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Prevalence and Outcome of Respiratory Distress in Newborn- A Tertiary Care Hospital Experience

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Abstract
Objective: *To determine the etiology, prevalence and outcomes of respiratory distress in neonates hospitalized in the SNCU/NICU in VSSIMSAR Hospital, Burla.*

Methods: *5760 neonates, both inborn and out born, admitted with respiratory distress were considered, out of which 417 were enrolled in the study after meeting inclusion and exclusion criteria. The required demographic informations were extracted from patients' dossiers. Examinations and investigations were carried out.*

Study Design: *Hospital based prospective observational study.*

Statistical Analysis: *The descriptive data were analysed using SPSS v 25.0 (IBM, New York) software.*

Result: *Out of the 417 cases enrolled in the study with male to female ratio of 1.66:1, the prevalence of respiratory distress was found to be 13.81%. 55.2% of neonates were of term gestation and 40% were preterm. Most common cause of respiratory distress was found to be HIE II:147 (35.3%), followed by RDS:135 (32.4%), Sepsis: 68 (16.3%), HIE III:36 (8.6%), MAS:16 (3.8%) and HIE I:15 (3.6%).281 (67.4%)were discharged, death occurred in 113 (27.1%)cases while 12 (2.9%) of them were referred to higher centre and 11(2.6%)cases went LAMA. Out of the 113 deaths, 40 (35.4%) were preterm, 32 (28.3%) were HIE III, 21 (18.5%) were HIE II and 20 (17.8%) were sepsis.*

Conclusion: *It was found that HIE II was the most common cause of respiratory distress, followed by RDS. Prematurity associated with RDS was most common cause of mortality followed by HIE and sepsis. Many of the etiologies for respiratory distress are preventable. Adequate follow-up of pregnancy and labor for early detection of risk factors, early referral to higher centre and timely intervention may improve the outcome of neonatal respiratory distress.*

Keywords: *Neonates, Respiratory distress, Prematurity, HIE.*

Introduction

Neonatal respiratory distress (NRD) is one the most common problems in the first few days of neonatal life. NRD is one of the most common causes of admission in NICU and throws a challenge to the treating paediatrician.[1] Most of

the causes of neonatal morbidity and mortality are preventable. Early detection of risk factors and early treatment of the cause for the respiratory distress will definitely improve the outcome of the newborn.

Among the neonates admitted in NICU, 29% of late preterm and 15% term infants develop significant respiratory morbidity.[2]Pulmonary disorders that manifest in the newborn are usually related to immaturity of the lung, events that occurred in the perinatal period, or a result of congenital malformations.[3] RDS, TTN, MAS, Birth Asphyxia, Congenital Heart Diseases, Septicemia are few of the numerous causes of respiratory distress in a newborn. The general principles of care are the same in all cases regardless of neonatal respiratory distress causes. Scores like the Silverman-Anderson Score and Downe's score are very useful to determine the progression of the respiratory distress. The importance of such an evaluation would be invaluable to plan referrals in the resource-limited environment of developing countries, where structured neonatal transportation facilities are unavailable.

Despite a relatively uniform approach to the initial management, delay in instituting definitive therapy would result in adverse outcome. Therefore, a definite diagnosis is mandatory for successfully managing infants with respiratory distress. The present study is intended to determine the etiology, prevalence and outcomes of respiratory distress in neonates hospitalized in the SNCU/NICU in VSSIMSAR Hospital, since having an idea of the common causes of respiratory distress is significant to help better treatment of neonates.

Materials and Methodology

This is an hospital based prospective observational study conducted in SNCU/NICU of a tertiary care teaching hospital of Western Odisha from September 2017 to October 2019.All newborns with respiratory distress who were hospitalized in SNCU/NICU with a birth age up to 28 days, of both sexes, with any gestational age and birth weight, were included. Syndromic neonates and surgical conditions leading to respiratory distress were excluded. Sample size estimation was done by n Master version 2.0 (BRTC) Vellore, using method one group proportion- confidence interval estimating single proportion- absolute precision of 4% method. As per the previous study "A clinical study of respiratory distress in newborn and its outcome", prevalence of respiratory distress among neonates is 13.7%. Taking confidence interval of 95%, minimum sample size is 284. Adding10% dropout, final minimum sample size was approximately 312.Out of 5760 neonates admitted in SNCU/NICU in the said study period, 417 cases were enrolled in the study after meeting inclusion and exclusion criteria through convenience sampling.

The required demographic information was extracted from patients' dossiers about the conditions of the selected neonates in terms of neonatal age upon admission, birth weight, gender, gestational age, habitat, birth order, place of delivery, mode of delivery, multiple gestation, any significant past history, maternal disease, presence of any maternal or foetal risk factors causing respiratory distress using a researcher-made questionnaire. Disease history and patient examination carried out to find different causes of respiratory distress. In babies with suspected septicaemia, sepsis screening was done based on WHO neonatal sepsis screening tool augmented with National Neonatal Intensive Care Unit Manual.[4,5]If any two parameters were abnormal, it was be considered as a positive septic screen and sample for blood culture and sensitivity was sent as it is gold standard for diagnosis of septicaemia. The results of chest radiography, cardiac echocardiography, transcranial ultrasound and blood culture and sensitivity were utilised for establishing complete diagnosis. The outcomes of neonatal respiratory distress led to either hospital discharge with complete improvement of respiratory symptoms or referral to higher centre

or death. The diagnosis of cause of respiratory distress was based on guidelines by NNF.[6,7]

Investigations

1. Complete blood count.
2. Neonatal sepsis screening in selected cases.[8-10]
3. Blood culture and sensitivity in selected cases.
4. CSF study in selected cases.
5. Chest X-ray.[11]
6. Transcranial ultrasound in selected cases.
7. 2D-Echocardiography.

All the relevant data collected were recorded in a predesigned case report format (CRF).Data validation and data cleaning were done manually by two separate persons not involved in the study. The descriptive data collected were analysed using SPSS v 25.0 (IBM, New York) software**.**

Results

A total of 417 cases were included in the study. The prevalence of respiratory distress in neonates admitted with respiratory distress in NICU/SNCU in our study is 13.81% (Table 1). Table 2 shows gender wise and gestational age wise distribution of cases. Males were260 (62.4%) while females were 157 (37.6%). Term neonates occupied maximum number of cases 230(55.2%) followed by preterm newborns 167 (40%). Post term neonates constituted 20 (4.8%) cases. Table 3 shows the various etiology of respiratory distress in our study. Most common cause of respiratory distress was HIE II 147 (35.3%) followed by RDS 135 (32.4%). Other causes were sepsis 68 (16.3%), HIE III 36 (8.6%), MAS 16 (3.8%) and HIE I 15 (3.36%) respectively. Table 4 shows the outcome of NRD in our study population. 281(67.4%) cases were discharged and death occurred in 113 (27.1%) cases. 12 (2.9%) cases were referred and 11 (2.6%) cases went LAMA. Table 5 denotes various causes of mortality in neonates with respiratory distress in our study. Among 113 (27.1%) deaths, the most common cause of death was prematurity 40 (35.4%)

followed by HIE III 32 (28.3%), HIE II 21 (18.5%) and Sepsis 20 (17.58%) respectively.

Table 1: Prevalence of respiratory distress in neonates admitted with respiratory distress in NICU/SNCU.

Total NICU/SNCU admissions	n (%)
5760	417(13.81)

Table 2: Gender and gestational age of the neonates admitted with respiratory distress in NICU/SNCU.

Gender and Gestational age	n (%)
Male	260 (62.4)
Female	157 (37.6)
Preterm	167 (40)
Term	230 (55.2)
Post Term	20 (4.8)

Table 3: Etiology of respiratory distress neonates admitted with respiratory distress in NICU/SNCU.

Diagnosis	n (%)
RDS	135(32.4)
HIE I	15(3.6)
HIE II	147(35.3)
HIE III	36(8.6)
MAS	16(3.8)
SEPSIS	68(16.3)

Table 4: Outcome of neonates admitted with respiratory distress in NICU/SNCU

Outcome	n (%)
Discharged	281(67.4)
Referred	12(2.9)
LAMA	11(2.6)
Death	113(27.1)

Table 5: Causes of mortality in neonates admitted with respiratory distress in NICU/SNCU

Cause of death	n (%)
Prematurity	40(35.4)
HIE III	32(28.3)
HIE II	21(18.5)
Sepsis	20(17.8)

Discussion

The present study was conducted in SNCU/NICU, Department of Pediatrics, VSSIMSAR, Burla were the prevalence of respiratory distress is high. Respiratory distress is one of the commonest disorders encountered within the first 48-72 hours

of life. The prevalence of respiratory distress in neonates admitted with respiratory distress in NICU/SNCU in our study is 13.81% as evidenced in Table 1. Studies done by Dr. Alok Kumar and B. Vishnu Bhat[12] had shown an incidence of 6.7%. Another study by S. Thomas, M.D. Ishwar C. Verma, and P.S.N. Menon, M.D. in All India Institute of Medical Sciences Hospital had shown an incidence of 8.28%. Another study done by Dr. Santosh S., Kushal Kumar K., Adarsha E. studied in KIMS Hospital, Bengaluru showed a prevalence of 13.7%.

As evidenced in Table 2, gender wise distribution of total cases admitted with NRD males contributed to the majority of the cases with 260 (62.4%) while females were 157 (37.6%). Gestational age wise categorisation of cases show that term neonates occupied maximum number of cases 230 (55.2%) followed by preterm newborns 167 (40%). Post term neonates constituted 20 (4.8%) cases. These findings were not consistent with the study done by S. Thomas, M.D., Ishwar C. Verma, and P.S.N. Menon, M.D. in All India Institute of Medical Sciences Hospital.

As seen in Table 3, among various etiology of NRD in our study, most common cause of respiratory distress was HIE II 147 (35.3%) followed by RDS 135 (32.4%). Other causes were sepsis 68 (16.3%), HIE III 36 (8.6%), MAS 16 (3.8%) and HIE I 15 (3.36%) respectively. Other studies show a different picture in the incidence of causative disease. Dr. Alok Kumar and B. Vishnu Bhat had found that Transient tachypnea ofnewborn to be the commonest (42.7%) cause of respiratory distress followed by infection (17.0%), meconium aspiration syndrome (10.7%), hyaline membrane disease (9.3%) and birth asphyxia (3.3%). Their study reveals that among preterm & term babies TTN was the commonest cause of respiratory distress(32.8 & 50.3 % respectively). S. Thomas, M.D., Ishwar C. Verma, and P.S.N. Menon, found that maximum number of cases (51.4%) were due to pneumonia and bronchopneumonia. Transient tachypnea was observed in 19%, all of termgestation. Meconium

aspiration was responsible in 12.1%. Hyaline membrane disease was responsible for respiratory distress in 8.6% cases. Septicemia, birth asphyxia, RDS and TTN were found to be the most common causes of neonatal respiratory distress in Adebami's et al. study.[13] Sauparna et al.[14] reported pneumonia, RDS, MAS, TTN, CHD, diaphragmatic hernia and pulmonary hemorrhage respectively as the most common causes of hospitalization for neonatal respiratory distress. Swarnkar at al.[15], and Kommawar et al.[16], found TTN, RDS, asphyxia and MAS as the common causes of neonatal respiratory distress.

As of outcome of neonates admitted with respiratory distress is concerned, Table 4 suggests that in our study, majority of the cases have been discharged 281 (67.4%) followed by death in 113 (27.1%) cases while 12 (2.9%) of them were referred to higher centre and 11 (2.6%) cases went LAMA. In study conducted by Lt Col RK Malik, Maj Gen RK Gupta had shown total mortality rate of 33.6% Another study by done by Dr Alok Kumar and B. Vishnu Bhat depicted a total mortality rate of 19%. Similar study done by Dr. A K Malhotra and R Nagpal observed a mortality rate of 38%. In another study conducted by Arit Parkash, Nighat Haider, Zubair Ahmed Khoso, Abdul Sattar Shaikh found that in total,138(67.3%) neonates were discharged, while 67(32.7%) expired.[17]

Among 113 (27.1%) deaths in newborns with respiratory distress in our study, the most common cause of mortality was prematurity 40 (35.4%) followed by HIE III 32 (28.3%), HIE II 21 (18.5%) and Sepsis 20 (17.58%) respectively. In study done by Ankush Kommawar et al, RDS (61.62%) was the most common cause of deaths in neonates with respiratory distress admitted in NICU followed by birth asphyxia (17.4%).[16]Study done by Mohammad Kazem Sabzehei, Behnaz Basiri, Maryam Shokouhi, Afshin Fayyazi[18] found RDS (82.4%), pneumonia (78.6) and CHD (62.5%) were the most common causes of infant mortality, respectively.

Conclusion

Neonatal respiratory distress is a major cause of neonatal admissions and has a high mortality rate. In our study HIE II was the most common cause of respiratory distress, followed by RDS, HIE III, MAS and HIE I respectively. Male newborns of term gestation term were more affected than preterm babies. Most of them were discharged signifying better management strategies and among those newborns died, prematurity was most common cause of death followed by HIE III. Many of the risk factors and etiologies for respiratory distress are preventable. Adequate follow-up of pregnancy and labor for early detection of risk factors, early referral to higher centre and timely intervention may improve the outcome of neonatal respiratory distress.

Author's Contribution

JNB has developed the concept proposal, manuscript writing and literature search. GV has done the statistical analysis, manuscript writing, literature search, data collection and validation. DKK has done the data collection and data entry. All the authors have done the proof reading.

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Conflict of Interest

The authors declared that they have no conflicts of interest.

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List of abbreviations

CHD- Congenital heart disease.

CSF- Cerebrospinal Fluid.

HIE- Hypoxic Ischemic Encephalopathy.

LAMA- Left Against Medical Advice.

MAS – Meconium Aspiration Syndrome.

NICU- Neonatal Intensive Care Unit.

NNF- National Neonatology forum.

NNPD- National Neonatology Perinatology Database.

NRD- Neonatal respiratory distress.

RDS – Respiratory Distress Syndrome.

SNCU- Special Newborn Care Unit.

TTN- Transient Tachypnoea of Newborn.

WHO- World Health Organisation.