e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(11); 1078-1088

Original Research Article

Etiological Study of Respiratory Distress and Outcome in Term Early Neonates – A Hospital Based Stud

Narayan Prasad Modi[1], Punyatoya Samal[2], Ramamani Dalai[3], Sabitri Beshra[4], Mangal Charan Murmu[5]

[1]Associate Professor, Department of Pediatrics, JK Medical College, Jajpur
[2]Senior Resident, Department of Pediatrics, S C B medical College, Cuttack, Odisha
[3]Associate Professor, Department of Ophthalmology, FM Medical College, Balasore, Odisha
[4]Assistant Professor, Department of Pharmacology, BB Medical College, Balangir
[5]Professor, Department of Pediatrics, Government Medical College, Sundargarh

Received: 09-08-2023 / Revised: 12-09-2023 / Accepted: 30-10-2023
Corresponding Author: Mangal Charan Murmu
Conflict of interest: Nil

Abstract

Introduction: Respiratory distress is a major contributor to newborn admission in neonatal period. It also contributes to significant morbidity and mortality. Respiratory distressis not a disease per se, but a common manifestation of varying disorders of both respiratory and non respiratory etiology.

Aim & Objective: To study the clinical and etiological profile of respiratory distress in term neonates in early [0-7] days of life and it's outcome in relation to maternal and neonatal risk factors. Material& Method: This observational perspective study was done in the department of pediatrics SCB Medical College, Cuttack from to 2022. 180 cases were studied who qualified the inclusion criteria.

Observation: Birth asphyxia (27.8%) was most common cause of respiratory distress followed by TTN (25.6%), Sepsis (18.3%), MAS(10.6%) and CHD(6.7%). RDS, Pneumothorax, Pneumonia, PPHN and surgical cases were other etiologies contributing to the respiratory distress in term newborns. Mortality in our study was found to be one-fifth of the cases. Birth asphyxia (33.3%), MAS(16.6%) and Sepsis(13.8%) were major contributors of mortality.

Conclusion: Perinatal asphyxia, TTN, MAS and CHD still remained major etiologies causing respiratory distress in term neonates. Perinatal asphyxia and MAS are major causes of death. Antenatal factors like maternal co-morbid illness, PROM, MSAF are risk factors for neonatal respiratory distress. Early identification and appropriate management of these conditions is essential to decrease the neonatal mortality rate.

Keywords: Respiratory distress , Neonate, Risk factor , Birth asphyxia

Introduction

Respiratory distress is one of the most common problems neonates encounter within the first few days of life [1]. Every year. An estimated 2.9 million babies die in the neonatal period [the first 28 days of life], accounting for more than half of the under-five child deaths in most regions of the world, and 44% globally [2]. The majority [~75%] of these deaths occur in the first week of life, with the highest risk of mortality concentrated in first day of life. Respiratory distress is one of the most common causes of hospitalization in neonatal period. The incidence of neonatal respiratory distress ranges from 2.2% to 7.6% in developed countries and from 0.7% to 8.3% in India [3]. Another study had found the incidence upto 13.7% [4]. The etiology of neonatal respiratory distress can be varied involving both respiratory system and nonrespiratory causes. The fetal lung has no active role in gaseous exchange in intrauterine life. When a baby is born, for successful transition into extra uterine life, ventilatory function of the lungs must be established. This depends upon many factors, most important ones being- rapid and effective clearance of lung fluid, patent airways, sustained Functional Residual Capacity [FRC]. Any abnormality in anatomy or physiology of respiratory tract can lead to respiratory distress in a newborn. The non-respiratory causes include neurologic, cardiovascular , metabolic , hematologic or neuromascular disorders. Respiratory distress is defined as presence of any two of the following criteria – Respiratory rate [RR]>60/min, Subcostal/intercostal recessions and Expiratory grunt/groaning [5]. Presence of nasal flaring, suprasternal retraction, decreased air entry on auscultation, cyanosis are also indicators of respiratory distress. The incidence of respiratory distress is more in preterm as compared to term neonates with Respiratory Distress Syndrome [RDS] being most common cause. The major causes in term

neonates include Transient Tachypnea of Newborn [TTN], Birth Asphyxia, Respiratory Distress Syndrome [RDS], Meconium Aspiration Syndrome [MAS], and sepsis [Pneumonia]. Among maternal risk factors, Cesarean section and PROM have been identified as significant etiological contributors in development of neonatal respiratory distress. Male sex has been found to be an associated risk factor. Neonatal respiratory distress has high mortality rate if proper timely interventions are not done especially in preterm and low birth weight babies. Early recognition and disease specific treatments have shown improved prognosis and outcomes. In spite of advancement in diagnostic and therapeutic measures, mortality and morbidity due to neonatal respiratory distress is still high. The no. of studies on neonatal respiratory distress in our country is limited. The result of such studies also vary in different centers. Our institution being a tertiary care center , handles both inborn and referral patients from all over the state with approx. 600 newborn admissions per month. At this juncture, this study will help us to understand the etiological distribution and clinical presentation of respiratory distress in term babies so that treating physician can be able to determine strategies for better outcome in terms of morbidity and mortality.

Aims & Objectives : PRIMARY OBJECTIVE: To know the clinical and etiological profile of respiratory distress in term neonates in early [0-7] days of life and it's outcome in relation to maternal and neonatal risk factors SECONDARY OBJECTIVES: 1. To study the etiology of respiratory distress among term newborns in early neonatal period [0-7] days 2. To find out clinical spectrum of respiratory distress in term newborns 3. To evaluate morbidity and mortality of respiratory distress in term newborns in a tertiary care center with respect to predictors of outcome 4. To assess relationship between maternal risk factors and incidence of respiratory distress in newborn period.

Material & Methods :

After getting clearance form institutional ethical committee, this observational prospective study was conducted in the Department of Pediatrics, SCB Medical College and Hospital, Cuttack and S.V.P.P.G.I.P. Cuttack, Odisha from October 2021-September 2022.

Inclusion Criteria:

1.Newborns with 37 completed weeks or more of gestational age admitted with complaint of respiratory distress in Newborn ward , SNCU and NICU,2. Newborns presented with respiratory distress during 0-7 days of life

Exclusion Criteria:

1.Newborns older than 7 days of age, 2. Newborns with gestational age less than 37 completed weeks, 3. Newborns who left against medical advice.

A total of 180 cases were taken into account who qualified for the inclusion criteria of our study.

A valid informed written consent was taken from parents or caretaker of each patient for obtaining relevant history, clinical examination and performing necessary investigations. Antenatal history of mother were collected in detail to study the relevant risk factors.

The following information was taken: Neonatal data included: 1. Name 2. Day of life at admission 3. Sex 4. Date of admission 5. Date of discharge or death 6. Body weight at birth 7. Gestational age according to the date of last menstrual period of the mother antenatal ultrasound or New Ballard Score. Factors related to labor and delivery recorded : 1. Mode of delivery (vaginal or LSCS or assisted) 2. Place of delivery (Inborn or Outborn) 3. Complications (prolonged rupture of membranes >18 hr, prolonged labor>18hrs, meconium staining of liquor, antepartum hemorrhage and others) Maternal information recorded : 1. Age (high risk group ≤18 yr or ≥35 yr and low risk group 19-34 yr), 2. Parity (which is divided into risk group P1 or >P4 and normal group = P2-4), 3. Any medical / surgical condition complicating pregnancy. This information was reviewed retrospectively from the clinical records

Investigations:

The final diagnosis of clinical conditions producing respiratory distress was based mainly on careful scrutiny of the history, clinical, radiological findings and other relevant investigations. This includes Complete blood count, absolute neutrophil count, I/T ratio, CRP (Q), Blood culture, ECHO Cardiography.

Data Analysis :

All the data collected was tabulated systematically. Data was analysed using SPSS version 24.0 software. Findings were recorded as percentages and graphically represented using bar graphs, piecharts and box-and-whisker plots. Relevant statistical tests – Chi-square test, Independent t test and Mann Whitney U test- were used to find correlation between various parameters. The p-value

<0.05 was taken statistically significant.

Observation

Table 1: Etiologywise disrtibution of death(n=36)

ETIOLOGY	NO OF CASES	NO OF DEATHS	PERCENTAGE (%)	CFR
BA	50	12	33.3	24.0%
TTN	46	0	0	0%
Sepsis	33	5	13.8	15.2%
MAS	19	6	16.6	31.6%
CHD	12	4	11.1	33.3%
RDS	4	0	0	0%
Pneumothorax	4	2	5.5	50%
NEC	3	2	5.5	66.7%
CDG	2	2	5.5	100%
Pneumonia	2	0	0	0%
PPHN	1	1	2.7	100%
Cleftlip	1	0	0	0%
TEF	1	1	2.7	100%
CaecalPerforation	1	1	2.7	100%
Hirschsprung	1	0	0	0%
Total	180	36	100	

Out of total 180 cases included in study, 36 died with a mortality of 20%. Birth Asphyxia was the main cause for mortality contributing to 33.3% overall death. MAS was second most common cause for mortality found in 16.6%cases.CHD was cause of death in 11.1% cases with Sepsis causing 13.8% deaths. TTN,RDS Pneumonia, Hirschsprung and cleftlip cases had no deaths attributed to them. Case fatality rate(CFR)for Birth Asphyxia was 24.0%,MAS was 31.6%,CHD was 33.3% and Sepsis was15.2% . Pneumothorax had a CFR of 50% and NEC 66.7%. CDH, PPHN, TEF and Caecal Perforation each had a CFR OF 100%.

Table 2: Etiologywise Distribution Of Discharge

DIAGNOSIS	NUMBER	DISCHARGE	PERCENTAGE
BA	50	38	76
TTN	46	46	100
SEPSIS	33	28	84.8
MAS	19	13	68.4
CHD	12	8	66.7
RDS	4	4	100
PNEUMOTHORAX	4	2	50
NEC	3	1	33.3
CDH	2	0	0
PNEUMONIA	2	2	100
PPHN	1	0	0
TEF	1	0	0
CAECALPERPF	1	0	0
HIRSCHSPRUNG	1	1	100
CLEFTLIP	1	1	100
TOTAL	180	144	

All 46 cases of TTN were discharged.38 out of 50 cases of Birth asphyxia were discharged . 28 out 33 Sepsis cases, 13 out of 19 MAS cases, 8 out of 12 CHD cases, 4out of 4 RDS cases,2 out of 2 pneumonia cases and 2 out of 4 pneumothorax cases were discharged.

Table 3 : Maternal factors

Maternal Factor		Number	%	outcome		P value
				Death	discharged	
Age	≤18or≥35yrs	20	11.1	25.78±5.04	26.37±5.16	0.539
	19-34yrs	160	88.9			
Gestational age in weeks	37– 38 wk	69	38.3	39.19±1.75	38.90±1.43	0.458
	≥39 wk	111	61.7			

Maternal age was ≤18years or ≥35years in 20cases and19-34in16 cases. 11.1%of mothers were in extreme age group. Out of 180 newborns with respiratory distress, 91 were born to primi mothers, 85 newborns were born to P2 to P4 mothers and 4 were born to grand multipara mothers (>P4). Out of 180 term babies, 69(38.3%) were early term (37-38 week) and 111(61.7%)were late term (≥39weeks) with more cases of respiratory distress

The mean maternal age among deaths was found to be 25.78±5.04 years and those who were discharged had mean age of 26.37±5.16 years. The *p*-value for relationship between maternal age and outcome was 0.539. The mean gestational age at delivery was 39.19±1.75 weeks for dead newborns and 38.90±1.43 weeks for discharged babies. The *p*-valve was found to be 0.458 for correlation between outcome in this study and gestational age.

Table 4: Distribution of comorbid illnessin mother (n=73)

CO-MORBIDILLNESS	NUMBER	PERCENTAGE(%)
IDM	22	12.2
PIH	13	7.2
Anemia	9	5.0
Oligohydrominos	8	4.5
Hypothyroidism	7	3.9
Pre-eclampsia	3	1.7
UTI	3	1.7
Epilepsy	2	1.1
CMV Infection	1	0.6
Eclampsia	1	0.6
Renal Calculus	1	0.6
Scoliosis	1	0.6
SLE	1	0.6
TB	1	0.6

Out of 73mothers having antenatal co-morbidities, maximum were suffering from DM(22) accounting for 12.2% followed by PIH in13mothers (7.2%) with 3 suffering from pre-eclampsia (1.7%). Anemia was present in 9mothers (5%) followed by oligohydramnios in 8(4.5%) and hypothyroidism in 7(3.9%) mothers. UTI, Epilepsy, Eclampsia, Scoliosis, TB, CMV infection, SLE and renal calculi were other conditions diagnosed.

Table 5: Relationship between maternal comorbid illness and outcome

COMORBID ILLNESS	OUTCOME		Total	P-Value
	DEATH	DISCHARGED		
PRESENT	16(21.9%)	57(78.1%)	73	0.595
ABSENT	20(18.7%)	87(81.3%)	107	

Out of 73 babies who had mothers having comorbid illness, 16(21.9%) died and 57(78.1%) were discharged. Of 107 mothers not having any antecedent illness, 20(18.7%) of the newborns died and 87(81.3%) were discharged. The *p*-valve for maternal comorbid illness as predictor of outcome was 0.595.

Table 6: distribution of perinatal risk factors (n=119)

Perinatal risk factor	Number	%	Outcome		Total	p-value
			Death	Discharge		
PROM	34	28.6	7 (20.6%)	27(79.4%)	34	0.924
PROLAB	56	47.1	17(30.4%)	39(69.6%)	56	0.020
MSAF	29	24.3	8 (27.6%)	21(72.4%)	29	0.265
TOTAL	119	100				

Out of 180 newborns taken in our study, mothers of 34(28.6%) had prolonged rupture of membrane (>18 hours), 56 (47.1%)had prolonged labour (>18 hours) and 29(24.3%) had meconium stained amniotic fluid. Of 34 mothers who had PROM,7 (20.6%) of the newborns died and 27(79.4%) were discharged. 56 babies were born after prolonged labour of more than 24 hours out of which 17(30.4%) died and 39(69.6%) got discharged. 29 babieshad meconium stained amniotic fluid who had respiratory distress, of which 8(27.6%) died and 21(72.4%) were discharged. The p-value for outcome for PROM, PROLAB and MSAF were 0.924, 0.020 and 0.265 respectively.

Table 7: Relationship between investigations and outcome

FINDING	OUTCOME		Total	P Value
	DEATH	DISCHARGED		
ABNORMALCXR	25(28.1%)	64(71.9%)	89	0.007
ABNORMALCBC	16(30.8%)	36(69.2%)	52	0.021
ABNORMALCRP	20(35.1%)	37(64.9%)	57	0.001
ABNORMAL ECHO	4 (33.3%)	8 (66.7%)	12	0.232
POSITIVENEC	2 (66.7%)	1 (33.3%)	3	0.102
POSITIVE BLOOD C/S	12(31.6%)	26(68.4%)	38	0.045

Out of 89 patients having abnormal chest X-ray , 25 died(28.1%) and 64 were discharged(71.9%).The relationship of abnormal chest X-ray with outcome was found to be p-value of 0.007. Out of 180 newborns, 52 had abnormal CBC. 16 out of 52 such newborns (30.8%) died and 36(69.2%) were discharged. The p- value was found to be 0.021. Abnormal CRP was found in 57 patients , out of which 20 died(35.1%) and 37 were discharged(64.9%). The statistical outcome was found to p value of 0.001. 12 babies were diagnosed as Congenital Heart Disease confirmed by abnormal ECHO. Out of12 , 4 died(33.3%) and 8 were discharged (66.7%). The p-value for correlation was found to be 0.232. 3 patients diagnosed as NEC out of which 2(66.7%) died and 1 was discharged (33.3%). The statistical correlation was p-value 0.102. Blood culture waspositive in a total of 38 patients out of which 12 died(31.6%) and 26(68.4%) were discharged. The relationship between positive blood culture and outcome was p-value 0.045.

Table 8 : gradatdion of respiratory distress and outcome

Parameter		Number	%	Outcome		p-value
				Death	discharge	
Downes' score	<5	111	61.7	5.89±1.7	2.93±2.1	0.001
	5-7	65	36.1			
	>7	4	2.2			
Duration hospitalization	≤3DAYS	53	29.4	10.64±9.3	8.55±6.7	0.334
	>3 DAYS	127	70.6			
	TOTAL	180	100			

Respiratory distress was graded using Downes' score. Out of 180 newborns,111 had score<5 (mild distress)(61.7%),65(36.1%)had scoreof5-7(moderate distress). Only 4 patients were received in severe distress with score >7(2.2%). Out of 180 newborns included in the study, 53(29.4%) either died or discharged within 3 or less than three days of hospitalization. 127 newborns were discharged or died after 3 days of hospitalization(70.6%). Downe's score for babies who died was 5.98±1.7 and those who were discharged was 2.93± 2.1. The *p*-value for correlation was 0.001. Average no days for those who died was10.64±9.3days and for discharged babies was 8.55±6.7 days. The *p*-value was found to be 0.334.

Table 9: Etiologywise oxygen requirement (n=180)

DIAGNOSIS	VENTILATOR	HOOD	CPAP	NP
BA(50)	13	16	8	13
TTN(46)	0	4	7	35
SEPSIS(33)	5	4	5	19
MAS(19)	4	1	14	0
CHD(12)	6	0	4	2
RDS (4)	0	0	4	0
PNEUMOTHORAX(4)	4	0	0	0
NEC (3)	1	0	1	1
CDH(2)	2	0	0	0
PNEUMONIA(2)	1	0	1	0
PPHN(1)	1	0	0	0
CLEFTLIP(1)	0	1	0	0
TEF (1)	1	0	0	0
CAECAL PERFORATION(1)	1	0	0	0
HIRSCHSPRUNG(1)	0	0	0	1
TOTAL(180)	39	26	44	71

Out of 50 cases Birth asphyxia cases, 13 required mechanical ventilation,16 were managed by hood, 8 required CPAP and 13 given oxygen via nasal prong. In 46 TTN cases, 35 were given nasal prong, 7 CPAP and 4 hood and none required mechanical ventilation. In sepsis, 19 required nasal prong, 4 hood, 5 CPAP and 5were ventilated. Out of 19 MAS patients 14 required CPAP,4 were ventilated only 1was managed by hood.6 out of 12 CHD patients were ventilated, 4 required CPAP and only managed by nasal prong. All the 4 RDS patients were managed by CPAP. All pneumothorax patients were managed by mechanical ventilation.

Table 10: Etiologywise need for rescuscitation (n=180)

DIAGNOSIS	YES	NO
BA(50)	43	7
TTN(46)	7	39
SEPSIS(33)	9	24
MAS(19)	7	12
CHD(12)	2	10
RDS (4)	0	4
PNEUMOTHORAX(4)	1	3
NEC (3)	0	3
CDH(2)	0	2
PNEUMONIA(2)	0	2
PPHN(1)	0	1
CLEFTLIP(1)	0	1
TEF (1)	1	0
CECALPERFORATION(1)	0	1
HIRSCHSPRUNG(1)	0	1
TOTAL	70	110

43 out of 50 Birth asphyxia babies, 7 out of 46 TTN patients, 9 out of 33 Sepsis newborns required resuscitation. Similarly, 7 out of 19 MAS, 2 out of 12 CHD, 1 out of 4 pneumothorax newborns required resuscitation at birth. 1 TEF was also resuscitated.

Discussion :

In our study, out of 180 cases taken Birth asphyxia (BA) was found to be most common cause of respiratory distress in term newborns, in 27.8% cases followed by next most common cause, TTN i.e.25.6%cases.Sepsis had contributed in 18.3% cases and MAS in 10.6%cases and rest like CHD and RDS had minimum incidence in our study. Perinatal asphyxia was the leading cause of respiratory distress among term babies in a study conducted by Adebami et al [6] in Nigeria. Bajad et al also found perinatal asphyxia as a major cause of respiratory distress among Indian population especiallyin terms [7].A study conducted by Dr J N Behera [8] et al most common cause of respiratory distress was found to be HIE-II. Another study conducted by D Sivakumaran and P Nirosha [9], Transient tachypnea of newborn (TTN) was most common cause (36.95%) followed by Birth asphyxia (21.98%),MAS(14.20%),CHD(11.91%)and Sepsis(11.91%).In a study by Sirageldin MK Abderlrahman et al[10] at Sudan "Neonatal respiratory distress in Omdurman Maternity Hospital", TTN was the commonest cause of respiratory distress(28%), followed by Sepsis(24%), HMD(15%), CHD(9%), MAS(6%). In a study at Basrah by Assel Mohammed Wadi et al [11]titled " Respiratory Distress in Full Term Neonates in the First Week of Life in Basrah Maternity and Children Hospital" out of 167 cases, it was found that 44.9% cases were due to Transient tachypnea of the newborn followed by birth asphyxia in 13.2% cases; Meconium Aspiration syndrome was found in 9.6% of cases, earlysepsis in 8.4% and Pneumonia in7.8%In Abhijit Dutta et al [12], Transient tachypnea of the newborn (TTN) was the commonest (32.23%) cause of respiratory distress followed by Pneumonia (24.35%), MAS (13.15%), Birth asphyxia (12.5%) and RDS (7.9%). Another study titled "Respiratory distress in Full and post term neonates : Prevalence, Etiologies and outcomes in a Tertiary Health centre in Yaounde'" by Kue, D.S.M. , Ngoue, J.E., Motaze, A.C.N., Nanfack, A.S. and Njom-Nlend, A.E. [13], Pneumonia was main etiology (44%) followed by TTN (35.45%) and MAS (16.6%). In Keerti Swarnakaret al study [14] the commonest causes of respiratory distress in this study were transient tachypnea of newborn (TTN) (40.7%). The etiology of respiratory distress is varies in term newborns with TTN being most common found in most studies. In our studyTTN next to Birth asphyxia. The high prevalence Birth asphyxia being most common etiology in our study can be explained by the fact that our centre being a tertiary care centre and handles mostly referral neonates from all around the region.

This could be a reflection of high prevalence of perinatal asphyxia in the developing countries [15].

In our study mortality was 20%. Birth Asphyxia was the main cause for mortality contributing to 33.3% overall death. MAS was second most common cause for mortality found in 16.6% cases. In a study at Birdem titled "Etiology of Respiratory Distress in Newborn – Experience in BIRDEM" conducted by HaqueA et al [16] mortality rate was 16.7%. Another study by Sirageldin MK Abderlrahman et al [10], overall Mortality rate was 36% with HMD(13%) as the leading cause of death followed by Sepsis (8%) and congenital heart disease(5%). In a study titled " Respiratory distress in full and post term neonates : Prevalence, etiologies and outcomes in a tertiary health centre in Yaounde'"[13], mortality rate was 10.4%. In the study conducted by D Sivakumaran and P Nirosha [9], the major cause of mortality was perinatal asphyxia(50.85%), followed by MAS(28.81%) and Congenital heart disease (6.78%).Overall mortality was 9.01%.In Keerti Swarnakar et al [14]study of "Neonatal respiratory distress in early neonatal period and its outcome" the overall mortality rate of cases of respiratory distress in this study was 22.86%. The overall mortality rate and major causes of mortality have been found wide ranged in various studies. The findings in our study are comparable to the findings of many of the authors in their studies.

The Case fatality rate (CFR) for Birth Asphyxia was 24.0%, MAS (31.6%), CHD (33.3%) and Sepsis (15.2%). In study by Sirageldin MK A Abderla et al [10], CFR for MAS, CHD , Sepsis and RDS was 33.3%, 55.6%, 33.3% and 86.7% respectively. CFR for Birth asphyxia, MAS, CHD and Sepsis was 33.33%, 0, 13.3% and 13.33% respectively in study by Assel Mohammad Wadi et al [11]. respectively. In the study conducted by D Sivakumaran and P Nirosha [9], CFR was 20.83%, 18.28%, 5.13%, 23.78% and respectively for Birth asphyxia, MAS, CHD, Sepsis and RDS respectively. In our study CFR for TTN, Birth asphyxia, MAS and RDS is similar to previous studies. CFR for Sepsis in our study is less than previous studies. This can be attributed to widespread and use of appropriate antibiotics as per blood culture sensitivity reports in our setup.

Out of 180 cases included,144 (80%) were discharged from the wards. As expected TTN has most favorable outcome with 100% discharge rate. Two-thirds of MAS patients and two-thirds of CHD patients were discharged. 76% of Birth asphyxia patients were discharged. The findings are similar to study done by D Sivakumaran and P Nirosha [9]except more proportion of sepsis patients were discharged in our study. This can be explained by widespread and effective use of antibiotics in our setup.

In our study. 11.1%of mothers were in extreme age group. In the study conducted by Assel MohammadWadi et al [11], 23.4% were in extreme age group and 76.6% were in 19-34 age group. In study done by D Sivakumaran and P Nirosha [9], 9.62% were in extreme age group. The findings in our study are similar to that of previous studies. In a study conducted by Ananda Kumar et al [17],66.3% babies having respiratory distress belonged to maternal age 18-25 years and 33.7% to age group 26-33 years. In another study by P. Brahmaiah, Rami Reddy [18] noted 2% of mothers belonging to age group more than 30 years whose babies had severe respiratory distress which was found to be risk factor. Similar finding was found in studies by C Dani [19] and AK Malhotra [74]. In a study titled "Clinical profile of respiratory distress in newborn" by Ravindra S et al [20,21] found that of more no of newborns born to mothers of age >30 years developed respiratory distress compared to newborns born to mothers between 22-30 years. The widespread variation in results in different studies is due to different cut-off of age taken in various studies. In our study, 50.5% cases were born to primi mothers, 47.2% were born to G2 to G4 mothers and 2.2% were born to grand multipara mothers (>G4). In the study conducted by Assel Mohammad Wadi et al [11], 41.% were primi and grand multipara and 58.1% were born to G2 to G4 mothers. In study done by D Sivakumaran and P Nirosha [9], the distribution of parity was 56.34% and 43.66%. primi and grandmultipara and G2- G4 mothers respectively Similar results were obtained by Ananda Kumar et al [17], Brahmaiah et al[18] C Dani et al [19] and Chandrsekhar et al[22]. Our result is comparable to previous studies. There is increased risk of respiratory distress in primi gravida probably due to prolonged labour. Out of 180 term babies, 38.3%were early term (37-38 week) and61.7%werelateterm(≥39 weeks)with more cases of respiratory distress In a study titled "Severe respiratory distress in term neonates' by J.B. Gouyon et al[23] showed that infants born at GA of 37-38 weeks present with increased risk of severe respiratory distress , morbidity as compared with infants born at 39-40 weeks. Another study by Kim et al [24] in term neonates titled "Early Neonatal Respiratory Morbidities in Term Neonates" , showed increased incidence of TTN in 37-38 weeks and MAS in≥39 weeks. In a study conducted by by Pirjani et al [25], it was found that elective LSCS at 38-39 weeks of gestation caused more NICU admission due to TTN than done after 39 weeks. In a study of Respiratory distress of the term newborn infant by Edwards et al[1] showed that the risk of respiratory distress decreases with each advancing week of gestation. At 37 weeks, the chances are three times greater than at 39-40 weeks gestation. Stutchfield P, Whitaker R, Russell [26]. Donaldsson [27] had similar findings in their study. The findings inour study are different from previous studies can be explained due to higher incidence of birth asphyxia and MAS in our study.

Maternal illness was present in 40.6% mothers of babies having respiratory distress. In the study by Assel Mohammad Wadi et al [11], 19.2% mothers had co-morbid illness. Keerti Swarnakar et al[14] found 12.14% maternal co-morbidity in their study. In the study by D Sivakumaran and P Nirosha [9] 30.8% mothers had antenatal co-morbidities.In the study by Brahmaiah et al[18], 50.5% mother had co-morbid illness. Our study findings showed presence of more maternal comorbid illness. Out of73 mothers having antenatal co-morbidities, maximum were suffering from DM followed PIH, Anemia followed by oligohydrominos and hypothyroidism. In the study by Brahmaiah et al [18], presence of PIH was highest(31.5%) and D M had very low association(5%). Study by Kue,D.S.M., Ngoue, J.E., Motaze, A.C.N., Nanfack, A.S. and Njom-Nlend, A.E. [13], DM and PIH were found in each 6.5% cases and maternal infection had highest presence(19.9%). Our study is comparable to previous studies.

Out of 180 newborns taken in our study, mothers of 28.6% had PROM (>18 hours), 47.1%had prolonged labour (>18 hours) and 24.3% had meconium stained amniotic fluid In the study by D Sivakumaran and P Nirosha [9], PROM was found in 13.59% cases, with prolnged labour in 19.8% and MSAF in 22.90% cases respectively. In the study by Assel Mohammad Wadi et al[11],PROMand MSAF were present in 11.4% and 12.4% cases respectively. The incidence of perinatal risk factors in our study is more than previous studies which can be attributed to our centre being tertiary centre and handling sick referral patients. All the patients diagnosed with MAS were associated with MSAF. Birth asphyxia babies also had higher association of MSAF in our study. PROM is associated with higher incidence of sepsis in our study. The study by T J.B. Gouyon et al h [23] showed MSAF is a significant cause of fetal distress in 39-41 weeks with population attributable risk of 37.9% causing respiratory distress postnatally.

Respiratory distress was graded using Downe's score. In our study61.7% had mild distress, 36.1% had moderate distress 2.2% had severe distress. Higher Downe's in our study was associated with MAS, Birth asphyxia , Pneumonia and Pneumothorax, In study by Brahmaiah et al[18], Downe's score > 7 was found in 12.7% cases and which was mostly associated with MAS followed by Pneumonia. The findings in our study are comparable to the above mentioned study.

The maior causes of mechical ventilation in our study has been birth asphyxia , MAS, severe sepsis, pneumothorax and various surgical causes. TTN has been successfully managed with minimal oxygen supplement by nasal prongs with minimal O_2supplement.As the Downe's score in creases,so does the need for supplemental oxygen. The study has similar findings as done by D Sivakumaran and P Nirosha [9].

In our study maximum no of babies requiring resuscitation had birth asphyxia (61.4). MAS(10%) has also higher association with requirement for resuscitation. TTN and sepsis babies had less requirement for resu scitation. Study by D Sivakumaran and P Nirosha [9] had similar findings.

Statistically Significant Predictors of Outcome

Prolonged labour is found to be statistically significant predictor of outcome. PROM as predictor of respiratory distress in newborn was also found in study by AynalemYA et al [28]. Sathenahalli VB[29] et al found out both PROM and MSAF as predictors of poor outcome. Prolonged labour causes fetal distress causing perinatal asphyxia and hence resultant respiratory distress. As the proportion of death due to birth asphyxia is high in our study, prolonged labour as a statistically significant predictor of outcome can be explained.

In our study abnormal chest X-ray, abnormal CRP values and positive blood culture were statistically significant predictors of outcome (p-value<0.05). In the study by Veeraraja B et al [29], positive sepsis screen (CRP positive and/or Abnormal CBC) was statistically significant predictor of poor outcome while abnormal chest X-ray was not statistically significant. In a study by Mathur NB et al [30] positive CRP and blood culture positivity was statistically significant predictor of outcome. In a study conducted by Pratapsingh et al [31] diagnostic accuracy of chest X-ray in diagnosis in respiratory distress in neonates was 59.7%. A study by Hisamuddin et al [32] gave CRP diagnostic accuracy of 70.07% for diagnosis of neonatal sepsis.

In our study Downes' score at time of admission into hospital is statistically significant in predicting outcome while day of life during admission and total no of days of hospitalizations were negative predictors. In the study by Sathenahalli VB [29] et alDownes' score was 5.74±0.167 which is similar to our study and in this study, Downes'score was statistically significant predictor of poor outcome (p-value<0.005). In the study by John BM et al [33] Downes' score>3 was associated with higher mortality(p-value<0.001) and score>4statistically significant predictor of mechanical ventilation but it was not significant in multivariate analysis. In the study by Brahmaiah et al [18], mortality was 100% in all neonates with score >7 (p- value<0.001).

Summary: Birth asphyxia (27.8%) was most common cause of respiratory distress followed by TTN (25.6%), Sepsis (18.3%), MAS(10.6%) and CHD(6.7%). RDS, Pneumothorax, Pneumonia,

PPHN and surgical cases were other etiologies contributing to the respiratory distress in term newborns. Mortality in our study was found to be one-fifth of the cases. Birth asphyxia (33.3%), MAS(16.6%) and Sepsis(13.8%) were major contributors of mortality. Case fatality rate (CFR) for Birth asphyxia, MAS, Sepsis was 24.0%, 31.6% and 15.2% respectively. TTN had zero mortality (CFR=0). Among CHD, PDA (41.6%) was most common cause for respiratory distress followed by CCHD (25%). 11.1% mothers were of extremes of age (≤ 18 years and ≥35 years) and¬ 50.5% mothers were primi and 2.2% were grand multipara out of all mothers. Out of 180 babies, 38.3% were early term(37-38 weeks) and 61.7%) were late term (≥39 weeks). Maternal comorbid illness was found in 40.6% cases of which DM was most common followed by PIH. PROM was present in 28.6% cases, prolonged labour was found in47.1% cases and history of meconium aspiration was associated with 24.3% cases. Of total 180 cases, 49.4% cases had abnormal X-ray. 52.8% had abnormal CBC and 31.6% had CRP raised. Positive culture was found in 21.1% cases. 61.7% babies had mild distress, 36.15 % were moderately distressed and¬ only 2.2% had severe respiratory distress as per Downes' score. 29.4% babies had hospitalization for ≤3 days period (death or discharge). Majority of TTN were discharged within 3 days. 24.55 % cases were supported by CPAP as means of oxygen delivery. 21.7% cases required mechanical ventilation. More number of MAS and Birth asphyxia cases required CPAP and mechanical ventilation. More than one-third (38.9%) cases had required resuscitation at time of birth. 37.2% cases were SGA (Wt 4 kg). 62.8% cases had birth weight 2.5-4 kg. Out of 180 babies, 62.2% were born by LSCS and 37.8% by vaginally. More than 70% cases of TTN were born by LSCS. 63.2% cases were male babies and 37.8% were female babies, Ratio for male: female was 1.6:1. Mode of delivery , birth weight and gender of the newborn were negative predictors of outcome. Maternal age and gestational age of the newborn were not statistically significant predictors of mortality (p-value> 0.05). Maternal comorbid illness were not significant in predicting outcome of respiratory distress. Prolonged labour (p-value =0.020) was significant predictor of outcome¬ in our study. However, PROM and MSAF were not statistically significant in our study. Abnormal Chest X-ray (p-value=0.007), abnormal CBC (p-value=0.021), abnormal CRP (p-value=0.001) and positive blood culture (p- value=0.045) were positive predictors of outcome. Downe's score (p-value0.001) was significant predictor of mortality with sensitivity= 77.78% and specificity=82.63% and AUC=0.844.

Conclusion:

Respiratory distress in newborns in a global problem. As a developing country with a limited resource set-ups, it becomes a challenging problem for us to provide adequate and effective interventions as and when required. It becomes imperative that we are well versed with various etiologies that cause respiratory distress especially in terms during early 7 days of life in our region so that we are well prepared to tackle this issue, Maternal and infant risk factors predicting respiratory distress in term newborns when managed properly would result in better outcome and reduce mortality. Perinatal asphyxia, TTN, MAS and CHD still remained major etiologies causing respiratory distress in term neonates. Perinatal asphyxia and MAS are major causes of death. Antenatal factors like maternal comorbid illness, PROM, MSAF are risk factors for neonatal respiratory distress. Early identification and appropriate management of these conditions is essential to decrease the neonatal mortality rate. Assessing the severity of distress by using scoring system, helps in guiding therapy thereby early and appropriate measures can be taken. The findings from our study would guide future interventional studies assessing that would help us in planning cost effective measures that can be implemented in peripheral centers to reduce the morbidity and mortality of respiratory distress.

Limitation : Long term complications and outcome could not be followed upϖ since it does not come under the purview of the study. The study was conducted in one hospital with limited sample size. Exact mortality could not be ascertained due to delay in transfer ofϖ babies from peripheral centers and majority were received in terminal stage.

Funding :None

Contribution Of Authors : All the authors have contributed equally for study designing , manuscript preparation, data collection and statistical evaluation .

Abbreviations:

BA- Birth Asphyxia

CCHD- Cyanotic Congenital Heart Disease

CDH-Congenital Diaphragmatic Hernia

CHD-Congenital Heart Disease

CXR-Chest X Ray

ELBW-Extreme Low Birth Weight

EOS-Early Onset Sepsis

GA-Gestational Age

HIE-Hypoxic-Ischemic Encephalopathy

HMD-Hyaline Membrane Disease

IUGR-IntraUterineGrowthRetardation

IVH-Intraventricular Hemorrhage

LOS-Late Onset Sepsis

MAS-Meconium Aspiration Syndrome

NICU-Neonatal Intensive Care Unit

PGE1-ProstaglandinE1

PPHN-Persistent Pulmonary Hypertension of Newborn

PROM-Prolonged rupture of Membranes

RDS-RespiratoryDistress Syndrome

VLBW-very Low Birth weight

References-

1. Edwards MO, Kotecha SJ, Kotecha S. Respiratory distress of the term newborn infant. Paediatr Respir Rev2013;14:29-36.
2. WHO data on neonatal mortality.https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-mortality-report-2020.
3. Kumar A , Bhat B. Epidemiology of respiratory distress of newborns. Indian Journal of Paediatrics. 1996;63(1):93.
4. Santosh S , Kushal Kumar K , Adarsha E ;A clinical study of respiratory distress in newborn and its outcome ; IJNMR 2013 April Vol-1(1):2-4.
5. South East Asia Regional Neonatal Perinatal Database www.newbornwhocc.org/ pdf/nnpd_report_2002-03.PDF.
6. Adebami OJ, Joel-Medewase VI, Agelebe E, Ayeni TO, Kayode OV, Odeyemi OA, Oyedeji GA. Determinants of outcome in newborns with respiratory distress in Osogbo, Nigeria. Int J Res Med Sci 2017;5:1487-93.
7. Bajad M, Goyal S, Jain B. Clinical profile of neonates with respiratory distress. International Journal of Contemporary Pediatrics. 2016;3(3): 1009-13.
8. Dr Jnanindra Nath Behera , Dr Goutam V , Dr Deepak Kumar Khamari: Prevalence and Outcome of Respiratory Distress in Newborn- A Tertiary Care Hospital Experience JMSCR 08 ;02 February 2020 : https://dx.doi.org/10.18535/jmscr/v8i2.115
9. Sivakumaran D, Nirosha P. A Study of Respiratory Distress in Term Neonates in Early Neonatal Period. Int J Sci Stud 2017;5(6):94-97.
10. Abdelrahman SM, Hamed SM, Nasr A. Neonatal respiratory distress in Omdurman maternity hospital, Sudan. Sudan J Paediatr 2014; 14:65-70.
11. Assel Mohammed Wadi; Aida Abdul Kareem Respiratory Distress in Full Term Neonates in the First Week of Life in Basrah Maternity and Children Hospital2012;2:91-9810.33762/mjbu.2012.75797
12. Dutta A. Spectrum of Respiratory Distress in Newborn: A Study from a Tertiary Care Hospital in Kolkata. 2011 Apr 30;15(2).
13. Kue, D. , Ngoue, J. , Motaze, A. , Nanfack, A. and Njom-Nlend, A. (2021) Respiratory Distress in Full and Post Term Neonates: Prevalence, Etiologies and Outcomes in a Tertiary Health Center in Yaoundé. Open Journal of Pediatrics, 11, 351-359. doi: 10.4236/ojped.2021.113032.
14. Swarnkar K, Swarnkar M. Neonatal respiratory distress in early neonatal period and its outcome. Int J Biomed Adv Res 2015;6:643-7.
15. Adebami OJ, Joel-Medewase VI ,Oyeddeji GA. Clinico laboratory determinants of outcome among babies with perinatal asphyxia in Osogbo, Southwestern Nigeria. Int J Contemp Paediatr.2016;3(2);409-15.
16. Haque A, Baki MA, Begum T, Akhter S, Begum S, Nahar N. Etiology of Respiratory Distress in Newborn in BIRDEM. Birdem Medical Journal Vol. 2013; 1(1) :19-22.
17. Harshini BP, Ananda Kumar TS, Kumar GV, Khan I. An etiological study of respiratory distress in neonates in a tertiary care medical college hospital. Pediatric Rev Int J Pediatr Res. 2020;7(1):22-26. Available From https:// pediatrics.medresearch.in/index.php/ijpr/article/view/566
18. Brahmaiah P, Reddy KR. Etiological Study of respiratory distress in newborn. Int J Contemp Med Res. 2017;4(10)2202-2206.
19. C Dani, MF Reali, G Bertini, L Wiechmann, A Spagnolo, M Tangucci, FF Rubaltelli Risk factors for the development of respiratory distress syndrome and transient tachypnoea in newborn infants. Italian Group of Neonatal Pneumology European Respiratory Journal 1999 14: 155-159; **DOI:** 10.1034/j.1399-3003.1999.14a26.x
20. Malhotra AK, Nagpal R, Gupta RK, Chhajta DS, Arora RK. Respiratory distress in newborn: treated with ventilation in a level II nursery. Indian pediatrics. 1995 Feb 1;32:207-.
21. Sonawane, R., Patil, A., & Sonawane, S. (2018). Clinical Profile of Respiratory Distress in Newborn. *MVP Journal of Medical Sciences*, 151–155. https://doi.org/10.18311/mvpjms/2018/v5i2/18616
22. Chandrasekhar R, Mohan MM, Lakshmi BV. Clinical study of respiratory distress in newborn. Int J Contemp Pediatr. 2016;10;2349-3291. doi: 10.18203/2349-3291.ijcp20162364
23. Gouyon JB, Ribakovsky C, Ferdynus C, Quantin C, Sagot P, Gouyon B; Burgundy Perinatal Network. Severe respiratory disorders in term neonates. Paediatr Perinat Epidemiol. 2008 Jan;22(1):22-30. doi: 10.1111/j.1365-3016.2007.00875.x. PMID: 18173781.
24. Kim H-A, Yang G-E, Kim M-J. Early Neonatal Respiratory Morbidities in Term Neonates. Neonatal Med. 2015;22(1):8.

25. Pirjani R, Afrakhteh M, Sepidarkish M, Nariman S, Shirazi M, Moini A, Hosseini L. 'Elective caesarean section at 38-39 weeks gestation compared to > 39 weeks on neonatal outcomes: a prospective cohort study. BMC Pregnancy Childbirth. 2018 May 8;18(1):140. doi: 10.1186/s12884-018-1785-2. PMID: 2973 9452; PMCID: PMC5941590.
26. Stutchfield P, Whitaker R, Russell I; Antenatal Steroids for Term Elective Caesarean Section (ASTECS) Research Team. Antenatal betamethasone and incidence of neonatal respiratory distress after elective caesarean section: pragmatic randomised trial. BMJ. 2005 Sep 24;331 (7518):662. doi: 10.1136/bmj. 38547.416493. 06. Epub 2005 Aug 22. PMID: 16115831; PMCID: PMC1226243.
27. Dónaldsson SF, Dagbjartsson A, Bergsteinsson H, Hardardóttir H, Haraldsson A, Thórkelsson T. Ondunarördugleikar hjá nýburum sem faedast med valkeisaraskurdi [Respiratory dysfunction in infants born by elective cesarean section without labor]. Laeknabladid. 2007 Oct;93(10):675-9. Icelandic. PMID: 17909278.
28. Aynalem YA, Mekonen H, Akalu TY, Habtewold TD, Endalamaw A, Petrucka PM, Shiferaw WS. Incidence of respiratory distress and its predictors among neonates admitted to the neonatal intensive care unit, Black Lion Specialized Hospital, Addis Ababa, Ethiopia. PLoS One. 2020 Jul 1;15(7):e0235544. doi: 10.1371/journal.pone.0235544. PMID: 326097 48; PMCID: PMC7329073.
29. Sathenahalli VB et al. Predictors of poor outcome in neonates with respiratory distress Int J Contemp Pediatr. 2016 Feb;3(1):76-79 http://dx.doi.org/10.18203/2349-3291.ijcp20160092
30. Mathur NB, Garg K, Kumar S. Respiratory distress in neonates with special reference to pneumonia. Indian Pediatr. 2002 Jun;39(6):529-37. PMID: 12084946.
31. Mehta N, Parihar P, Khan S, Rajimwale G. Role of Chest in Respiratory Distress of Neonates. Int J Recent Surg Med Sci 2018;4(1):19-23.
32. Hisamuddin E, Hisam A, Wahid S, Raza G, Validity of C-Reactive Protein(CRP) for the diagnosis of neonatal sepsis. PakJ Med Sci 2015;31(3): 527-531.
33. John BM, Venketeswar V, Dagar V. Predictors of outcome in neonates with Respiratory Distress.J Nepal Paediatr Soc2015;35(1):31-37.