure, meconium aspiration and persistent pulmonary hypertension which may require artificial ventilator therapy. Neonatal mechanical ventilation is one of the most important factor contributing to the reduction in neonatal mortality. With improving standards of supportive care, better equipments, experience and confidence in using ventilators, the survival rates have improved. It is not only deaths but outcomes of various other medical conditions require regular follow ups and special high risk clinics. The outcome of ventilated babies is dependent on various factors related to baby's condition, available facilities of equipments and infra structures, man power ratio of nurse & doctor to babies, skills and experience of a care provider .Various studies from India reported survival from 41% to 68% [(11)].

Methods: This study was conducted at Department of Pediatrics at Rural Tertiary Care NICU From 1st January 2014 to June 2015. Study population: All the neonates admitted in neonatal ICU and required ventilator support during NICU stay. Study variables: Age of neonates at the time of admission, sex, gestational age at the time of birth, underlying medical conditions, birth weight, mode of delivery, and outcome will be studied. Analysis of data Multiple regression analysis & univariant analysis will be applied. Necessary institutional ethical clearance and consent from the parents of the new born was obtained.

Inclusion Criteria : All the newborns requiring mechanical ventilation support.

Exclusion Criteria : Those patients who were already ventilated outside and transferred to District General Hospital.

Patients who required ventilation for surgical congenital malformation. Newborns whose parents are not willing to give consent for the study

After selecting the patients a detailed antennal, natal and post natal history of the mother and of the new born was obtained. A detailed medical history of the parents was noted.

Result : The study period was from January 2014 to June 2015. Out of total admission (n= 50) required mechanical ventilation who were enrolled in the study. Result are displayed in follwoing table 1 and 2

Table 1: Correlation of Sex with outcome in mechanically ventilated neonates

Sex	Outcome		Total
	Death	Survive	
Male	4	27	31
	12.9%	87.1%	100.0%
Female	2	17	19
	10.5%	89.5%	100.0%
Total	6	44	50
	12.0%	88.0%	100.0%

Table 2: Correlation of various factors with survival or non survival of mechanically ventilated neonates.

Factors		Out come		P value
		Death	Survive	
Gestational maturity N=50	Full term n=19	2 (10.5%)	17 (89.5%)	
	Preterm	4 (12.9 %)	27 (87.1%)	
Birth weight	<1.5 kg n=22	4 (18.2%)	18 (81.8%)	
	1.5-2.5 kg n=15	0 (0%)	15 (100%)	
	>2.5 kg n=11	2 (15.4%)	11 (84.6%)	
Gravid N=50	Multi (n=26)	3 (11.5%)	23 (88.5)	
	Primi (n=24)	3 (12.5%)	21 (87.5)	0.91

ANC care n =50	Y (n =22)	2 (9.1%)	20 (90.9%)	0.57
	N (n =28)	4 (14.3)	24 (85.7)	
PROM > 4 hrs n =50	Y (n=3)	1 (33.3%)	2 (66.7%)	0.24
	N (n=47)	5 (10.6%)	42 (89.7 %)	
Liquor n = 50	Clear (n=36)	5 (13.9%)	31 (86.1 %)	0.908
	Meconium stained(n=12)	1 (8.3%)	11 (91.7%)	
	Oligohydromnios (n=1)	0 (0%)	1 (100%)	
	Polyhydromnios (n=1)	0 (0%)	1(110%)	
Mode of delivery n =50	LSCS (n= 17)	2 (11.8%)	15 (88.2%)	
	NVD (n=33)	4 (12.1)	29 (87.9%)	

Discussion: Out of 50 mechanically ventilated neonates, 31 were males & 19 were female. Although females had a better survival compared to males, the difference was not statistically significant (p=0.802). A study by Kollef et al,did not find any correlation between Age and sex of the neonates to outcome (p>0.05).[8]

We can see that mortality rate was higher in preterm (12.9%) babies than full term (10.5%) babies. A study by Anantharaj A et al[9], Riyas PK et al[10], Nangia S et al[11] had similar findings[12] as of our study.

Among the ventilated neonates weighing less than 2.5kg had a higher mortality rate 18.2% than the neonates having birth weight >2.5kg. Mathur et al,[13] also observed a high mortality in underweight and preterm babies. Gravida status of mother did not reveal any correlation with the outcome of ventilated neonates.

Mother who had not taken antenatal care had higher mortality rates compared to mothers who had take ANC care . Out of 50 neonates we had ventilated 3 neonates with h/o PROM> 4hrs . Out of 3 ventilated neonate, one had died with mortality rate (33.3%) Mortality was higher with clear liquor 13.9% because majority of neonates were having HMD and birth asphyxia followed by mecoinum stained liquor mortality was 8.3% (1/12) There were 2 neonates ventilated each with maternal h/o oligo and polyhydramnios but not affecting the outcome . Mode of delivery had no correlation with outcome.

In our study out of 50 neonates, the commonest indication of ventilation was hyaline membrane disease (14/50)with a survival rate of 87.5% . MD was the common indication in preterm neonates. In some neonates HMD was associated with other conditions like HMD with birth asphyxia (6/50) with survival rate of 83.3%, HMD with apnea of prematurity (3/50),HMD with meconium aspiration syndrome (1/50),and HMD with PPHN (1/50). Followed by birth asphyxia which was commonest indication of ventilation in full term neonates with survival rate of 87.5% .

Out of 50 neonates, 5 had Birth asphyxia with MAS with PPHN , out of which 1/5 died . Out of 50 neonates one patient had Birth asphyxia with severe PPHN who died. Followed by meconium aspiration syndrome 5/50 with survival rate of 100% and was associated with birth asphyxia. Followed by Pneumonia 4/50 had 100% survival. In a study by Hossain et al[14], had similar 100 percent survival in pneumonia. Study by Nangia S et al[11],

Mathur NC et al[15], Malhotra AK et al [16] showed Hyaline membrane disease, was the commonest indication for ventilation. But a study in south India by Anantharaj A Bhat Vishnu 2011 observed MAS as the commonest indication for ventilation[9].

In a study by Nangia et al[11] one hundred and fifty nine neonates were ventilated over a period of 1 year of which 74 (46.54%) survived. Hyaline membrane disease was the commenest indication followed by birth asphyxia ,apnea of prematurity, meconium aspiration syndrome and persistent pulmonary hypertension of neonates. exclusion criteria have not been mentioned in their study.

Conclusion: Sexes, mode of delivery, time of initiation of breast feeding and cord blood haemoglobin level are not associated with 3rd day hyperbilirubinemia. Oxytocin induction of labour has significant correlation with the development of 3DHB. Cord bilirubin level ≥ 1.75mg/dl and 1st day (20-25h) level≥4.1 mg/dl could predict the development of hyperbilirubinemia(≥14mg/dl) on the third day of life in neonates weighing > 2k.

In a study of 100 healthy newborns weighing > 2 k at birth;Cord blood bilirubin of ≥1.75 mg/dl,or S. bilirubin of ≥4.1 mg/dl collected at 24 hr age,could predict the development of hyperbilirubinemia(serum bilirubin ≥14 mg/dl) on day three.

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