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Original Research Article

Clinico-epidemiological profile and outcomes of respiratory distress in newborns prospective observational study in a tertiary care

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ABSTRACT

Background: Respiratory distress in neonates is common and can be a serious neonatal emergency. Globally prevalence of respiratory distress in newborns ranges from 0.64 to 88.4%. There are many risk factors predisposing neonates to respiratory distress. Respiratory distress syndrome (RDS) has high incidence in preterm neonates, while in late preterm and term neonates' transient tachypnea of newborn (TTN) is common. In-hospital mortality due to respiratory distress varies between 0.21 to 57.3% world-wide.
Methods: Prospective observational study was conducted in neonatal section, JNMCH, AMU, Aligarh, U. P., India over a period of 2 years which included 200 neonates with respiratory distress out of 2806 neonates born on enrolment days. Various causes of respiratory distress, risk factors, immediate outcomes and prevalence of respiratory distress was observed and analysed.
Results: Prevalence of respiratory distress in newborns was 7.12% on enrollment days in our study with RDS as the leading cause of neonatal respiratory distress (n=71; 35.5%). Approximately 60% of study recruits were males (n=123) in which RDS (n=43) was commonest cause of respiratory distress. Out of 200 enrolled candidates in our study 167 (83.5%) were discharged and 33 (16.50%) expired with RDS (70%) being the major cause of mortality.
Conclusions: Neonatal respiratory distress is one of the common causes of NICU (Neonatal intensive care unit) admission. RDS was the most common cause of respiratory distress with maximum mortality in study recruits. Various fetal and maternal factors predisposed to neonatal respiratory distress and also influenced their immediate clinical outcomes.

Keywords: Neonatal respiratory distress, Prevalence of neonatal respiratory distress, Risk factors of neonatal respiratory distress

INTRODUCTION

Neonatal respiratory distress usually accounts for 30-40% of admissions in NICU. It is more common among preterm neonates.[1,2] In Asia, 0.9-60% prevalence of neonatal respiratory distress was observed.[3] South East Asia regional neonatal-perinatal database defines respiratory distress as presence of any 2 of the following features or only grunting: respiratory rate >60/min, subcostal/ intercostal recessions, expiratory grunting/ groaning.[4] Nasal flaring, suprasternal retractions, decreased air entry on auscultation of chest also indicates respiratory distress. Life threatening signs that require prompt intervention are gasping, choking or stridor (signs of upper airway obstruction), apnea or poor respiratory effort/bradycardia, poor perfusion and cyanosis.

Causes of respiratory distress can be divided into pulmonary and non-pulmonary causes. Pulmonary causes include choanal atresia, RDS, meconium aspiration syndrome (MAS), pneumonia, TTN, pneumothorax, tracheoesophageal fistula (TEF), persistent pulmonary hypertension of the newborn (PPHN), pulmonary

hypoplasia, diaphragmatic hernia, laryngo-tracheomalacia. Non pulmonary causes like congenital heart disease (CHD), neurological causes (asphyxia, cerebral edema, hemorrhage), metabolic (hypothermia, hypoglycemia, metabolic acidosis), others (maternal sedation, sepsis, anemia, polycythemia, hypothermia, and hyperthermia).

Risk factors predisposing neonates to respiratory distress includes preterm baby, weight less than 2.5 Kg, maternal diabetes, maternal polyhydramnios or oligohydramnios, cesarean babies without preceding labor, precipitated labor, intrauterine asphyxia, second twin, cold stress, male child, etc.

Globally, neonatal respiratory distress related in-hospital mortality varies between 0.21 and 57.3% and 1.03-49.3% in Asia.[1] RDS, neonatal infections, hypoxic ischemic encephalopathy (HIE) and MAS are the leading cause of mortality with variable numbers.

Objectives

Objectives were to study prevalence, risk factors, causes and immediate clinical outcomes for respiratory distress in neonates at tertiary center.

METHODS

This prospective observational study was done between July 2022 to July 2024 in the neonatal section, department of paediatrics, JN medical college, Aligarh, India. The prevalence of respiratory distress was not more than 12% according to data reviewed, therefore, 200 neonates were taken as sample size.[5-7]

Inclusion criteria

All babies born at Jawaharlal Nehru medical college and hospital and admitted with respiratory distress within 6 hours of birth in neonatal unit with consent obtained from their parents were included.

Exclusion criteria

Neonates whose parents did not gave consent, outborn neonates, neonates referred to other hospitals and neonates who presented with symptoms onset 6 hours after birth were excluded.

Procedure

The 200 neonates meeting the aforementioned criteria were enrolled. Relevant history was taken and examination was done based on predesigned clinical proforma. Then collected data was coded and entered into Microsoft excel to make spreadsheet. The SPSS 25 version was used for data analysis. Respiratory distress due to respiratory and non-respiratory etiologies were clustered and studied. Fisher exact test was used to evaluate association between two categorical variables. P<0.05 was considered significant. Graphical summarizations of the data were done using bar diagrams and pie charts.

Ethical approval

The study was approved by the institutional ethics committee.

RESULTS

During the study period July 2023 to July 2024, out of 2806 neonates born on enrollment days 200 neonates having respiratory distress were enrolled.

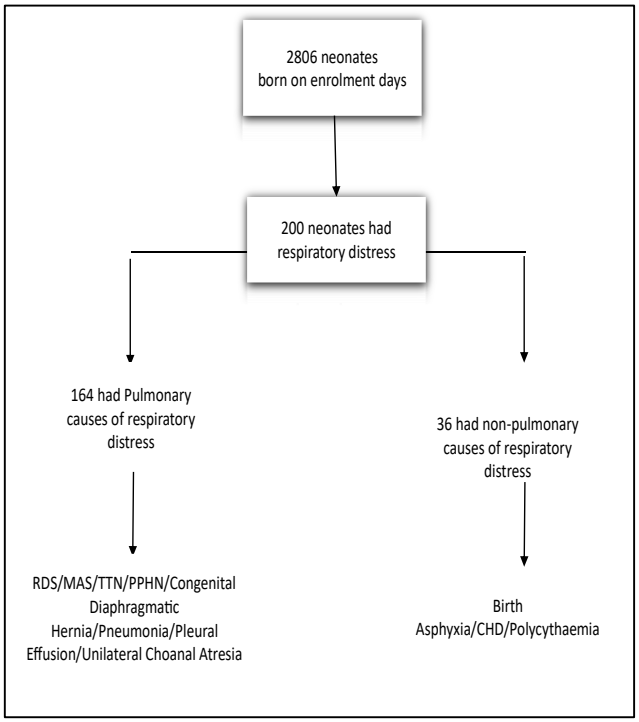

Figure 1: Study profile depicted in a flow-chart.

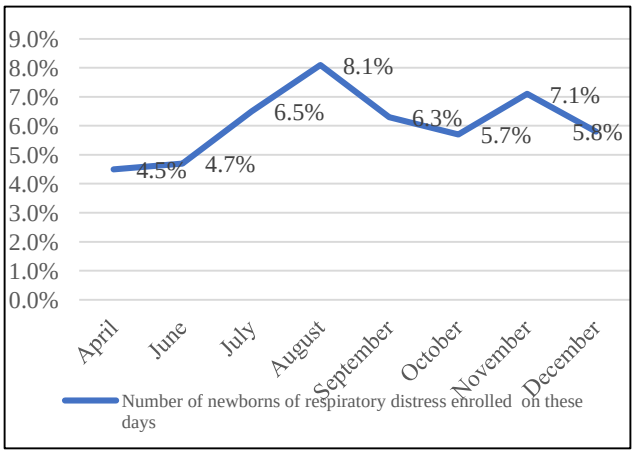

Figure 2: Prevalence of respiratory distress in newborns at tertiary center, (year 2022).

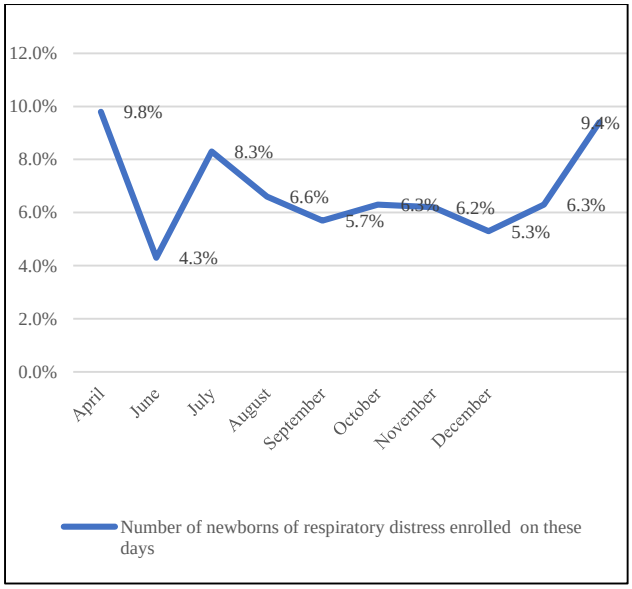

Figure 3: Prevalence of respiratory distress in newborns at tertiary center (year 2023).

Total number of newborns born in year 2022 (Figure 2) and 2023 (Figure 3) on enrolment days=2806. Total number of respiratory distress newborns born in 2022 and 2023 on enrolment days=200. Prevalence of respiratory distress in newborns in year 2022 and 2023=(200/2806)×100=7.12%.

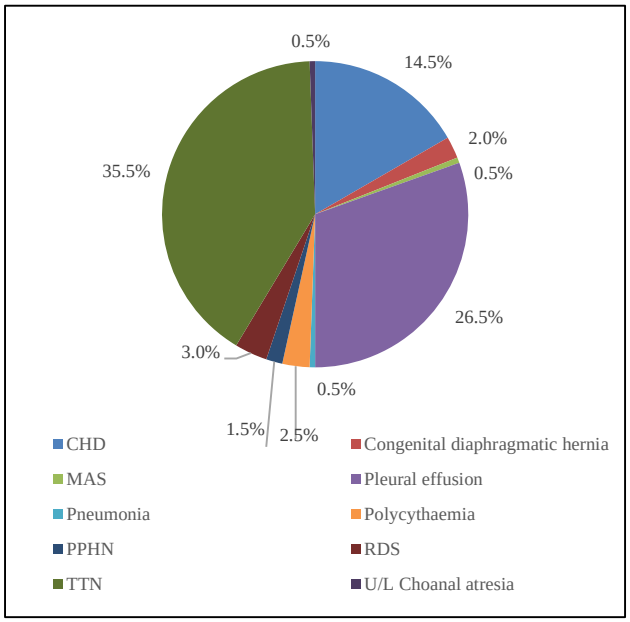

Figure 4: Causes of respiratory distress.

After analysing the data for causes of respiratory distress (Figure 4) amongst the study subjects (n=200), RDS was found to be the most common cause (n=71; 35.5%) followed by MAS (n=53; 26.5%). Amongst the least common causes congenital diaphragmatic hernia, pleural effusion and U/L choanal atresia all three had similar occurrences (n=1; 0.5%).

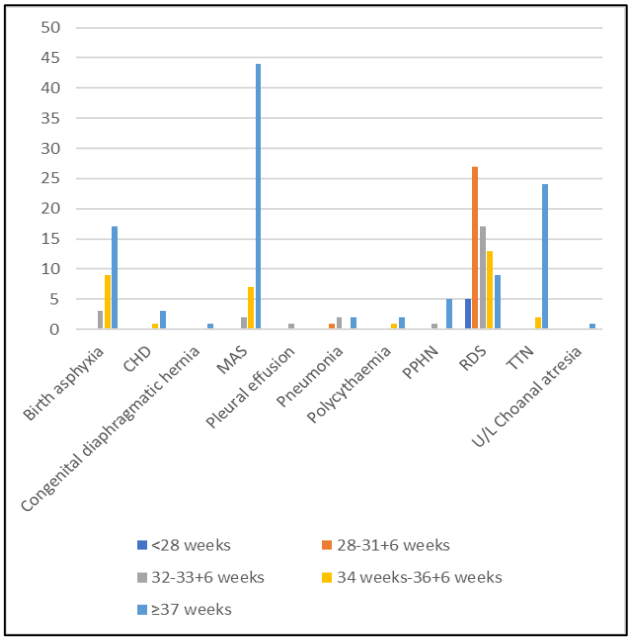

Figure 5: Causes of respiratory distress in study subjects according to gestational age, (n=200).

In (Figure 5) extreme/very/moderate preterm newborns (<34 weeks) (n=59; 83%) and late preterm newborns 34 weeks-36^{+6} weeks (n=33, 39.3%) RDS is the most common cause. Term newborns (n=108; 40.7%) have MAS as the commonest cause of respiratory distress.

Table 1: Causes of respiratory distress in study subjects according to mode of delivery (n=200).

Causes of respiratory distress	LSCS, (n=109)	NVD, (n=91)
RDS	35	36
MAS	33	20
TTN	19	7
Birth asphyxia	14	15
CHD	4	0
Polycythaemia	2	1
PPHN	1	5
U/L Choanal atresia	1	0
Congenital diaphragmatic hernia	0	1
Pleural effusion	0	1
Pneumonia	0	5
Total	**109**	**91**

Among our study subject recruits (n=200) with respiratory distress (Table 1), LSCS (n=109) was observed to be a slightly commoner mode of delivery.

After analysing the data for the incidence of various causes of respiratory distress in study subjects among the two modes of delivery-LSCS and NVD, RDS was overall most common in both the sub-groups (n=35, n=36 respectively) followed by MAS.

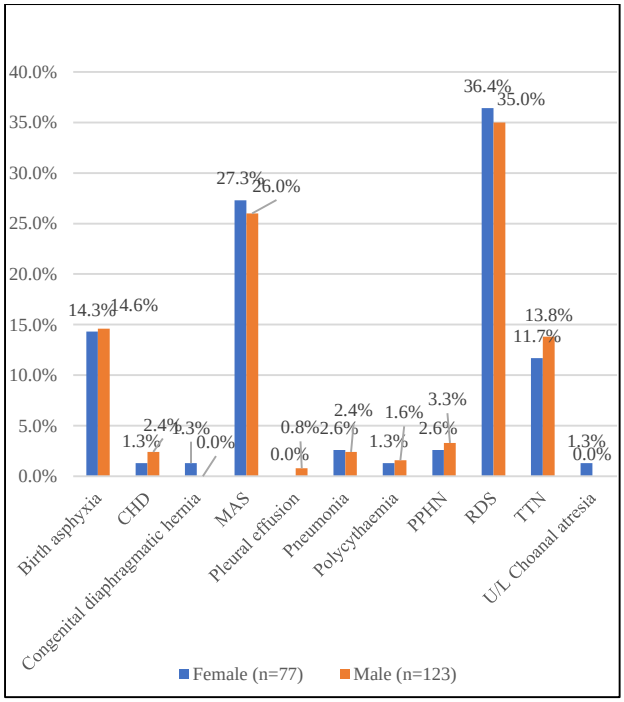

Figure 6: Causes of respiratory distress in study subjects according to gender, (n=200).

Approximately 60% of study recruits were males (n=123) in which RDS (n=43) was the most common cause of respiratory distress followed by MAS (n=32), birth asphyxia (n=18) and TTN (n=17) (Figure 6). Similar trends were observed in the female subjects. However, incidence of TTN was twice in males than females.

It was also observed that continuous positive pressure ventilation was the most common mode of ventilation in study subjects (n=135), followed by nasal prongs (n=33) and ventilator (n=32).

Out of 5 candidates who received surfactant 4 expired (80.00%) and out of 66 candidates of RDS who did not received surfactant 19 expired (28.78%). There is no positive association between surfactant received and RDS cases discharged in our study due to treatment bias as surfactant was given to sick RDS neonates.

On analysis of maternal diagnosis predisposing respiratory distress in newborns it was observed that GDM (Gestational diabetes mellitus) in mothers (n=26) led to RDS in 9 newborns followed by MAS in 5 newborns whereas PPROM (Preterm premature rupture of membranes) (n=13) to RDS in 8 newborns.

Out of 200 enrolled candidates (Figure 7) in our study 167 (83.5%) were discharged and 33 (16.50%) expired.

It was observed (Table 2) that amongst the discharged candidates most of them had MAS and RDS (n=48) followed by birth asphyxia and TTN.

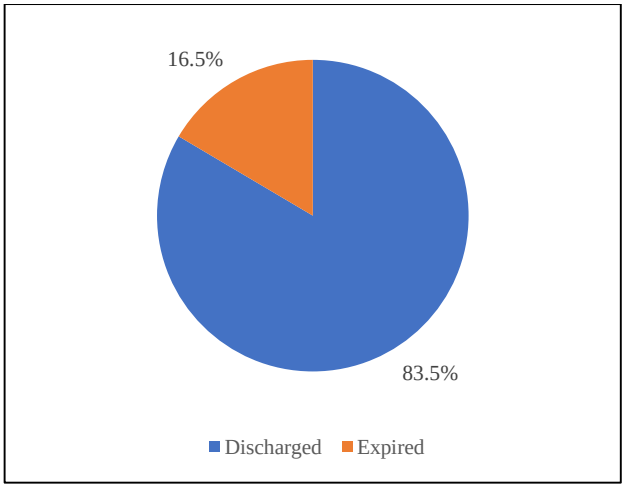

Figure 7: Outcome of respiratory distress in study subjects, (n=200).

Table 2: Outcome according to different causes of respiratory distress in study subjects, (n=200).

Causes of respiratory distress	Discharged	Expired
MAS	48	5
RDS	48	23
Birth asphyxia	27	2
TTN	26	0
PPHN	6	0
Pneumonia	5	0
CHD	3	1
Polycythaemia	3	0
U/L choanal atresia	1	0
Congenital diaphragmatic hernia	0	1
Pleural effusion	0	1
Total	167	33

Out of 33 expired candidates' majority were RDS (n=23) i.e. approximately 70% followed by MAS (n=5) and birth asphyxia (n=2).

Table 3: Association of antenatal steroids (4 doses of dexamethasone) received by mother with outcome of respiratory distress in study subjects, (n=71).

Outcome	Received, (n=14)	Not received, (n=57)
Discharged	12 (85.7%)	36 (63.2%)
Expired	2 (14.3%)	21 (36.8%)

*P=0.12

It was observed that (Table 3) 85.7% of RDS neonates whose mothers received antenatal 4 doses of dexamethasone were discharged while only 63.2% RDS neonates were discharged whose mothers did not receive antenatal steroids. In our study there is positive association between antenatal steroids received by mothers of RDS neonates and RDS neonates discharged after treatment.

DISCUSSION

In our study population of 200 neonates enrolled 61.5% were males which was similar to studies like Behera et al had 62.4% males, Lamichhane et al had 60.36% male neonates.[6,8] Among neonates with respiratory distress caesarean section was the mode of delivery in majority of cases 54.5% in our study, corresponding to other studies like Lamichhane et al with LSCS as 51.35% and Sahoo et al with 56% caesarean deliveries.[6,9]

Prevalence in our study is similar to Tochie et al review and Lamichhane et al.[3,6] In our study RDS (35.5%) is the leading cause of respiratory distress as in Baseer et al (49.6%) and Tochie et al review (58 studies from Asia) (35.83%) whereas comparable to Behera et al (32.4%) and Raha et al (29.1%).[2,3,8,10] MAS (26.5%) is the second most common cause of respiratory distress followed by birth asphyxia (14.5) and TTN (13%) which is also comparable to studies mentioned. Pneumonia also holds major share in respiratory distress in various other studies.

Also, it was observed that respiratory distress was more common in preterms than in term neonates proportional to other studies. But Raha et al and Behera et al had greater number of term neonates enrolled so in their study larger percentage of term newborns had respiratory distress compared to preterms.[8,10] In our study it was observed that neonates of mothers having GDM, PPROM, oligohydramnios, polyhydramnios, maternal fever, diabetes mellitus and chorioamnionitis co-morbidities were more predisposed to respiratory distress than others like in Rijal et al.[5] In our study it was observed that majority of neonates received CPAP (67.5) while in Raha et al received others (oxygen via hood or nasal prongs) because in our study majority of recruits were preterm and B Raha et al had term neonates.[10]

In our study 16.5% of newborns expired which is comparable to Tochie et al (25 studies from Asia) 20.29% and Rijal et al with 12.8%.[3,5] In our study percentage recovery was 100% in TTN which is comparable to Sahoo et al et al, Parkash et al and Tochie et al.[9,11,12]

Limitation was sample size of our study was small.

CONCLUSION

Prevalence of neonatal respiratory distress was found to be 7.12% in our study. According to our study, TTN, birth asphyxia, and RDS were the next most common causes of respiratory distress in term and post-term neonates, after MAS whereas pneumonia, CHD and PPHN vary in numbers. Causes like CDH, polycythemia, pleural effusion, choanal atresia were fewer in numbers. RDS was the leading cause of respiratory distress in preterm neonates.

Among all the causes of neonatal respiratory distress TTN carries a good prognosis with maximum recovery rates. The major causes for mortality in our study due to neonatal respiratory distress were RDS followed by MAS and birth asphyxia. There were various fetal and maternal factors, predisposing to neonatal respiratory distress which also influenced their immediate clinal outcomes these include; male sex, caesarean section, maternal age, maternal comorbidities, gestational age, antenatal steroids received by mother, etc.

Therefore, appropriate steps must be taken to reduce morbidity and mortality in neonates due to various causes of respiratory distress mainly aiming for effective management of these conditions.

Recommendations

Measures like change of maternal life style, adequate antenatal care, intra-partum care and postnatal care should be taken to advert risk factors thereby, leading to better anticipation of management of respiratory distress in neonates. At the same time, there is need for more aggressive treatment and innovations targeted towards RDS.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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