

Spectrum of Respiratory Distress in Neonates delivered in Tripoli Medical Center

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Abstract

Introduction: Neonatal respiratory distress (NRD) is a main cause of neonatal morbidity and mortality . Early detection of its risk factors and early treatment of its etiologies are major challenges in the developing countries. However, few studies in the developing countries have provided data needed to tackle it.

Aim : this study carried out to determine the admission rate, etiologies, related intervention and outcome of NRD in Tripoli Medical Center (TMC) as the main referral center in Tripoli-Libya.

Method: Case series study was carried out from 1st January to 31th March 2010, and was based on reviewing the hospital files of all newborns admitted to the N.I.C.U. because of neonatal respiratory distress(NRD) irrespective of to the underlying cause. NRD was diagnosed based on the presence of one or more of the following signs: an abnormal respiratory rate, expiratory grunting, nasal flaring, chest wall recessions and thoraco-abdominal asynchrony with or without cyanosis. These data included: clinical variables of newborns and their mothers in addition to results of their investigations . These variables were cross-checked to make sure that they were in line with the etiology of NRD in the hospital files. The related intervention ,and outcome were studied. Statistical data were coded and SPSS software was used for analysis.

Result : In the 3 months studied and out of 2815 births ,and 448 newborns admitted in NICU, there were 337 newborns were admitted in NICU because of NRD giving admission rate of 11.9% from total births , and 75% from the total number of admission in NICU in the same period.

The main etiologies of NRD were Transient Tachypnoea of Newborn(TTN) 33.2%, followed by Respiratory Distress Syndrome (RDS) 26.4% , then Meconium Aspiration Syndrome (MAS) 13.1% and Perinatal Asphyxia 12.2% from the total No. of NRD. During admission period , 11.2% of NRD newborns were managed by mechanical ventilation; and only 0.6% were intervened by continuous positive airway pressure CPAP; where surfactant therapy was given to 3% .

During this period the mortality rate of NRD was 11% , which was significantly related to RDS as it account 66.7% of total deaths ($p \leq 0.001$). Taking in consideration that RDS account only 26.4% from total admission .

Conclusion: NRD is a frequent emergency and causes high morbidity and significant mortality. Most of its risk factors and etiologies are preventable. Adequate follow-up during pregnancy and labor for timely intervention may improve the neonatal outcomes. Overall, our results emphasize the urgent need of improving obstetric care , equipping neonatal care

units by noninvasive ventilatory support measures like CPAP machines ,and availability of surfactant.

Introduction

The birth of the child is preceded by several changes to prepare transfer from intrauterine to extrauterine life.

Five major events that establish the lungs as the organ of gas exchange at birth include:-

1. Clearance of fetal lung fluid.
2. Establishment of spontaneous breathing.
3. Decrease of pulmonary vascular resistance.
4. Release of surfactant.
5. And cessation of RT.to LT. shunting of venous blood returning to the heart.

Each of these five events can be affected or impaired by several factors and culminates as Respiratory Distress and could necessitate transfer to intensive care unit ⁽¹⁾ .

Its clinical presentation include apnea, cyanosis, grunting, inspiratory stridor, nasal flaring, poor feeding, tachypnea, there may be retraction in the intercostals subcostal, or supracostal spaces⁽¹⁾.

Respiratory distress is frequent cause of admission in neonatal intensive care in both Term and preterm infants, it occurs in 7% of infants ,and accounts for nearly half of neonatal deaths⁽²⁾ , It's a heterogenous group of illness with varying incidence, aetiology, and outcome

The most common etiologies is Transient tachypnea of newborn(T.T.N.), Respiratory distress syndrome (R.D.S.), Hyaline membrane disease and Meconium

Aspiration Syndrome (M.A.S).The other etiologies include(pneumonia , sepsis), pneumothorax, persistent pulmonary hypertension and congenital malformation⁽²⁾.

Table -1 ⁽²⁾:-

Differential diagnosis of respiratory distress in newborn

Most common causes*:-

Transient Tachypnea of Newborn (T.T.N.) .

Respiratory Distress Syndrome (R.D.S.).

Meconium Aspiration Syndrome (M.A.S.).

Less common causes:-

Infection (e.g Pneumonia,Sepsis).

Nonpulmonary causes:-

- Anaemia.
- Congenital heart disease.
- Congenital malformation
- Medication
- Neurological or Metabolic.
- Polycythemia. -Persistent Pulmonary Hypertension.
- Pneumothorax

Causes Listed in order of incidence.

40% of Neonatal Respiratory Distress is Transient Tachypnea of Newborn T.T.N.⁽²⁾. It occurs when residual pulmonary fluid remains in fetal lung tissue after delivery , Its benign condition and symptoms resolve spontaneously within few hours to several

days,Its risk factors includes maternal asthma⁽³⁾, male sex, macrosomia and maternal diabetes⁽⁴⁾, and cesarean deliveries⁽⁵⁾.

In premature infants, the most common cause of respiratory distress is Respiratory Distress Syndrome (RDS) (Hyaline Membrane Disease), correlating with structural & functional lung immaturity, (surfactant deficiency),it is most common in infants born at fewer than 28 weeks gestations and affect 1/3 of infants born at 24-34weeks gestation but it occurs in

□ 5% of those born at 34 weeks gestation⁽⁶⁾. This condition is more common in boys⁽⁷⁾, and incidence is approximately six times higher in infants whose mothers have diabetes, because of delayed pulmonary immaturity despite macrosomia⁽⁴⁾.

oxygenation, ventilation, surfactant replacement is often necessary. Intervention by Prenatal administration of corticosteroids between 24-34 weeks gestation reduces the risk of respiratory distress when the risk of preterm delivery is high.

Typically in term and post term Meconium Aspiration Syndrome (M.A.S.) is one of the common causes of respiratory distress, meconium stained amniotic fluid occurs in 15% of deliveries, causing M.A.S. in 10-15% of these cases⁽⁸⁾, it causes respiratory distress immediately after delivery and hypoxia occurs because aspiration occurs in utero.

Treatment options are resuscitation, oxygenation, surfactant replacement, and ventilation.

Other possible causes of respiratory distress in newborns is Infection (pneumonia, sepsis)

Common pathogens include (group B streptococci,

staphylococci, streptococcus pneumoniae, Gram negative rods).

Pneumonia and sepsis have various manifestations include typical signs of respiratory distress as well as temperature instability and unlike T.T.N., R.D.S.,

And M.A.S. bacterial infection takes time to develop with the consequence

occur hours to days after birth.

Risk factors for pneumonia and sepsis are prematurity and maternal fever,

Prevention of group B streptococcal infection through universal screening and antipartum treatment reduce the rates of Early onset disease including pneumonia and sepsis by rate of 80%⁽⁹⁾.

* Less common causes of respiratory distress in newborns are:- Persistent Pulmonary Hypertension of the newborn. occurs when pulmonary vascular resistance fails to decrease

soon after birth as with normal transition. The aetiology may be idiopathic or secondary to M.A.S., Pneumonia, Sepsis, R.D.S., or, T.T.N

- Pneumothorax. Which can occur spontaneously or as result of infection, M.A.S., lung deformity, or ventilation (Barotrauma). The incidence of spontaneous pneumothorax 1-2% in term infants⁽¹⁰⁾ but it increases to about 6% in premature infants⁽¹¹⁾.

- Certain congenital malformation, which include pulmonary hypoplasia, Pulmonary emphysema, esophageal atresia, and diaphragmatic hernia.

- Certain medications like use of selective serotonin reuptake inhibitors (SSRI) in third trimester also implicated as cause of respiratory distress⁽¹²⁾.

Rational of study

Respiratory distress in newborns is common problem during neonatal period with considerable mortality.

Epidemiology of neonatal respiratory distress (NRD) in developed countries have been investigated in several studies, however the etiologies and risk factors associated with NRD have not been well cited in low-income countries and particularly sub-Saharan Africa.

The present study is designed to investigate about epidemiology and outcome of NRD in Tripoli Medical Center (TMC) in Tripoli - Libya.

Objectives of study

To study admission rate of NRD in N.I.C.U. in T.M.C.

To find out etiology, clinical course (including related intervention), and outcome of NRD in N.I.C.U. in T.M.C. in Tripoli – Libya.

Patients and Methods

Case series study was carried out from 1st January to 31st March 2010, and was based on reviewing the hospital files of all newborns admitted to the N.I.C.U. because of neonatal respiratory distress (NRD) irrespective of the underlying cause. NRD was diagnosed based on the presence of one or more of the following signs: an abnormal respiratory rate, expiratory grunting, nasal flaring, chest wall recessions and thoraco-abdominal asynchrony with

or without cyanosis. Data were extracted from the files into Simple case sheet form*. These data included: Obstetric history: Parity, multiple pregnancies, diseases during pregnancy, mode of delivery, prolonged rupture of membranes (≥ 18 hours), maternal fever $>38^{\circ}\text{C}$, meconial stained amniotic fluid, and fetal distress ; Neonatal variables: Gestational age, APGAR score at 1st and 5th minutes, gender, birth weight, age on admission, and results of investigations such as full blood count (FBC), C-reactive protein (CRP), blood glucose, and X-ray and cardiac ultrasound if was done, in addition to any abnormal specific investigations . These variables were cross-checked to make sure that they were in line with the etiology of NRD in the hospital files. The related intervention ,and outcome –discharge in good condition, transfer to other departments or death were studied.

Statistical data were coded and SPSS software was used for analysis.

Result

In a period from 1st of January to 31th of March 2010 there were (2815) newborns delivered in Tripoli Medical Center, out of these (448) newborns were admitted to, NICU ,and out of these there were(337) newborns met the inclusion criteria of(N RD) yielding admission rate(11.9%) from total live births, and(75%)from total admission in NICU.(table²) ,(table³)(fig¹).

	Frequency	percent
Total Births in TMC	2815	100%
No. of RD Admission in NICU	337	11.9%

Table (2)

frequency	Percent
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Total admission in NICU	448	100%
No. of RD Admission	337	75.2%

Table (3)

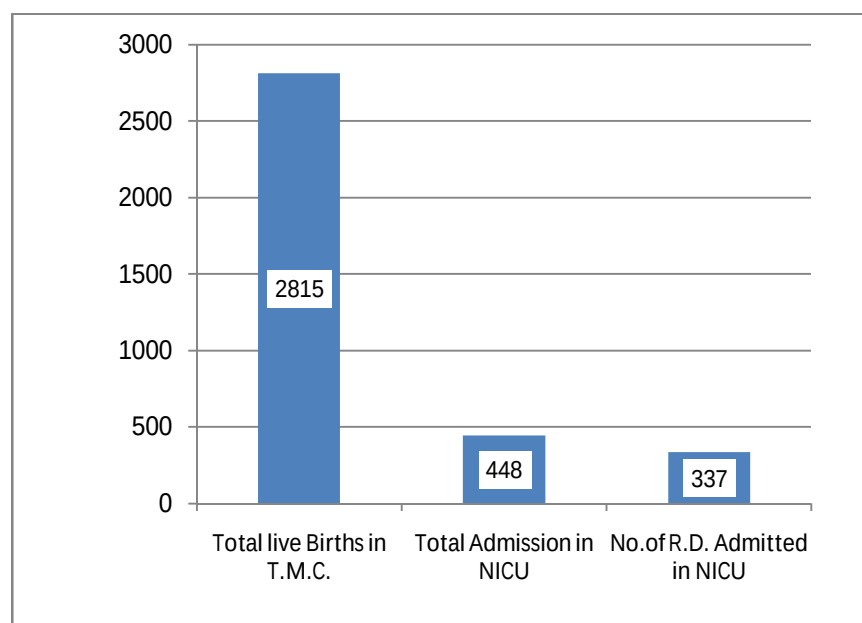


Fig (1)

The main etiologies of RD in these 337 newborns were TTN (112 newborns =33.2%), followed by RDS (89 newborns 26.4%), then MAS(44 newborns13.1%)and and perinatal asphyxia(41 newborns12.2%). The other remaining etiologies are neonatal sepsis ,congenital heart disease, metabolic causes congenital malf. PPHTN and anaemia.(table⁴ .fig.²)

	Cause of R.D.	Frequency	Percent	Valid percent	Cumulative percent
Valid	TTN	112	33.2	34.5	34.5
	RDS	89	26.4	27.4	61.9
	MAS	44	13.1	13.5	75.5
	Birth Asphyxia	41	12.2	12.6	88.1
	Sepsis	14	4.2	4.3	92.4
	CHD	10	3	3.1	95.5
	Cong.malf	6	1.8	1.8	97.3
	PPHTN	4	1.2	1.2	98.5
	metabolic	4	1.2	1.2	99.7
	Anaemia	1	0.3	0.3	100
	Total	325	96.4	100	
Missing	system	12	3.6		
Total		337	100		

Table (4) Causes of RD

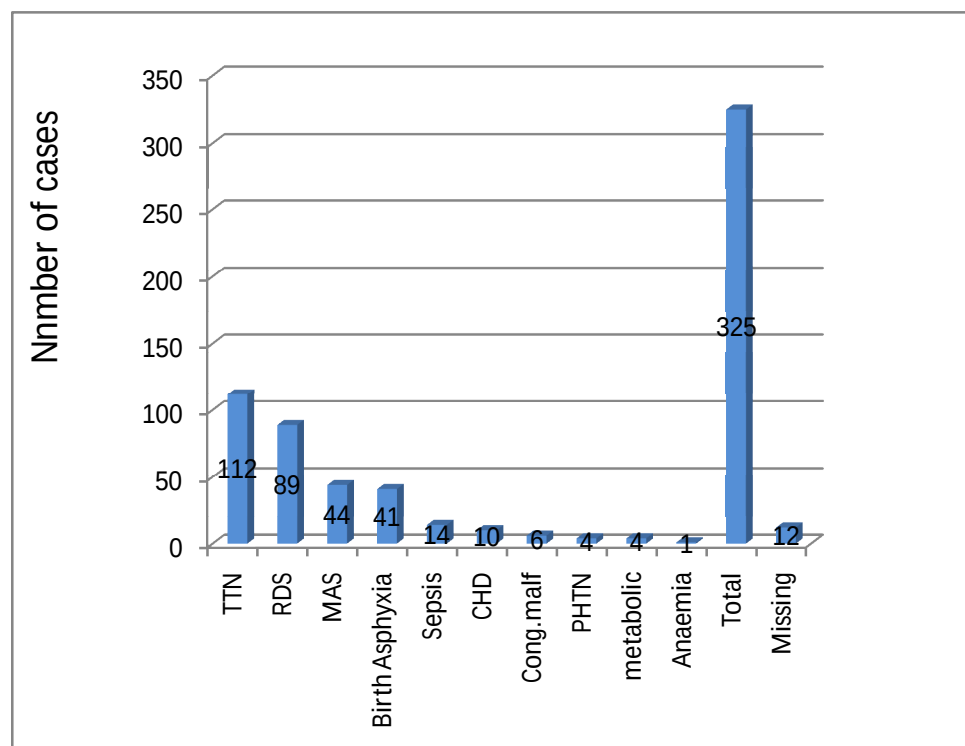


Fig.(2). Causes of NRD

During admission period, out of 337 newborns admitted because of RD, there were 37 newborns(11.2%) managed by mechanical ventilation; only 2 newborns(.6%) were intervened by continuous positive airway pressure (CPAP); and 10 newborns(3%) received surfactant therapy; lastly 280 newborns(85.1%) were out of invasive management and received routine nursery care. (Tab.⁴, fig.³)

		Frequency	Percent	Valent Percent	Cumulative Percent
Valid	Routine Nursery Care	280	83.1	85.1	85.1
	C.P.A.P.	2		0.6	85.7
	Surfactant	10	3	3	88.8
	M.V.	37	11	11.2	100
	Total	329	97.6	100	
Missing	Missing	8	2.4		
Total		337	100		

Table (5): Related intervention

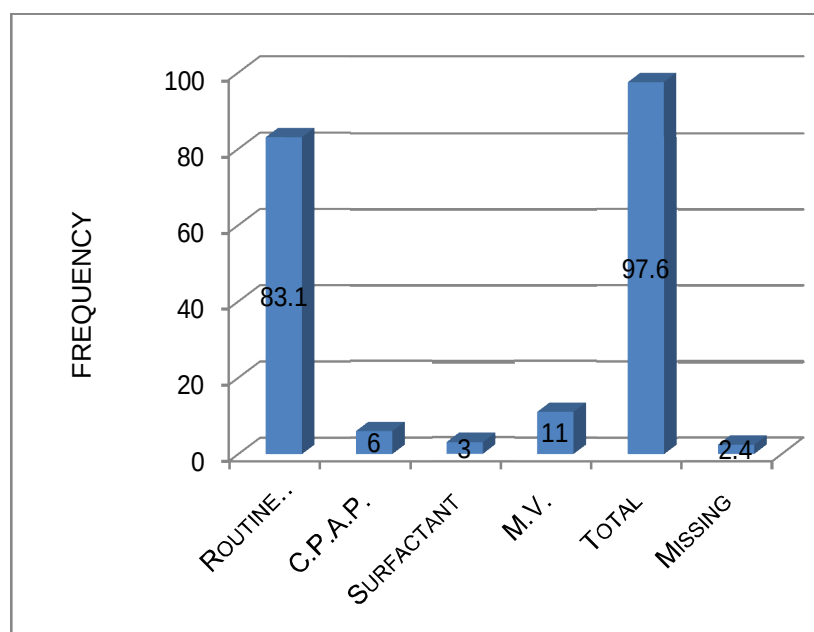


Fig.(3) Related intervention.

According to short term outcome 283 babies(84%) were discharged in good condition, 10 babies (3%) were transferred to other units to finish their treatment, 37 babies(11%) were

died, and finally 7 babies(2.1%) there outcome was missed because data in their medical records are unavailable table 5. Fig.4. fig. 5

OUTCOME

		frequency	percent	Valid percent	Cumulative percent
VALID	discharged with good condition	283	84	85.8	85.8
	transferred care unit	10	3	3	88.8
	died	37	11	11.2	100
	total	330	97.9	100	
missing	system	7	2.1		
total		337	100		

Table (6)

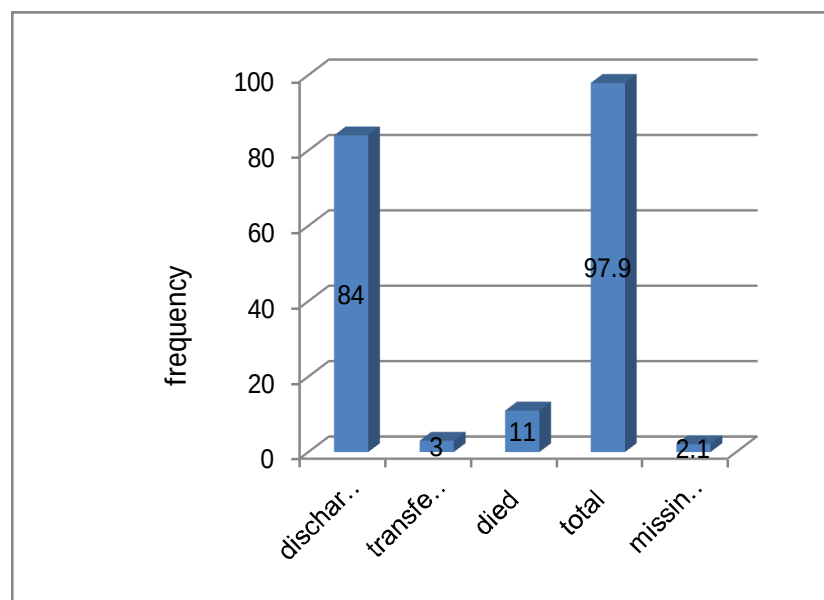


Fig 4

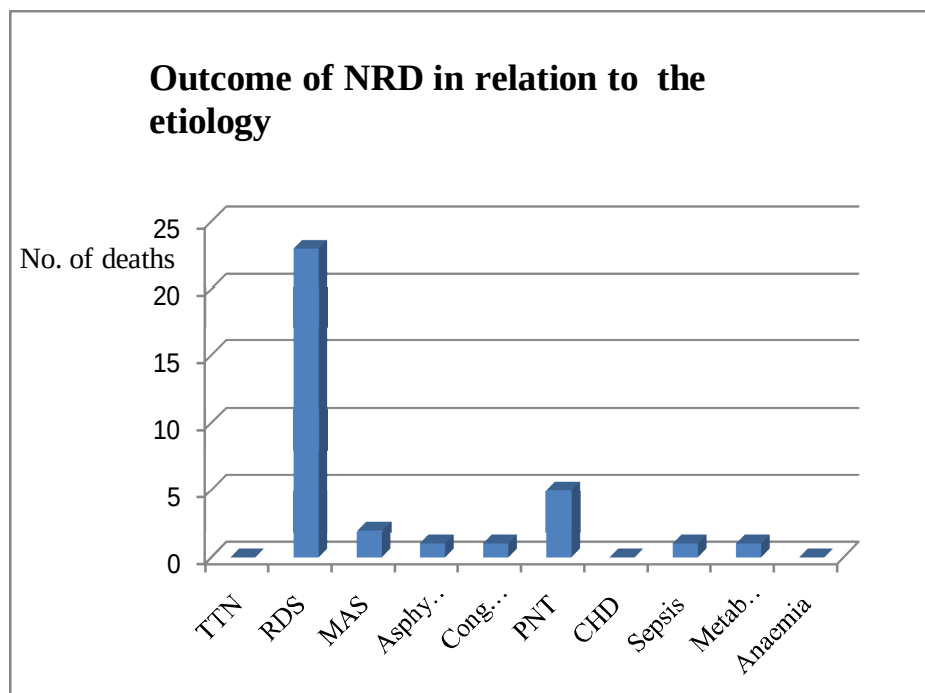


Fig. (5)

Discussion

Tripoli medical centre (TMC) is one of tertiary centers in Tripoli - Libya , it is the main referral center in Tripoli and it concentrates on high risk pregnancies, so the neonatal unit in TMC deals with most neonatal emergencies like NRD.

We found high admission rate of NRD (11.9%) from total live births , and (75.2%) from total admission to NICU .

A study from Switzerland reported that the proportion of newborns hospitalized with RD was 3.8% of whole neonatal population and 53% of all newborns admitted to NICU⁽¹³⁾, While a study in a Moroccan teaching hospital neonatal unit reported a prevalence of 9.83% in 75 newborn⁽¹⁵⁾ .

Regarding the etiology of NRD our study found out it was predominated by TTN (33%) then by RDS (26%), followed by MAS (13%) and birth asphyxia(12%); Thus meticulously weighing

the benefits of normal labor against the risk of NRD following elective caesarean section might prevent TTN; early diagnosis and treatment of threatened preterm labor might prevent RDS; regular fetal monitoring during pregnancy and labor for early detection of fetal distress and timely intervention might prevent MAS and hypoxic ischemic encephalopathy. Many African studies demonstrated that The main etiologies of NRD were neonatal infections, TTN and RDS and MAS^(14,15) , while in the developed countries and because the progress in the management of high risk pregnancies ,and an increased number of viable infants with extremely low birth weight the R.D.S. is the main etiology of NRD followed by TTN⁽¹⁶⁾.

Regarding treatment of NRD in NICU in TMC we found that nasal CPAP was used in (.6%) of cases , and administration of surfactant (3%) , despite that the RDS was the 2nd most common cause (26%) of NRD . while using of invasive ventilatory support was (11%) of cases . this explained by shortage of non invasive ventilatory support measures(CPAP machines) and the surfactant was just introduced at end of our study . while in Switzerland one study documented that treatment of NRD by nasal CPAP was 26%, by surfactant administration was 53%,and by mechanical ventilation was 16% ⁽¹³⁾.

The mortality rate due to NRD was 11% , and the most common cause was RDS 67.6% although it account only 26% of causes of NRD. So the major cause of NRD deaths was RDS. So equipping neonatal units by noninvasive ventilatory support measures like CPAP machines and availability of surfactant will improve NICU care level and decrease the mortality rate of preterm babies and improve out come of NRD.

One study in Cameroon reported that the mortality rate due to NRD was 24.5%. Major causes of NRD death were neonatal sepsis, prematurity with RDS and HIE ⁽¹⁴⁾.

Older African studies noted NRD specific mortality rate of 50% in Burkina Faso⁽¹⁵⁾ and 59.6% in Morocco ⁽¹⁶⁾.and neonatal sepsis was the major contributor to the death rate amongst NRD patients.

Conclusion

NRD is a major cause of neonatal admissions and has a significant mortality . Many of its significant risk factors and etiologies are preventable especially RDS and TTN. Adequate follow-up during pregnancy and labor for early detection of risk factors and timely intervention may improve the outcome of neonatal respiratory distress, Overall, our results emphasize the urgent

need of improving neonatal care by equipping neonatal units by noninvasive ventilatory support measures like CPAP machines and artificial surfactant, in order to tackle NRD, and improve survival rate of neonates especially preterms.

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