

A study of various risk factors associated with development of severe respiratory distress in the new born at tertiary health care center

Chethan K B¹, Sandeep Patil^{2*}, Spoorthi S M³, Lakshmidivi⁴

¹Assistant Professor, ³Sr. Resident, Department of Paediatric, JJM medical College, Davangere, Karnataka, INDIA.

²Assistant Professor, ⁴Sr. Resident, Department of Paediatric, Navodaya Medical College, Raichur, Karanataka, INDIA.

Email: drsan.pat@gmail.com

Abstract

Background: Neonatal respiratory distress occurs in infants whose lungs have not yet fully developed. The earlier a baby is born, the less developed the lungs are and the higher the chance of neonatal respiratory distress. **Aims and Objectives:** To study various Risk factors associated with development of severe respiratory distress in the new born at tertiary health care center. **Result:** **Methodology:** This was a Hospital based observational study conducted at Apollo BGS Hospital, Tertiary Health Centre, Kuvempunagar, Mysore. Hundred newborns who were having respiratory distress within 72 hours of birth admitted to NICU of Apollo BGS Hospital, Mysore was studied. This was a one year prospective study i.e. December 2013 to November 2014. Sample size was 100. Statistical analysis done by using SPSS software **Result:** Significant risk factors associated with respiratory distress were Maternal age- >30 and <21 ($X^2=7.207$, $p=0.0073$), Primigravida ($X^2=35.3501$, $p=0.001$), Per-vaginal(PV) Examinations>4 ($x^2=5.272$, $p=0.02$), Meconium stained Liquor – ($x^2=14.982$, $p=0.0002$). Caesarean – ($x^2=12.208$, $p=0.005$), SGA ($x^2=35.58$, $p<0.001$), APGAR score-<7 ($X^2=8.007$, $p=0.0047$), Birth Weight <2.5 ($x^2=26.85$, $p<0.001$) **Conclusion:** The important risk factors were very young or aged mother, primigravida, more prevaginal examinations, meconium stained liquor, Cesarean delivery, IUGR and Low birth weight etc. this knowledge of risk factor is important for the prevention of future newborns from respiratory distress. **Key Words:** Respiratory distress in the new born, Primigravida, Meconium stained Liquor, SGA (Small for Gestational age), Low Birth Weight.

*Address for Correspondence:

Dr. Sandeep Patil, Assistant Professor, Department of Paediatric, Navodaya Medical College, Raichur, Karanataka, INDIA.

Email: drsan.pat@gmail.com

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INTRODUCTION

Neonatal respiratory distress occurs in infants whose lungs have not yet fully developed. The earlier a baby is born, the less developed the lungs are and the higher the chance of neonatal respiratory distress. In addition to

prematurity there are certain factors which increase the risk of developing neonatal respiratory distress.

Maternal Risk Factors Diseases: It is known that gestational diabetes and chronic hypertension are the two main identifiable risk factors for respiratory distress. Lee KS *et al*¹ studied a group of 412 infants with birth weights between 501 and 2,500 gm and gestational ages of 36 weeks or less for the influence of maternal hypertension on the incidence of respiratory distress, it was demonstrated that maternal hypertension was a risk factor for respiratory distress. Similar findings were confirmed in the study done by Dani C *et al*.² However Lureti M³ has found that gestational or chronic diabetes, pregnancy induced or chronic hypertension were not related to the risk of developing respiratory distress in the newborn. Study done by Vignoles Pet *al*.⁴ on 3,237 women who delivered after 34 weeks with gestational diabetes showed that it's an strong independent risk factor

for severe neonatal respiratory failure. Also similar results were obtained in a study done by Fung GPG *et al*⁵

Drugs: Medication includes antidepressants, mood stabilizers such as lithium, antiepileptics such as carbamazepine and sodium valproate, conventional and atypical antipsychotics, benzo-diazepines and anticholinergics. Drugs of misuse and alcohol are known to have detrimental effects on the foetus. Comorbidity in pregnant women of severe mental illness and substance misuse leads to intrauterine death, increased risk of congenital defects, cardiovascular and musculoskeletal anomalies and foetal alcohol syndrome, all attributable to the misused substances⁶

Maternal Age: In a study done by Dani C *et al*¹⁰ it was seen that mothers more than the age of 32 were at a higher risk of delivering babies with respiratory distress. Similar results were shown in the study done by Malhotra AK *et al*⁷ where higher maternal age was identified as a risk factor.

Mode of delivery: In the study done by Dani C *et al*¹⁰ it was seen that caesarean born babies had more chances of developing respiratory distress. Similarly Riskin A *et al*⁸ found the risk of caesarean vs normal vaginal delivery to be that of 50.7% versus 22.4%. Geller EJ *et al*⁹ in his study showed that vaginal delivery had decreased NICU admission than compared to caesarean delivered babies. Similar results were obtained by De Luca R *et al*¹⁰ and Gouyon JB *et al*¹¹ where they showed that the caesarean deliveries increase the chances for developing respiratory distress than compared to normal vaginal delivery. In the study done by Hansen AK *et al*¹² showed that increased risk of respiratory distress was found for newborn delivered by elective caesarean section compared to vaginal delivery. Similar results were obtained in the study done by Baumert M *et al*¹³ and Gerten KA *et al*¹⁴. In the study done by Kolas T *et al*¹⁵ in 2005 included 18,653 deliveries at Norway concluded that planned caesarean deliveries doubled both the rate of transfer to the neonatal intensive care unit and the risk of pulmonary disorder.

Single vs. multiple pregnancy: In a study done by Dani C *et al*² it was seen that the incidence of respiratory distress was more in the first pregnancy and after the fourth pregnancy. Similar results were seen in the study done by Mathur NB *et al*⁸ and Pender CB⁹ it was seen that multigravida was one among the risk factors for developing respiratory distress. However in the study done by Lureti M *et al*³ it was seen that multiparity has no significance in the attainment of respiratory distress.

Smoking: Smoking is one among the major risk factors for respiratory distress. It is seen that mothers who smoke tend to have babies who are underdeveloped and requiring respiratory support. Lureti M *et al*³ has shown

that smoking is associated with respiratory distress in the newborn. However in the studies done by Curet L Bet *et al*¹⁸ and White *et al*¹⁹ showed that smoking is associated with decreased incidence of respiratory distress in newborn.

Duration of rupture of membrane: Lee KS *et al*¹ has shown that rupture for more than 72 hours had no greater effect on the incidence of respiratory distress than those lasting 24 to 72 hours. In the study done by Bauer CR *et al*²⁰ showed that lower incidence of respiratory distress syndrome in infants born after greater than 16 hours rupture of membrane when compared to those who were born after membrane had been ruptured less than 16 hours. Chiswick ML²¹ showed that there was a lower incidence of respiratory distress syndrome in babies born after pregnancy complicated by prolonged rupture of membrane. Study done by Papageorgiou AN *et al*²² showed that there was a lower incidence in the respiratory distress syndrome in those with prolonged rupture of membrane greater than 24 hours and Yoon JJ *et al*²² showed that rupture of membrane for more than 24 hours prior to delivery protects against the development of idiopathic respiratory distress syndrome.

PV examination: Tita ATN *et al*²⁴ has shown that the multiple PV examination is a risk factor for: chorioamnionitis which is significantly associated with respiratory distress. Lee KS *et al*¹ showed that per vaginal examination done more than 5 before the delivery time was more associated with respiratory distress.

Fetal Risk Factors Term/ Preterm: Lee KS *et al*¹ has shown that gestational age of less than 32 weeks or less the incidence of respiratory distress was more when compared to the gestational age between 33 to 36 weeks. Dani C *et al*² has shown that gestational age was associated with respiratory distress in newborn. Lureti M³ in his study has shown that the babies born on or before 31st week of gestation were more frequently associated with respiratory distress. However in studies done by Zaw W,²⁵ Baumen WA²⁶ and Pender CB¹⁷ has shown that respiratory distress syndrome was more in premature babies. In the study done by Chard T *et al*²⁷ showed that incidence of respiratory distress syndrome was higher among the less mature neonates and related to gestational age.

Apgar Score: Lureti M³ has shown that a Low Apgar score at 1st and 5th minute (< 7) was associated with an increased risk of RDS, compared to babies with Apgar score more than 7.9 at 1 minute of age and 8.4 for 5 minutes of age. Gouyon JB *et al*¹¹ showed that Apgar score ≤ 3 at 1 min was more associated with increased respiratory distress. Fidanovski D *et al*²⁸ showed that lower Apgar score (minutes 1 and 5) were associated with respiratory distress and prolonged stay in the NICU. In the study done by Linderkamp O *et al*²⁹ showed that the

incidence of respiratory distress was significantly higher in babies with apgar scores below 6 at 1 min.

Birth weight: In the study done by Lureti M⁶; it was seen that the risk of RDS markedly increased with decreasing birth weight compared to babies weighing more than 2500 g at birth. Similarly Fidanovski D *et al*²⁸ showed that there was higher risk of mortality in infants with lower birth weight. In the study done by Miller HC³⁰; it was seen that respiratory distress was more common in babies weighing between 1000gms-1500gms and the risk of respiratory distress reduced with increase in weight. However similar study done by Bhakoo ON *et al*³¹ showed that increased risk of respiratory distress in very low birth neonates. Studies done by Sharma Pet *al*³² and Pariente G *et al*³³ showed that SGA infants associated with increased risk of respiratory distress

MATERIAL AND METHODS

This was a Hospital based observational study conducted at Apollo BGS Hospital, Tertiary Health Centre, Kuvempunagar, Mysore. Hundred newborns who were having respiratory distress within 72 hours of birth admitted to NICU of Apollo BGS Hospital, Mysore was studied. This was a one year prospective study i.e. December 2013 to November 2014. Newborns admitted to NICU at Apollo BGS Hospital, Mysore due to respiratory distress within 72 hours of birth will be studied. The severity of respiratory distress will be noted according to risk factors, time of onset, clinical assessment, number of days of oxygen requirement and chest x ray features.

Sample Size: 100, calculated by using the formula

$$n = \frac{(1.96^2)(50)(PQ)}{d^2}$$

n= sample size, p= prevalence of respiratory distress in newborn(50%)

q= 100 – p, d= relative precision of 20%.

$$n = \frac{(1.96^2)(50)(100 - 50)}{10^2}$$

$$n = 96$$

In order to compensate for drop outs we studied 100 newborns. All newborns admitted to NICU of Apollo BGS Hospital, Mysore within 72 hrs of birth due to respiratory distress were included into study while All Newborns admitted to NICU with onset of respiratory distress after 72hrs, Outside born newborns admitted with respiratory distress were excluded from the study. A pre-structured and pre-tested proforma will be used to collect data. Time of onset of distress at birth and subsequent hours was documented, The severity of the distress was documented and the severity will be assessed by using Silverman and Anderson clinical scoring and interpreted as Mild (0- 3), Moderate (3-7), Severe (>7)

Respiratory distress. Serial x-rays was be done at 1hour and 6 hours in all newborns and were reported by the radiologist for abnormal findings, and classified as Transient Tachypnea of Newborn (TTNB), Respiratory Distress Syndrome(RDS), Meconium Aspiration Syndrome (MAS), Acyanotic Congenital Heart Disease (ACHD), Congenital Diaphragmatic Hernia (CDH). Depending on the clinical diagnosis of respiratory distress, relevant investigations were sent and newborns were managed as per protocol. Duration of O2 therapy, intervention done in the form of Medical/surgical / ventilator / surfactant therapy and mortality were documented to assess the clinical outcome against the final diagnosis. Statistical analysis done by using SPSS software. Data for continuous variable will be expressed as mean SD and actual frequencies or percentages for noncontinuous variables. Comparison between groups will be made using students “t” test for parametric data and chi-square test for non-parametric data. SPSS for windows (version 17.0) was employed for data analysis p<0.05 was considered as significant and p<0.01 was considered as highly significant.

RESULT

Table 1: Maternal age

Age of mothers (yrs)	Frequency n=100	Severe distress(n=48)	%
<21	25	14	56%
22-30	60	21	35%
>30	15	13	86%

$\chi^2=7.207$, p=0.0073 significant

86% of the newborns (13 out of 15) born to mothers with maternal age >30 developed severe respiratory distress compared to 56 % (14 out of 25) and 35% (21 out of 60) newborns born to mothers below 21 years and between 22-30 years respectively.

Table 2: Parity

Parity	Parity Frequency n=100	Severe Distress n=48	%
Primigravida	40	25	62.5%
Gravida 2 to 3	34	16	47 %
Multigravida	26	7	35%

$\chi^2=35.3501$, p=0.001 very highly significant

62.5% of the newborns (25 out of 40) born to Primigravida mothers developed severe respiratory distress compared to 47 % (16 out of 34) and 35% (7 out of 26) newborns born to 2nd and 3rd Gravid and more than 4th gravid.

Table 3: Pervaginal(pv) examinations

Pv examination	Frequency n=100	Severe distress	%
<4	33	10	30%
>4	67	38	57%

$\chi^2=5.272$, p=0.02 Highly Significant

57% of the newborns (38 out of 67) born to mothers who had more than 4 Pervaginal examinations had severe respiratory distress compared to 30% (10 out of 33) born to mothers who had less than 4 pervaginal examinations.

Table 4: LIQUOR

Liquor	Liquor Frequency n=100	Severe distress n=48	%
Clear	62	22	35.40%
Meconium stained	38	26	68.40%

$\chi^2=14.982, p=0.0002$, very highly significant

68.4% of newborns (26 out of 38) born to mothers with meconium stained liquor developed severe respiratory distress compared to 35.40% of the newborns (22 out of 62) born to mother with clear liquor.

Table 5: Mode of delivery

Mode of Delivery	Mode of Delivery Frequency n=100	Severe distress n=48	%
Caesarean	75	37	49.3%
Normal vaginal	25	11	44%

$\chi^2=12.208, p=0.005$ highly significant

49.3% of newborns (37 out of 75) born by caesarean section developed severe respiratory distress compared to 44% of the newborns (11 out of 25) born by normal vaginal route.

Table 6: Gestation of the baby

Gestation	Frequency	Severe distress n=48	%
SGA	24	20	83.30%
LGA	10	6	60%
AGA	66	22	33.30%

$\chi^2=35.58, p<0.001$, very highly significant

83.6% of newborns (20 out of 24) with SGA developed severe respiratory distress compared to 60% (6 out of 10) and 33.3% (22 out of 62) newborns with LGA and AGA respectively

Table 7: 1 MIN APGAR SCORE 1minapgar

Score	Frequency n=100	Severe distress n=48	%
<7	72	38	53%
>7	28	10	36%

$\chi^2=8.007, p=0.0047$, highly significant

53% of newborns (38 out of 72) with 1 min apgar of less than 7 developed severe respiratory distress compared to 36% (10 out of 28) with 1 min apgar more than 7

Table 8: Birth weight

Birth Weight	Weight in kg Frequency n=100	Severe distress n=48	%
<2.5	27	16	59.25%
2.5-3.5	66	30	50%
>3.5	7	2	28.50%

$\chi^2=26.85, p<0.001$ very highly significant

59.25% of the newborns (16 out of 27) with birth weight of < 2.5 Kgs had developed severe respiratory distress compared to 50% (30 out of 66) and 28.5% (2 out of 67) with birth weight of 2.5 -3.5 Kgs and >3.5kgs respectively.

DISCUSSION

Maternal Age: In the present study it was seen that 86% of the newborns (13 out of 15) born to mothers with maternal age >30 developed severe respiratory distress compared to 56% (14 out of 25) and 35% (21 out of 60) newborns born to mothers below 21 years and between 22-30 years respectively. Similar results were observed in the study done by Dani C *et al.*² where it was observed that mothers > 32 years of age were at a higher risk of delivering babies with respiratory distress. Similar comparison was seen in the study done by Smith A *et al.*⁷ where higher maternal age was identified as a risk factor for neonatal respiratory distress. Hence in the present study it was observed higher maternal age to be a risk factor for developing respiratory distress in newborns.

Parity: In the present study 62.5% of the newborns (25 out of 40) born to Primigravida mothers developed severe respiratory distress when compared to 47% (16 out of 34) and 35% (7 out of 26) newborns born to 2nd and 3rd Gravida and multigravida. Similar results were observed in the study done by Dani C *et al.*² where it was seen that the incidence of respiratory distress was more in the first pregnancy and after the fourth pregnancy. However Mathur NB *et al.*¹⁶ has shown that multigravida was a risk factors for developing respiratory distress in newborns.

PV examination: 57% of the newborns (38 out of 67) born to mothers who had more than 4Pervaginal examinations had severe respiratory distress compared to 30% (10 out of 33) born to mothers who had less than 4 pervaginal examinations. Tita ATN *et al.*²⁴ has shown that the multiple PV examination was significantly associated with respiratory distress.

Liquor: 68.4% of newborns (26 out of 38) born to mothers with meconium stained liquor developed severe respiratory distress compared to 35.40% of the newborns (22 out of 62) born to mother with clear liquor. Similar observations were observed in the study done by Rygal M³⁴ where meconium stained liquor had more chances of developing respiratory distress 58.8% when compared to 21.14%.

Mode of delivery: 49.3% of newborns (37 out of 75) born by caesarean section developed severe respiratory distress compared to 44% of the newborns (11 out of 25) born by normal vaginal route. Similar findings were observed in studies done by Dani C *et al.*² Geller EJ *et al.*⁹

and Gouyon JB *et al.*¹¹ where it was noticed that caesarean delivered babies have more chances of neonatal respiratory distress when compared to normal vaginal delivery.

FETAL RISK FACTORS

Gestation: In the present study it was seen that 83.6% of newborns (20 out of 24) with SGA developed severe respiratory distress compared to 60% (6 out of 10) and 33.3% (22 out of 62) newborns with LGA and AGA respectively. Similar findings were observed in a study done by Lee KS *et al.*¹ where it was seen that SGA babies had a significantly higher association with the incidence of respiratory distress when compared to AGA or LGA babies. Dani C *et al.*² and Lureti M³ has also observed in their studies that SGA babies were more associated with respiratory distress when compared to AGA or LGA babies.

1min Apgar score: In the present study it was seen that 53% of newborns (38 out of 72) with 1 min apgar of less than 7 developed severe respiratory distress compared to 36% (10 out of 28) with 1min apgar more than 7. Study done by Lureti M³ has shown that a Low Apgar score at 1st and 5th min < 7 was associated with an increased risk of respiratory distress when compared to babies with Apgar score more than 7.9 at 1 minute of age and 8.4 for 5 minutes of age. Similarly Fidanovski D *et al.*²⁸ observed that low 1 min apgar score was more associated with respiratory distress and Prolonged NICU stay.

Birth weight: In the present study it was seen that 59.25% of the newborns (16 out of 27) with birth weight of < 2.5 Kgs had developed severe respiratory distress compared to 50% (30 out of 66) and 28.5% (2 out of 67) with birth weight of 2.5 -3.5 Kgs and >3.5kgs respectively. In the study done by Lureti M³ it was seen that the risk of neonatal respiratory distress markedly increased with decreasing birth weight compared to babies weighing more than 2500 g at birth.

CONCLUSION

The important risk factors were very young or aged mother, primigravida, more prevaginal examinations, meconium stained liquor, Cesarean delivery, IUGR and Low birth weight etc. this knowledge of risk factor is important for the prevention of future newborns from respiratory distress.

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