

Epidemiology of Respiratory Distress of Newborns

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Abstract. The present prospective study was conducted to find out the incidence, etiology and outcome of respiratory distress (RD) in newborns. All newborns (n = 4505), delivered at this hospital over a period of 13 months, were observed for respiratory problems. Relevant antenatal, intranatal and neonatal information was noted. Cases were investigated for the cause of respiratory distress and followed up for the outcome. The overall incidence of RD was 6.7%. Preterm babies had the highest incidence (30.0%) followed by post-term (20.9%) and term babies (4.2%). Transient tachypnea of newborn (TTN) was found to be the commonest (42.7%) cause of RD followed by infection (17.0%), meconium aspiration syndrome (10.7%), hyaline membrane disease (9.3%) and birth asphyxia (3.3%). TTN was found to be common among both term and preterm babies. While Hyaline membrane disease (HMD) was seen mostly among preterms, and Meconium aspiration syndrome (MAS) among term and post-term babies. Overall case fatality ration for RD was found to be 19%, being highest for HMD (57.1%), followed by MAS (21.8%) and infection (15.6%). Our results indicate that RD is a common neonatal problem. TTN accounts for a large proportion of these cases. MAS and infection also contribute significantly and are largely preventable. Without adequate ventilatory support HMD and MAS carry high mortality. (Indian J Pediatr 1996; 63 : 93-98)

Key words : Newborn; Respiratory distress; Incidence; Etiology; Mortality.

Respiratory distress is a common problem during the newborn period with considerable mortality (1-4). It accounts for nearly half of all neonatal deaths (5-7). It is a heterogeneous group of illness with varying incidence, underlying etiology, clinical course and outcome. In the recent years, neonatal respiratory disorders have evoked much interest and enthusiasm. There have been tremendous advances in ventilator therapy, surfactant replacement, extra corporeal membrane oxygenation and sophisticated monitoring gadgets. They have improved the outcome among the babies with respiratory disorders with

increasing cost of neonatal care. Epidemiology of RD in developed countries has been investigated in several studies.^{1,3,6,8,9} However, few researchers from India have addressed to the entire spectrum of respiratory disorders.^{5,10} The present study is designed to investigate the incidence, etiology and outcome of neonatal RD in a hospital in South India.

MATERIALS AND METHODS

All live newborns delivered at JIPMER hospital during the period between July 1993 to May 1994 were observed for development of respiratory distress. Any newborn showing one or more of the following signs for more than two hours

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was considered to have respiratory distress : (i) Respiratory rate of sixty per minute or more (ii) grunting (iii) intercostal or subcostal retraction.^{1,2} Intrapartum details with special reference to the fetal well-being, duration of rupture of membranes, quality of liquor and drugs especially analgesics and sedatives given to the mother were recorded. Apgar score, resuscitation details, sex, gestational age (based on last menstrual period date and clinical examination), birth weight and findings suggestive of respiratory distress were also noted.

All babies with respiratory distress were cared for in the neonatal intensive care unit. Blood sugar, electrolytes and calcium (when indicated), packed cell volume, and chest X-ray were obtained in all cases. Babies with RD were also subjected to sepsis screening tests including micro-ESR, Band-Cell count, gastric aspirate for culture and smear (when PROM was present or mother had features of amnionitis) and total leukocyte counts. Blood culture was done whenever any of the sepsis screening test was positive or the clinical index of suspicion was very high. Other investigations including CSF study, shake test on gastric aspirate, cranial ultrasound, echocardiography were done whenever indicated. All babies with RD received standard care with frequent monitoring. Mechanical Ventilatory support was not available during the study period. Babies who expired were subjected to post-mortem, lung and liver biopsy and autopsy when consent could be obtained.

Causes of RD were classified using a system based on that of Hjalmarson⁸, as follows. (i) Hyaline membrane disease (HMD) : onset of RD within six hours of birth with increasing severity during first

24 hours of life, positive shake test and reduced air content with reticulogranular pattern in chest X-ray or autopsy evidence of HMD; (ii) Transient tachypnea of newborn (TTN) : onset of RD immediately after birth with improvement during first 24 hours and chest X-ray showing hyperinflation, prominent perihilar markings, interlobar fissure edema; (iii) Meconium aspiration syndrome (MAS) : meconium staining of amniotic fluid and throat and patchy bilateral infiltrates with atelectasis and emphysematous changes on chest X-ray; (iv) infection : a positive culture and/or three of the sepsis screening tests positive (Total Leukocyte Count < 5000/mm³ or > 30000/mm³, Band cells to total polymorphs ratio > 0.2, micro ESR > 10 mm/first hour, C-Reactive protein > 6 ug/ml.)

Data was stored and analyzed with the help of specially designed computer program.

RESULTS

There were 4505 live births during the study period and of these, 300 babies developed RD giving an overall incidence of 6.7%. Incidence of RD among the term babies was found to be 4.2% whereas it was 30.0% and 20.7% among preterm and postterm babies respectively.

The major causes of RD are shown in Table 1 and the etiology in relations to gestational age groups in Fig 1. TTN was found to be the commonest cause of RD (42.7%) and it was found to be common among both term and preterm babies. Infection was the second commonest cause and it was found to be the sole cause of RD in 17% of cases. Infection was also present in additional 19% cases with other primary

TABLE 1. Causes of Respiratory Distress in Newborns

Primary diagnosis	Present Study (n = 4505)		Malhotra <i>et al</i> (5) (n = 2931)		Nielsen <i>et al</i> (3) (n = 7401)	
	No.	%	No.	%	No.	%
Transient tachypnea of newborn	128	(42.7)	7	(14.0)	145	(65.9)
Infections	51 (+ 19*)	(17.0)	6	(12.0)	12	(5.4)
Meconium aspirations syndrome	32	(10.6)	6	(12.0)	7	(3.2)
Hyaline membrane disease	28	(9.3)	9	(18.0)	29	(13.2)
Birth asphyxia	10 (+ 16*)	(3.3)	6	(12.0)	—	—
Others	51	(17.0)	16	(32.0)	27	(12.2)
Total	300	(100.0)	50	(100.0)	220	(100.0)

* Also present as secondary diagnosis in these additional cases

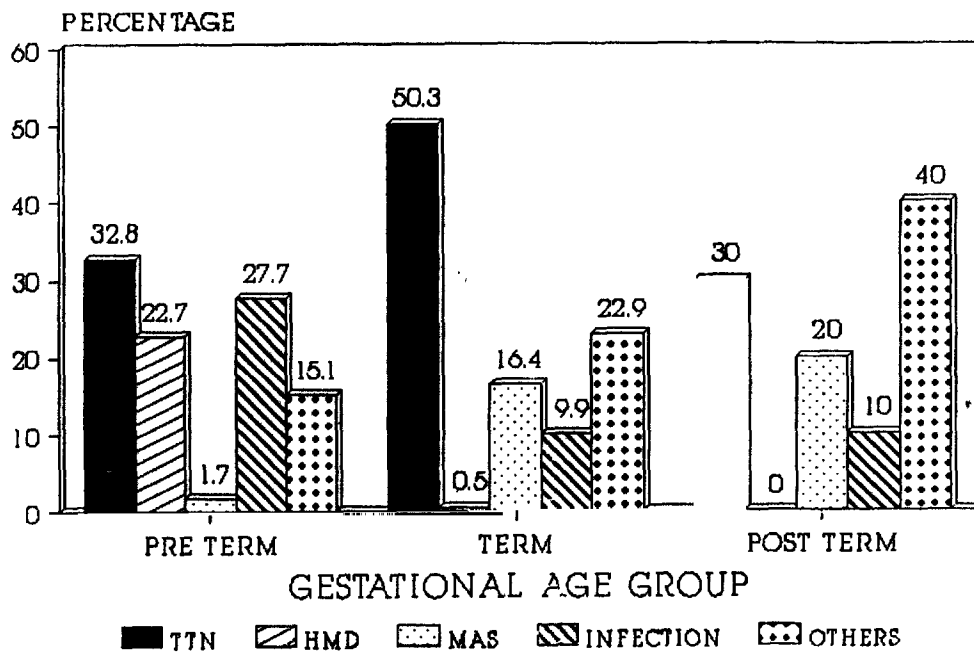


Fig. 1. Causes of RD and gestational age

diagnosis. MAS was seen mostly among term and post-term babies whereas HMD was seen mainly among preterm babies. Birth asphyxia (an apgar score of six or less at 5 minutes) was the primary cause of RD in 3.3% of the cases although asphyxia was present in 8.7% of cases. Congenital heart disease (2.0%), diaphragmatic hernia (2.0%), Pulmonary hypoplasia (1.3%) and anemia due to blood loss in cases of abruptio placenta and placenta previa (1.0%) were among other causes of RD.

The overall case fatality ratio for respiratory distress was found to be 19.0% as shown in Table 2, being highest among the cases of HMD followed by MAS and infection. There was no death among the cases of TTN. The early neonatal mortality for the hospital during the study period was 15.5 per 1000 live births (1.5%).

DISCUSSION

The overall incidence of RD in this study was 6.7%. Other recent studies from developed countries have reported incidence varying between 2.9 to 7.6%.^{1,2,8,10} Indian studies have reported incidence between 0.7% to 8.3%.^{3,5,11} Diagnostic criteria and study design could

TABLE 2. Case Fatality Ratio (CFR) in Respiratory Distress

Diagnosis	CFR
Transient tachypnea of newborn	0.0
Infection	15.6
Meconium aspiration syndrome	21.8
Hyaline membrane disease	57.1
Others	42.6
Overall	19.0

be partly responsible for such wide variation. It is also likely that some of the studies with low incidence included only severe cases since they recorded high case fatality ratio. However, the geographical and ethnic factors, availability of health care facilities may also influence the incidence of RD. Results from our study and some other recent studies^{2,3,5,10} indicate that the incidence of RD in newborns has been underestimated. Incidence of RD among the preterms in our study was comparable to those quoted from the developed countries which varies between 28 and 56%.^{1,2,6,8} No such data is available from India for comparison.

TTN was found to be the major cause of RD, followed by infections, MAS and HMD. TTN has been found to be the commonest cause of RD in other studies from developed countries.^{2,6,8,12} In a hospital based study from Dundee, 71% of the infants with RD were classified as TTN (12). In India, TTN has been reported to be responsible for 14 to 19% of all RD cases^{3,5}. The low incidence of TTN reported in the Indian studies could be partly due to the exclusion of the milder forms of RD as reflected by the low overall incidence of RD.^{3,5} The study design, particularly the diagnostic criteria, may be another reason. Increasing incidence of TTN has also been attributed to the changing pattern of RD.¹² We have not observed any correlation between TTN and babies biochemical profile. In our study, infection was the second commonest cause of RD (17%). Infection was also found to be associated with other causes of RD and it was present in 23.3% of all cases of RD. Infection included pneumonia, septicemia and meningitis. We also observed a higher incidence of MAS in comparison to those (3.2%) reported from

developed countries.^{2,8} But Thomes *et al* from Delhi (12.1%) and Malhotra *et al* from Pune (12%) have also reported similar incidence of MAS.^{3,5} The incidence of Meconium stained amniotic fluid at our center is 11% and we undertake routine suctioning of oropharynx and trachea after intubation in all babies where there is thick meconium stained liquor. Higher incidence of infection and MAS in this and other Indian studies^{3,4,5} could be due to lack of antenatal care, high incidence of obstructed labor, inadequate referral facilities and poor intrapartum and post-partum managements which are largely preventable.

The overall mortality in our study (CFR = 19%) was higher than those reported from developed countries which varies between 8.2 and 8.5%.^{2,8} Such a high mortality in our study is partly explained by the lack of adequate ventilatory support and surfactant therapy for HMD, as reflected by very high CFR among cases with HMD (57.1%) as compared to that (20.6%) reported by Neelsen *et al* from Sweden.² Another reason could be the higher incidence of MAS in our study where the mortality is high as also reported in other studies.^{13,14} Khatua *et al*¹¹ have reported an overall CFR of 39%. Malhotra *et al* have reported a CFR of 38% inspite of ventilatory support (s). As mentioned earlier, inclusion of more severe cases in these studies may explain their higher mortality. CFR among cases where infection was the only cause of RD was comparable with those reported from developed countries.^{15,16} Mortality was higher when infection complicated other diseases.

It may be concluded that RD is a common neonatal problem. Majority of cases are due to TTN which is self-limiting and mild. Infection and MAS are other

common causes of RD which could be prevented to a large extent. The high mortality due to HMD and MAS as seen in our setup could be reduced by surfactant therapy and better respiratory support.

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FOLIC ACID AND MOUTH LIP ± CLEFT PALATE

Women, who take multivitamins containing folic acid around the time they conceive, might substantially reduce their infant's risk for orofacial defects. Seven hundred and thirty one mothers of infants with cleft palates or lips, and 734 mothers of nonmalformed infants were asked about their daily periconception. Those, who had taken folic acid-containing multivitamins from one month before, to two months after, conception showed 25 percent to 50 percent less likelihood of having infants with orofacial defects than mothers who did not take multivitamins with folic acid. Eating iron-fortified cereal daily also decreased mothers' risk of delivering orofacially clefted infants.

Abstracted from :

Laurie Larson, AAP News, October 1995 : page 2.