Research Article

Predictors of poor outcome in neonates with respiratory distress

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ABSTRACT

Background: To identify the determinants of mortality in neonates admitted in sncu of tertiary care hospital with respiratory distress. Neonatal intensive care unit in a tertiary level care hospital in central India. Study Design was a prospective observational study. Neonates admitted with respiratory distress over a period of 8 months.

Methods: Neonates with respiratory distress i.e. respiratory rate >60/min, chest retraction, grunting, central cyanosis, were included in the study. Surgical problems causing respiratory distress i.e., congenital malformations affecting respiratory tract and congenital heart disease were excluded from the study. All the cases were divided in two groups based on outcome with good outcome defined as those babies who were discharged and poor outcome defined as those babies who expired during the treatment and analyzed.

Results: On analysis, Antenatal history of per vaginal bleed, meconium stained liquor, prolonged rupture of membrane, VLBW, prematurity, pre-ductal SpO_2 , shock, apneic attacks, positive sepsis screen were found to be significantly associated with death.

Conclusions: India in recent times has made huge improvement in neonatal care with establishing special care new born units. But, still the neonatal mortality rate is in higher range and needs further intense approach to reduce it. The antenatal and neonatal factors discussed above can be used as referral criteria for early referral of a new born with respiratory distress to a tertiary level new born unit for further management. The early identification and referral of a neonate with above risk factors may help in reducing the associated mortality and hence will reduce neonatal mortality.

Keywords: Neonates, Respiratory distress, Neonatal mortality, Special care new born unit

INTRODUCTION

Respiratory distress is a common problem during the newborn period with considerable mortality.[1-4] The incidence varies from 7-8% among live births with 30% among preterm, 20% among post term and 4% in term babies. It contributes to 20% of neonatal mortality.[5] The introduction of surfactant, mechanical ventilation, extra corporeal membrane oxygenation (ECMO) and non invasive monitoring devices has improved the management of respiratory distress in new borns significantly. Often the need for tertiary care can be predicted during the prenatal or intra partum period; ideally such infants should be born in institutions with appropriate facilities and personnel to manage the critically ill infant. An early identification and timely referral of a sick new born with respiratory distress delivered at peripheral health care centres plays a key role in reducing the morbidity and mortality. Special care new born units have played a vital role in reducing the neonatal mortality rate, but many of these are level-2 units lacking in infrastructure and expertise in management of new borns requiring higher level care. So referral criteria's are required to clearly define which neonates to be referred at the earliest. So this study was conducted to determine factors which may have poor outcome in babies with respiratory distress, which if identified early and referred timely can save number of babies.

METHODS

A prospective observational study was conducted in neonates admitted in neonatal intensive care unit of a tertiary care hospital in central India with respiratory distress from February 2012 to August 2012.

Neonates with respiratory distress i.e. respiratory rate >60/min, chest retraction, grunting, central cyanosis, were included in the study. Surgical problems causing respiratory distress i.e., congenital malformations affecting respiratory tract and congenital heart disease were excluded from the study.

A predesigned Performa was used to record antenatal history, weight & height of mother, partum history and history of resuscitative measures. H/o initial breast feeding was noted. A detailed examination of the baby was done. New Ballard scoring was done to determine the gestational age of the newborn. Severity of the respiratory distress was assessed by Downey's scoring system. Vitals i.e., Heart rate, Respiratory rate, Capillary refill time, temperature was recorded. Pre ductal & Post ductal saturation was recorded at right upper limb & right lower limb with GE pulse oximeter with neonatal probe respectively. Initial stabilization of all babies was done by maintenance of thermo neutral zone of temperature, blood glucose levels and oxygen saturation. All newborns were administered oxygen to achieve a stable saturation of 92%. FiO_2 needed to achieve this saturation level was recorded.

Depending on the clinical diagnosis of respiratory distress, relevant investigations were sent and managed according to the institutional protocol. The diagnosis of respiratory problems was based on guidelines recommended by the National Neonatology Forum (NNF). Sepsis/Pneumonia, Transient tachypnea of the new born, Respiratory distress syndrome (RDS), Meconium aspiration syndrome was diagnosed based on guidelines recommended by the National Neonatology Forum (NNF).

The subjects were observed for co-morbidities and were managed accordingly. All the cases were divided in two groups based on outcome with good outcome defined as those babies who were discharged and poor outcome defined as those babies who expired during the treatment.

Statistical analysis was done using SPSS version 20. Continuous variables were studied using student t test and categorical variables were studied using chi-square test. P-value of less than 0.05 was considered as statistically significant. Univariate and multivariate logistic regression analysis was done for all the variables used for the comparison of the neonates included in the study in relation to the outcome.

Study methodology

Newborns with respiratory distress fulfilling inclusion criteria (n=117)

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Time period: 8 months excluded-CHD, surgical cases, asphyxiated babies

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Enrolled in study after taking informed consent (n=100)

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Initial stabilization and detailed systemic examination

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Investigations and management

Sepsis   RDS   TTNB   MAS

Good outcome (n=60)   Poor outcome (n=40)
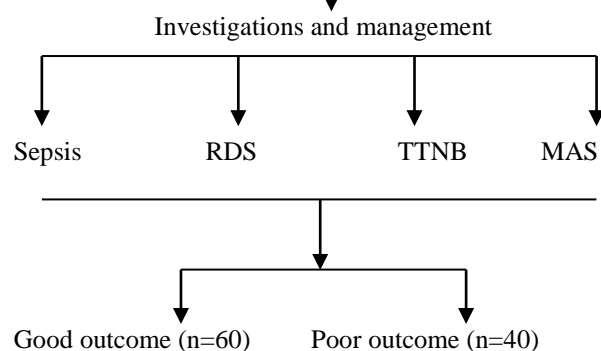
RESULTS

Table 1: Baseline characteristics of the sample studied.

Characteristics	Good outcome	Poor outcome	P-value	Total
Sex of Baby (%)				
Male	34 (61.8%)	21 (38.2%)	0.28	55
Female	23(51.1%)	22 (48.9%)		45
Residence (%)				
Urban	40 (58%)	29 (42%)	0.77	69
Rural	17 (58.4%)	14 (45.2%)		31
Place of delivery				
Institutional	35 (63.6%)	20 (36.4%)	0.138	55
Non-institutional	22 (48.9%)	23 (51.1%)		45
Delivery conducted by				
Doctor	52 (62.7%)	31 (37.3%)		83
Nurse	5 (33.3%)	10 (66.7%)	0.28	15
Dai	0	2(100%)		20
Mean age of presentation (hrs)*				
	36.9±18.5	63±29.1	0.433	
Mean baby weight (kg)*				
	2.44± 0.09	1.82±0.11	<0.0001	
Mean maternal weight (kg)*				
	58.6± 0.79	58.2±0.83	0.76	
Mean maternal height (feet)*				
	5.35±0.02	5.28± 0.03	0.05	
Mean gestational age *				
	37.23±0.81	33.44±1.1	0.005	

* M ± SE (95% CI)

**Table 2: Factors studied in relation to outcome of babies with respiratory distress.**

Parameter	Good outcome	Poor outcome	Total	P-value
Antenatal and perinatal factors				
Foul smelling liquor	20 (46.5%)	23 (53.5%)	43	0.06
PV Bleeding in mother	1(12.5%)	7(87.5%)	8	0.01
Meconium stained liquor	22(68.8%)	10 (31.2%)	32	0.10
Oligohydromnios	1(50%)	1(50%)	2	0.84
PROM	3(27.3%)	8 (72.7%)	11	0.04
Mode of delivery				
Vaginal	34(48.6%)	36(51.4%)	70	
Assisted	2(66.7%)	1(33.3%)	3	0.032
LSCS	21(77.8%)	6(22.2%)	27	
Advanced Resuscitation	11 (57.9%)	8 (42.1%)	19	0.418
Duration of travel for out born babies				
<1 hour	18(60%)	12(40%)	30	0.006
>1 hour	3(20%)	12(80%)	15	
Neonatal factors				
Mean heart rate *	159.1±1.34	161.4±2.01		0.334
Mean respiratory rate*	66.7 ±0.72	69.2±0.54		0.009
Capillary refill time *	1.02±0.018	1.26±0.067		< 0.001
Mean SPO2 on admission*	84.84 ± 0.416	83 ± 0.81		<0.0001
Mean Downey's score *	4.39 ± 0.122	5.74±0.167		<0.0001
Mean FiO$_2$ requirement*	30.02±0.353	33.35±0.405		<0.0001
Grunting	39 (57.4%)	29 (42.6%)	68	0.917
Refusal to feed	6 (42.9%)	8(57.1%)	14	0.294
Fever	0(0%)	3 (100%)	3	0.043
Poor Neonatal reflexes	23(35.9%)	41(64.1%)	64	<0.0001
Septic shock	2 (11.1%)	16 (88.9%)	18	<0.0001
Seizures	3 (25%)	9 (75%)	12	0.017
Apnea	1 (10%)	9(90%)	10	0.002
Positive Sepsis screen	20 (45.5%)	24 (54.5%)	44	0.031
Abnormal X ray	46 (58.2%)	33 (41.8%)	79	0.630

* M ± SE (95% CI)

On analysis of antenatal and neonatal factors it was found that those babies born to mother with PV bleeding and PROM had poorer outcome than those babies who did not had these similar complications. Those babies who had to travel for more than 1 hour to reach hospital had higher incidence of mortality than who reached hospital timely. Babies born vaginally had higher mortality than babies born by caesarean section. We could not find any significant relation between factors like foul smelling liquor, meconium stained liquor, oligohydraminos, requirement of resuscitation and outcome of respiratory distress.

Mean capillary refill time, mean respiratory rate , mean heart rate, mean downe's score and mean FiO$_2$ was higher in babies with poor outcome while mean oxygen saturation was lower in babies with poor outcome. Among these factors only mean heart rate was not found to be statistically significant. Other clinical features and investigations were studied and it was found that presence of septic shock, apnoea, fever, poor neonatal reflexes and Positive sepsis screen was associated with poor outcome in the studied sample. No significant association can be derived from poor outcome and birth asphyxia and seizures in newborn. In this study, highest mortality was seen in babies with RDS (65%) (Figure 1).
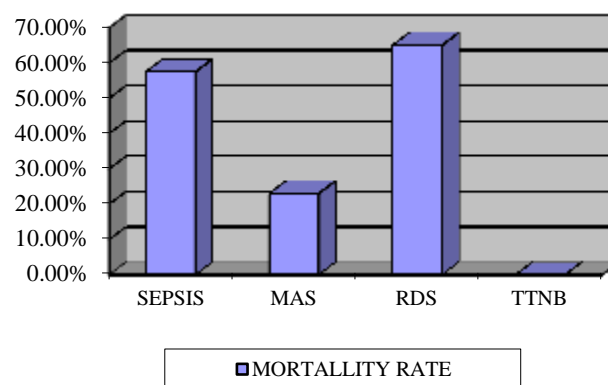
Figure 1: Mortality rate in co morbid conditions associated in with respiratory distress.

DISCUSSION

In this study out of total sample studied 40 % babies had poor outcome. It was observed that mortality rate was high in Respiratory distress syndrome (65%) and sepsis (52%). Similar report was given by Alok kumar et al[7], where they observed that overall case fatality ratio for respiratory distress was 19% and case fatality rate was highest for respiratory distress syndrome (57.1%), followed by meconium aspiration syndrome (21.8%) and sepsis (15.6%). In study done by N.B. Mathur et al, the overall mortality in neonates with respiratory distress was 32%.[6] Pneumonia was the leading cause. Mortality was high in RDS, birth asphyxia and MAS.

On studying the antenatal and perinatal factors associated with poor outcome i.e., death, this study showed that mean respiratory rate, capillary refill time, mean SPO$_2$ on

admission, mean Downe's score, mean FiO_2 requirement, Mean gestational age, mean baby weight (kg), Mode of delivery, PV Bleeding in mother, PROM, duration of travel for out born babies were statistically significant. In study done by N. B. Mathur et al, weight, gestational age, age at presentation, lethargy, absent neonatal reflexes, shock, positive CRP, positive ventilatory support, blood culture positivity.[6] High Silverman score, FiO_2 40%, low P^H, alveolar arterial gradient (AaO_2) >250 mm Hg, arterial alveolar tension ratio (a/A) of < 0.25 were significantly associated with mortality. In study by Ogunlesi TA et al, on studying predictors of mortality in neonatal septicaemia in under resourced setting, babies with estimated gestational age (EGA) less than 32 weeks, weight less than 1.5 kg, temperature less than 38 degrees C, respiratory distress, abdominal distension, poor skin colour, hypoglycemia, and infection with gram-negative pathogens were significantly associated with death.[11] In study by Amare Gebrehiwot et al, failure to suck, meconium stained liquor, premature rupture of membrane, lethargy, seizure and fast breathing were significantly associated with positive sepsis screen and poor outcome.[12] Study by Louis et al, showed that myocardial dysfunction, higher initial oxygen requirement and low birth weight are significantly associated with mortality in meconium aspiration syndrome.[13] Thus the above derived risk factors can be considered as predictors of poor outcome.

CONCLUSION

India in recent times has made huge improvement in neonatal care with establishing special care newborn units. But, still the neonatal mortality rate is in higher range and needs further intense approach to reduce it. The antenatal and neonatal factors discussed above can be used as referral criteria for early referral of a newborn with respiratory distress to a tertiary level newborn unit for further management. The early identification and referral of a neonate with above risk factors may help in reducing the associated mortality and hence will reduce neonatal mortality.

What is already known

- Respiratory distress is a common problem during the newborn period with considerable mortality.
- An early identification and timely referral of a sick newborn with respiratory distress delivered at peripheral health care centres plays a key role in reducing the morbidity and mortality.

What this study adds

- PV bleed, shock and apneic attacks are most significantly associated with death and can be used as referral criteria for early referral to a tertiary level newborn unit.

REFERENCES

1. Hjalmarson O. Epidemiology of neonatal disorder of respiration. Int J Technol Access Health Care. 1991;7(1):9-15.
2. Nielsen TF, Hokegard KH. The incidence of acute neonatal respiratory disorder in relation to mode of delivery. Acta Obset Gynaecol Scand. 1984;63:109-14.
3. Thomas S, Verma IC, Singh M, Menon PSN. Spectrum of respiratory distress syndrome in the newborns in North India. A prospective study. Indian J Pediatr. 1981;48:61-65.
4. Singhal PK, Mathur GP, Mathur S, Singh YD. Neonatal morbidity and mortality in ICDS Urban slums. Indian Pediatric. 1990;27:485-8.
5. Kumar A, Bhat BV. Epidemiology of respiratory distress in newborn. Indian J Pediatr. 1996;63:93-8.
6. Mathur NB, Garg K, Kumar S. Respiratory distress in neonates with special reference to pneumonia. Indian Pediatrics. 2002;39:529-37.
7. Kumar A. Bhat BV. Respiratory distress in newborn. Indian J Matern Child Health. 1996;7:8-10.
8. Khatua SP, Gangwal A, Basu P, Patodhi PKR. The incidence and etiology of respiratory distress in newborn. Indian Pediatr. 1974;16:1121-6.
9. Shakunthala SKV, Rao GM, Urmila S. Diagnostic lung puncture aspiration in acute pneumonia of newborn. Indian Pediatr. 1978;15:39-44.
10. Malhotra AK, Nagpal R, Gupta RK, Chhajra DS, Arora RK. Respiratory distress in newborn; Treated with ventilator in a level II nursery. Indian Pediatr. 1995;32:207-11.
11. Ogunlesi TA, Ogunfowara OB. Predictors of mortality in neonatal septicaemia in an under resourced setting. J Natl Med Assoc. 2010;102(10):915-21.
12. Gebrehiwot A, Lakew W, Moges F. Predictors of positive blood culture and death among neonates with suspected neonatal sepsis in Gondar University Hospital, Northwest Ethiopia. European Journal of Experimental Biology. 2012;2(6):2212-8.
13. Louis D, Sundaram V, Mukhopadhyay K, Dutta S, Kumar P. Predictors of Mortality in Neonates with Meconium Aspiration Syndrome. Indian Pediatrics. 2014;54:637-40.