International Journal of Biomedical and Advance Research
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: 10.7439/ijbar
CODEN: IJBABN

Original Research Article

Neonatal respiratory distress in early neonatal period and its outcome

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Abstract

Introduction: Respiratory distress is one of the most common causes of admission in NICU. The aim of this work was to study the commonest causes of respiratory distress in NICU, analysis of each cause, and to determine the strategic plan needed to improve the outcome of these cases.
Patients and Methods: A prospective study was conducted through the period from January 2003 to October 2004. Data were collected from all patients admitted in the unit during this period.
Results: Total number of, 855(17.27%) newborn were admitted to NICU, 140 of them developed respiratory distress comprising 16.37% of all NICU admissions and with an incidence of 2.83%. The commonest causes of respiratory distress in our study were transient tachypnea of newborn (TTN) 57 (40.7%) respiratory distress syndrome (RDS) 24 cases (17.2%), birth asphyxia 16 cases (11.4%) and Meconium aspiration syndrome (MAS) 13 cases (9.3%). Cesarean section was the most common predisposing factor associated with the development of TTN and RDS (the most 2 common causes of respiratory distress in our study). The overall mortality rate of cases of respiratory distress in our study was 22.86%.
Conclusion: The study confirmed the importance of NRD with a frequency rate of 2.83%, morbidity of 5% and mortality of 22.86% of cases. The causes, risk factors and immediate outcome were determined and discussed. Some recommendations were suggested in order to reduce its frequency, morbidity and mortality
Keywords: Respiratory Distress, early neonatal period, Cesarean section

1. Introduction

Neonatal mortality accounts for 40% of deaths in children under five years of age.(1) Globally, there has been a considerable decline in under-five and infant mortality in the past decades. However, neonatal mortality remained relatively unchanged especially in developing countries [1]. The highest neonatal mortality rates are seen in sub Saharan Africa. In Asia the average rates are lower but this region accounts for over 60% of the estimated global total, mainly because of the large population and high fertility rate [2]. Efforts to achieve the UN Millennium Development Goal 4 of reducing childhood mortality by two-thirds by 2015 are focused on reducing neonatal deaths in high mortality countries [3]. The incidence of neonatal respiratory distress (NRD) is ranging from 2.2% to 7.6% in developed countries and from 0.7% to 8.3% in India [1]. Neonates with respiratory distress are 2-4 times more likely to die than those without respiratory distress so its prevention and adequate management will decrease mortality [4]. This descriptive study was carried out to evaluate the cases of respiratory distress in early neonatal period in relation to causes, neonatal, maternal, characteristics and outcome in neonates.

2. Material and methods

This study was a prospective, descriptive, cross sectional hospital-based study, carried out from January 2003 to October 2004 at kamla Nehru hospital, Gandhi medical college, Bhopal. The study included all newborns from 0-7 days that had been admitted to NICU. The inclusion criteria were to enroll all newborns from 0-7 days with low, normal or high birth weight of different gestational ages admitted into NICU, diagnosed as neonatal respiratory distress. The study excluded newborns whose parents refused to be admitted to the study.

2.1 Data Collection

A special questionnaire was designed for the purpose of the study. The following information were taken: name, age at admission, sex, and residence of the family, date of admission and date of discharge or death. Neonatal data included: body weight, gestational age according to the date of last menstrual period of the mother, singleton or multiple births, Apgar score if available, need for resuscitation after birth, days of hospitalization. Factors related to labor and deliveries were assessed including: type of delivery (vaginal or cesarean section= elective or emergency), place of delivery (home or hospital), complications (prolonged rupture of membranes >18 hr, prolonged labor, meconium staining of liquor, antepartum hemorrhage and others). Maternal information was recorded including: age (high risk group <18 yr or >35 yr and low risk group 18-35 yr [5], parity (which is divided into risk group=P0 or > P4 and normal group = P1-4), any medical disease, antenatal care attendance (if present or not), history of any sign of infection before labor, maternal education. The cases were diagnosed clinically by the presence of at least 2 of the following criteria, namely RR of 60/min or more, subcostal indrawing, xiphoid retraction, suprasternal indrawing, flaring of alae nasi, expiratory grunt and cyanosis at room temperature. They were also assessed by scoring systems using Silvermen Anderson scoring system and Downe's scoring system. All were weighed and classified to risky weight (small for gestational age (SGA) ≤ 2.5 kg and large gestational age (LGA) ≥ 4 kg) and normal weight group (2.5-4 kg). Chest x-ray was sent for all patients and classified into normal and abnormal findings. Then they were followed in the ward for duration of hospitalization and outcome.

2.2 Statistical analysis

Statistical analysis was done using SPSS program (version17), data was tabulated and comparison of proportions were performed using appropriate test, P-value of < 0.05 was considered as statistically significant.

3. Results

Among the 4950 newborn delivered during the study period, 855(17.27%) newborn were admitted to NICU, 140 of them developed respiratory distress comprising 16.37% of all NICU admissions and with an incidence of 2.83%

Table1. Etiology of Neonatal Respiratory Distress and Relation to mode of delivery

Diagnosis		Number	Vaginal (%)	Elective c/s (%)	Emergency c/s (%)
Transient tachypnea of newborn(TTN)		57 (40.7)	15 (26.31)	30 (52.6)	12 (21.1)
Respiratory distress syndrome* (RDS)	Group 1	18(12.85)	0	12(66.7)	06 (33.3)
	Group 2	06(4.28)	0	02(33.3)	04(66.7)
Birth asphyxia(BA)		16 (11.4)	12 (75)	0	04 (25)
Meconium aspiration syndrome (MAS)		13 (9.3)	10 (76.9)	03 (23.1)	0
Pneumonia with sepsis		11 (7.9)	08 (72.7)	0	03 (27.3)
pneumothorax		07 (5)	07 (100)	0	0
Anemia		07 (5)	01 (14.3)	0	06 (85.7)
Congenital heart disease		05 (3.57)	03 (60)	01 (20)	01 (20)
total		140 (100)	56 (40)	48 (34.29)	36 (25.71)

**RDS categorized in to two groups on the basis of Gestational age, Group 1, 25-<32 and Group 2, 32-34wks*

The commonest causes of neonatal respiratory distress in our study were transient tachypnea of newborn (40.7%), respiratory distress syndrome (17.2%), birth asphyxia (11.4%), and Meconium aspiration syndrome (9.3%). Majority of cases of TTN (52.6%) and RDS (66.7%) were delivered by elective cesarean section. (Table 1)

Table 2: Sensitivity, specificity, and predictive value of clinical signs and symptoms

Signs and symptoms	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Grunting(n=84)	48.5	70.2	78.1	38.3
Cyanosis(n=50)	48.5	68	76.9	37.6
Tachypnea(n=150)	88.3	6.3	67.4	20
Chest retractions(n=160)	93.2	36.1	76.1	771
Difficulty in feeding(n=92)	88.3	4.2	67	13.9
Flaring of alae nasi(n=54)	57	92	93.57	48.6

Of all clinical signs and symptoms grunting and flaring of alae nasi had high specificity for neonatal respiratory distress while tachypnea, chest retractions and difficulty in feeding has high sensitivity for diagnosis (Table 2).

Table 3: Neonatal and maternal characteristics of commonest causes of Neonatal Respiratory Distress

Neonatal and Maternal characteristics	TTN	RDS		Birth asphyxia	MAS
		Group 1	Group 2		
GA(wks) Range Mean Number in each group (%)	 34-42 37.6 57(40.7)	 25-<32 30 18(12.85)	 32-36 34.2 06(4.28)	 30-42 36.8 16 (11.4)	 37-40 38.6 11 (7.9)
Sex ratio	1.2:1	1.5:1	1.7:1	1.6:1	2.7:1
Weight (gm) Range Mean	 1800-4000 2693	 500-1700 1256	 1100-2500 2036	 2250-3500 2900	 2500-3600 2964
Mode of delivery (%) CS VD	 42 (73.68) 15 (26.32)	 18 (100) 0	 06 (100) 0	 04 (25) 12 (75)	 03 (27.3) 08 (72.7)
Maternal risk factor (%) PROM H.T D.M Stained liquor twin	 08 (14) 05 (8.8) 02 (3.5) 00 04 (7)	 05 (27.8) 03 (16.7) 01 (5.6) 00 03 (16.7)	 02 (33.3) 01 (16.7) 00 00 01 (16.7)	 03 (18.75) 02 (12.5) 00 05 (31.25) 00	 00 03 (27.2) 00 11 (100) 00

Most cases of TTN were full term with mean gestational age of 37.6 and mean weight was 2693 gm, there was no significant difference between male and female ratio. In RDS 75% of cases were of <32wks with mean birth weight of 1256 gm, also there was male preponderance with ratio of 1.5:1. Maternal risk factors like PROM, hypertension, diabetes mellitus and twin pregnancy were present in significant no. of cases of TTN and RDS. (Table 3)

Table 4: Mortality in relation to causes of Neonatal Respiratory Distress

Causes		Cured	Discharged with complication	Died	Case fatality rate (%)	Total
Transient tachypnea of newborn		57	0	0	0	57
Respiratory distress Syndrome	Group 1	02	03	13	72.2	18
	Group 2	03	01	02	33.33	06
Birth asphyxia		11	0	05	31.25	16
Meconium aspiration syndrome		09	0	04	30.8	13
Pneumonia with sepsis		06	01	04	36.4	11
Pneumothorax		07	0	0		07
Anemia		06	0	01	14.3	07
Congenital heart disease		0	02	03	60	05
Total		101(72.14%)	07 (5%)	32	22.86	140

Overall outcome of Neonatal Respiratory Distress was cure in 72.14%, Neonatal mortality rate of 22.86%, and maximum mortality of 62.5% in Respiratory Distress Syndrome cases.

4. Discussion

The importance of Respiratory distress in neonates can be realized from the fact that the neonates with respiratory distress are 2-4 times more likely to die than those without respiratory distress [6].

Knowledge of the causes of respiratory distress is important for planning and provision of basic facilities for sick and low birth weight newborns [7].

In our study frequency of NRD is found to be 2.83% which is in accordance with previous studies. [1,8] This study demonstrated that male sex is a risk factor for respiratory distress.[9,10] The cause for that is unexplained.[11] Regarding maternal characteristics, majority of mothers were of low socioeconomic status, and of low education.[12,13] The commonest causes of respiratory distress in our study were TTN (40.7%), Respiratory Distress Syndrome (17.2%), Birth Asphyxia (11.4%), and Meconium Aspiration Syndrome (9.3%).[1,14,15] Grunting, flaring of alae nasi had high specificity for neonatal respiratory distress while tachypnea, chest retractions and difficulty in feeding had high sensitivity for diagnosis.[4]

In our study, most cases of TTN were full terms with their mean GA 37.6 weeks, and their mean weight was 2693 gm, which is in disagreement with Rawlings and Smith[16] that none of the affected newborns had a birth weight >4,000 gm, excluding the possibility that macrosomia favors the development of TTN.

In our study, we found that cesarean section was the most common factor associated with development of TTN.[17] This finding can be explained by the possibility that labor and delivery enhance neonatal lung adaptation by inducing a surge of catecholamines in the fetus which stimulate the absorption of fetal lung fluid, inhibit secretion of fetal lung fluid and increase the release of surfactant.[13]

Respiratory distress syndrome was the second most common cause of respiratory distress, 75% of cases occurred in those with gestational age of <32weeks, their mean weight was 1256 gm. There was male preponderance with a ratio of >1.5:1. As stated two decades ago in previous studies, the present work confirmed that the frequency of RDS is inversely related to gestational age and birth weight[18-20], that CS can favour the onset of RDS[21-24] and male sex is a strong risk factor[18,20,21,25] for RDS.

Maternal risk factors like PROM (25.9%), Hypertension (16.7%), Diabetes Mellitus (4.2%) and Twin pregnancy (16.7%) were present in cases of RDS.[26] On the contrary Dani C *et al*[27] did not demonstrate relations between maternal diseases and RDS, probably due to the fact that infants of mothers with maternal diseases are commonly subjected to predisposing insults, such as premature birth and CS, which represent the real risk factors.[19]

Most common radiological findings in cases of TTN were linear streaking at hilum that correlates with engorgement of lymphatic system with retained lung fluids.[28] While reticulogranular pattern in RDS.[14]

Comparison between the causes and their fatalities in this study shows that RDS has maximum case fatality rate of 62.5%. This high mortality rate could be attributed to many factors; the most important of them was lack of surfactant replacement therapy in our unit. Steven *et al*[29] reported that mortality rate of respiratory distress syndrome decreased by approximately 50% over the last decade with the advent of surfactant therapy.

The results indicate that NRD is a common neonatal problem among admitted newborns to NICU. Respiratory Distress Syndrome, Pneumonia With sepsis and Meconium Aspiration Syndrome contributed largely to mortality. These causes are to some extend preventable and treatable; therefore, their morbidity and mortality can be reduced. In putting the strategy for dealing with cases of respiratory distress in our NICU, we are interested in two factors:(a) Cases that represent the higher incidence of occurrence and their main predisposing factors (b) Cases associated with the higher mortality rate, and their management protocols.

5. Conclusion

Respiratory distress was the major cause of admission in our NICU. The most common causes of respiratory distress were TTN, RDS, Birth asphyxia, and MAS. Cesarean section was the most common predisposing factor associated with the development of respiratory distress in neonates. The outcome of neonatal respiratory distress was found as: a cure rate of 72.14%, mortality rate of 22.86% and patients discharged with complications (morbidity rate) in 5%.

6. Recommendations

Proper antenatal care to decrease the incidence of premature labour, evaluation of indication of cesarean section, and antenatal steroids for expected premature delivery.

Use of surfactant immediately after delivery for all premature infants especially <32 weeks gestation.

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