J Afric Neonatal 2023;4: 120 – 125

ORIGINAL

Emeagui Diana O
Okolo Angela A
Ajaegbu Obinna C
Ofudu Prince O
Achuzia Blessing E

Neonatal respiratory distress in Federal Medical Center, Asaba, Nigeria: Experiences from a low resource setting

Received: 5th October 2023
Accepted: 15th October 2023

Okolo Angela A (✉)
Emeagui Diana O,
Ajaegbu Obinna C, Ofudu Prince O,
Achuzia Blessing E
Department of Paediatrics,
Federal Medical Center,
Asaba, Nigeria.
Email: aneneolisa@gmail.com

Abstract*: Background*
Neonatal Respiratory distress, is a major cause of morbidity and mortality in low resource settings (LMICS). It is crucial to have a clear information of the situation to inform effective management.
This review identifies the clinical presentation, associated causes and duration of admission for neonatal respiratory distress in newborn of lower middle-income countries (LMICS).
Methods: The institutional Ethical Committee approved the protocol. Patients or the public WERE NOT involved in the design, or conduct, or reporting, or dissemination plans of our research. Upon informed parental consent, cases of Newborn respiratory distress were recruited prospectively from 1st July 2020 to 31st December 2020. Epidemiologic, demographic and other relevant information, were documented.
Frequencies, Means, standard deviations, were studied.
Results: Of the three hundred and sixty-five neonates admitted during the study, 126 (34.5%) were preterm and 239 (65.5) were terms. 110(30%) had respiratory distress (RD), 58 of 71(64.5%) in born admissions were admitted within the 1st hour. More females than males had respiratory distress (ratio 1.4:1). Antecedent history included: caesarian section delivery (57.3%), preeclampsia (41.8%), preterm labor and PROM (17.3%) and fetal distress (14.5%) were associated with higher incidence of RD. Fast breathing 55.5% and grunting respirations 22.7% were commonest mode of presentation. The mean duration of admission was 3-10 days 48.1%, 41-60 days 7.3%. Eighty (72.7%) were discharged and 30 (27.30%) died.
Conclusion: Newborn RD was important cause of morbidity accounting for high mortality in our setting.

Key Words: Newborn Respiratory distress; Newborn admissions; Causes of mortality.

Résumé: L'Introduction
La détresse respiratoire neonatal est une cause majeure de morbidité et de mortalité dans les milieux à faibles ressources (MFR). Il est crucial d'avoirune information claire sur la situation pouré claire-rune gestion efficace.
Cette revue identifie la presentation clinique, les causes associées et la durée d'admission pour détresse respiratoire néonatale chez les nouveau-nés des pays à revenue interm édiaireinférieur (LMICS).
Méthodes: Le comité d'éthique institutionnel a approuvé le protocole. Les patients ou le public N'ONT PAS été impliqués dans la conception, la conduite, la communication ou les plans de diffusion de notre recherche. Avec le consentement éclairé des parents, des cas de détresse respiratoire neonatal ont étérecrutés de manière prospective du 1er juillet 2020 au 31 décembre 2020. Des informations épidémiologiques, démographiques et autres informations pertinentes ont été documentées.
Fréquences, Moyennes, écarts types, ont été étudiés.
Résultats: Sur les trois cent soixante-cinq nouveau-nés admis au cours de l'étude, 126 (34,5 %) étaient prématurés et 239 (65,5%)

étaient nés à terme. 110 (30 %) souffraient de détresse respiratoire (DR), 58 des 71 (64,5 %) 58 des 71 (64,5 %) née sen FMC ont étéprise en charge dans la 1ère heure. Plus de filles que de garcons souffraient de détresse respiratoire (rapport 1,4 : 1). Les antecedents comprenaient : l'accouchement par césarienne (57,3 %), la prééclampsie (41,8 %), le travail prématuré et la Rupture prolonge de la poche des eaux[RPPE] (17,3 %) et la souffrance fœtale (14,5 %) étaientassociés à une incidence plus élevée de DR. La respiration rapide 55,5 % et les respirations grognantes 22,7 % étaient le mode de présentation le plus courant. La durée moyenne d'admissionétait de 3 à 10 jours[48,1 %], de 41 à 60 jours[7,3 %]. Quatre-vingts (72,7 %) ont été libérés et 30 (27,30 %) sontdécédés.
Conclusion: La DR du nouveau-né était une cause importante de morbidité expliquant une mortalitéélevée dans notre contexte.

Mots clés: Détresse respiratoire du nouveau-né ; Admissions de nouveau-nés ; Causes de mortalité.

Introduction

Respiratory distress (RD) defined as an increase in the amount of work required to surmount the airway resistance, the lung and chest wall elastic recoil,[1,2] also known as increased work of breathing,[2] is identified clinically by the presence of nasal flaring, tachypnea, chest retractions, grunting and or cyanosis.[3-4]Such clinical signs grade the level of disease severity and utilize tools such as the Silverman Anderson score(SA).[4]About 15% of terms and 29% of preterm newborns admitted into the neonatal intensive care units (NICUs) have respiratory difficulty.[5] While on the other hand, between 10% to 36% of newborn mortality is associated with RD.[5-8] The reported underlying causes of newborn RD (NRD) are: respiratory distress syndrome (RDS), septicemia, transient tachypnea of the newborn (TTNB), meconium aspiration syndrome (MAS), perinatal asphyxia (PA) and metabolic disorders.[3,8]
At birth, the first inspiratory effort aims to clear out the lung fluid and initiate airway opening. The required opening pressure is about 20 to 55cm H_20.[9] The braking mechanism maintains the positive intrathoracic pressure created, and ensures that the end expiratory lung volume is preserved.[9] Other factors reported to be implicated in the smooth transition of effective gaseous exchange from intra-uterine life to extra-uterine respirations include: temperature stability, Hering-Breuer reflex activation, maturity of the oxygen sensitive chemoreceptors and intrauterine drug exposure.[10-12] The role of these factors have to be reviewed and necessary equipment prepared for the management of the presumed respiratory difficulty.

The skills, preparedness and respiratory support facilities available at the newborn birth influences the easy adjustment to independent breathing efforts in neonatal life.However, in the event of newborn respiratory maladaptation to extra-uterine life, this will result in RD, respiratory failure and mortality if not promptly diagnosed and treated.[13] Therefore, critical analysis and good knowledge of the pattern of NRD in a facility is pertinent to enhance better planning and provision of necessary support for optimal management.
Evaluation of the clinical presentation and outcome associated with NRD will further guide and boost skill development, training of medical personnel and procurement of relevant commodities. Such information will support advocacy for resource mobilization for the requisite materials.
On the premise that there is no specific clinical presentation or outcome associated with NRD we propose these research questions:
What is the clinical presentation of NRD?
What are the causes and prognosis of NRD as a guide to the formulation of the polices to address the given situation relevant to this work?
The following objective and specific objectives are stated:

Aim

This study aims to identify the clinical presentation, associated causes and outcome of NRD admitted to the neonatal unit at the FMC Asaba

Specific Objectives

1. What is the identifiable underlying cause of newborn respiratory distress?
2. What are the signs and symptoms of neonatal respiratory distress?
3. What is the outcome of newborns with respiratory distress?

Subjects and Methods

Hospital setting

The hospital serves and provides health care for inhabitants of the major cities of Asaba, Kwale, Onitsha, Agbor Abudu and other neighboring communities.

The Neonatal unit

Is situated in the proximity of the delivery room and maternity units and receives newborn from the delivery room and the catchment communities. There are the outborn ward and the in-born patient ward, each of which has attached mother's unit. Each section has a total of 10 bed space for 4 incubators and 6 cots.

Clinical Evaluation

Was according to the unit protocol. The SAS was used to grade the degree of RD severity and the tissue oxygen saturation (SPO_2)was measured with the pulse oximeter.

Respiratory support was provided accordingly either in delivery room or on admission as indicated.

Data Extraction:
We utilized a study proforma to collect relevant demographic and epidemiologic data which was inputted and analyzed using the SPSS version 26.0. p-value < 0.05 was considered statistically significant

Inclusion criteria:
All newborns of consenting parents admitted into the neonatal unit with clinical symptoms of RD and a supporting laboratory and or radiologic investigation.

Exclusion criteria
Lack of parental consent.

Results

Prevalence and characteristics of neonatal respiratory distress

Table 1 shows the characteristics of the babies with respiratory distress while Fig 1 shows the associated underlying maternal medical condition.
The commonest mode of delivery was cesarean section in 57.3% of babies while53.9% of preterm had respiratory distress
The maternal conditions associated with RD were major complications in pregnancy: Hypertension, PROM, preterm labor. Implications for these include the fact that RD should be anticipated in such offspring. While 40 (36.3%) presented with the most severe forms of manifestation commonest in the preterm or in infants with severe disease.

Fig 1: Associated underlying maternal medical condition.

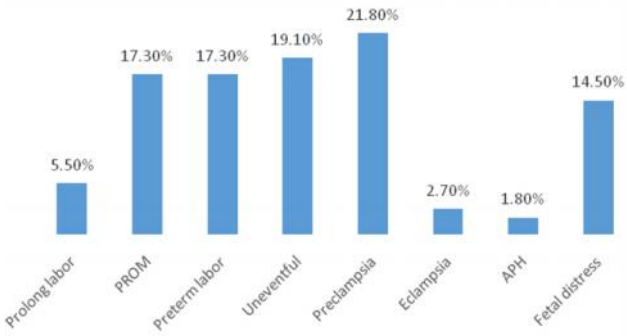
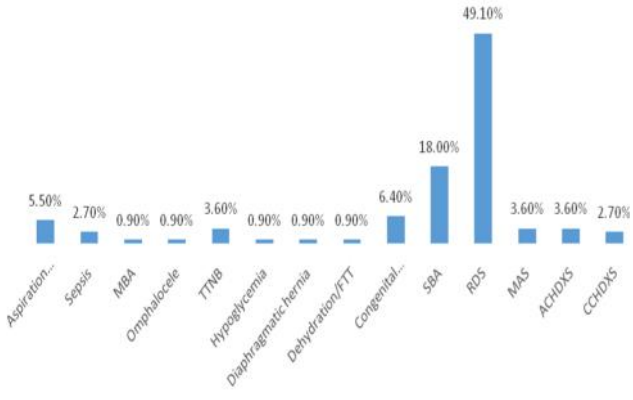


Table 1: Characteristics of neonatal respiratory distress

Variables	Frequency (N)	Percentage (%)
Place of delivery		
Inborn	71	64.5
Out born	39	34.5
Gender		
Male	45	40.9
Female	65	59.1
M:F ratio	1:1.4	
Mode of delivery		
SVD	47	42.7
ELCS	38	34.6
EMCS	25	22.7
Birth weight		
ELBW	19	17.3
VLBW	25	22.7
LBW	17	15.5
NBW	47	42.7
Macrosomic	2	1.8
Maturity		
Extreme preterm	23	20.9
Very preterm	26	23.6
Late preterm	19	17.3
Term	38	34.5
Post term	4	3.6
Attendant at delivery		
Pediatrician	65	59.1
Non-pediatric doctor	37	33.6
Midwife	8	7.3
Age on admission		
0 hour	58	52.7
1-6 hours	23	20.9
7-23 hours	2	1.8
1-5 days	25	22.7
6-10 days	2	1.8

SVD: spontaneous vaginal delivery. ELCS: Elective caesarean section. EMCS: Emergency caesarean section. ELBW: Extreme low birth weight. VLBW: Very low birth weight. NBW: Normal birth weight.

Fig 2: Distribution of the diagnosis related to neonatal respiratory distress



TTNB. Transient tacypnea of newborn, MBA: Moderate birth asphyxia, FTT: Failure to thrive, SBA: severe birth asphysia. RDS: Respiratory distress syndrome, MAS: Meconium aspiration syndrome, ACHDXS: Acynotic congenital heart disease, CCHDXS: cyanotic congenital heart disease.

Table 2: Clinical presentation, duration on admission and Outcome of newborns with respiratory distress.

Variables	Frequency (N)	Percentage (%)
Clinical presentation		
Gasping	10	9.1
Grunting	25	22.7
Fast breathing	61	55.5
Difficulty breathing	9	8.2
Apnoea	5	4.5
Duration on admission		
3- 10 days	53	48.1
11- 20 days	19	17.3
21- 30 days	13	11.8
31- 40 days	17	15.5
41- 60 days	8	7.3
Outcome		
Discharged	78	70.9
Transferred	1	0.9
Died	30	27.3
DAMA	1	0.9

DAMA: Discharge against medical advice.

Sixty-one babies presented with complaints of fast breathing;80 (72.7%) babies were discharged. Forty-eight percent of babies spent less than 10 days on admission

Babies with respiratory distress were diagnosed with RDS, SBA, Congenital pneumonia, Aspiration pneumonia, Acyanotic/Cyanotic congenital heart diseases, TTNB, MAS.

Table 3: Mean clinical and laboratory parameters of newborns with respiratory distress at presentation

Parameters	Mean ± STD	Minimum	Maximum
Duration of admission (days)	18 ± 12	3	60
Respiratory rate (Cyc/min)	61.64 ± 17.6	17.0	86.0
Birth weight (Kg)	2.19 ± 1.2	0.6	4.3
Silverman Anderson score	7.5 ± 0.7	6.0	10.0
$SpO_{2\%}$	77.3 ± 13.1	32.0	94.0
Bicarbonate levelMmol/L	14.2 ± 3.4	9.0	23.0

Table 4: Distribution of surfactant therapy among newborns with respiratory distress

Time of administration of surfactant to both term and preterm babies as shown below;

Onset of administration	Frequency	Percentage
Within 1st hour	14	12.7
2nd-12hours	14	12.7
12th -24th hours	10	9.1
After 24hours	11	10.0
No surfactant	61	55.5

Discussion

The 30% NRD incidence, where 61.8 % of cases were pre-term, agrees with the findings of Suzanne Reuter[6]but differs from reports from Africa. The prominent contribution of prematurity with RDS and BA to the RD cases might explain the difference between this survey and others from Africa.[6,8,11,13-20] Other causes of RD similar to findings from Nigeria, Cameroun and Egypt[7,16&18] were SBA, Pneumonias and TTNB. This report also highlighted the role of RDS to RD admissions to NICU.

Although preterm admissions accounted for 34% of admissions and 44.5% of RD cases; 44% of these with RDS received Surfactant within the 1st hour of life. This might have contributed to positive outcome as these cases were amongst the 72.7% discharged. The rest 61 babies who did not receive surfactant were larger babies who received respiratory support with the improvised bubble CPAP.

RDS rather than transient tachypnea of the newborn (TTNB) was prominent cause of RD. Settings where TTNB featured more prominently might have institutionalized antenatal preterm labor management measures with potentials for reduction of preterm RDS.[21-23]As such, identified parturient with associated clinical conditions should be refocused for application of prevention intervention as antenatal corticosteroids and magnesium sulfate with proven efficacy not only for pulmonary disease in preterm but also for the longer-term outcome.

The observed female sex preponderance might be a reflection of the admission pattern as other studies have reported a higher male predisposition for NRD. Such works[17 &20] postulated advanced female fetal lung maturity as protection factor from RDS. They also adduced that such protection for females might be mediated by an increase in vascular endothelial growth factor (VEGF)[21], which stimulates the proliferation and maturation of alveolar type II cells.[21] This study could not verify the consistency of male preponderance and predisposition to RDS; it calls for a larger and longer duration of the study in our local environment.

Amongst the presenting symptoms of RD, fast breathing and grunting respiration were the most common presenting complaints and the assigned SAS indicated that most newborn had moderate to severe degree of RD. Forty (36.3%) presented with such features commonest in severe disease[1-3], whereas in the bigger babies of Kuti et al[7],mild RD was the more predominant form. This severe degree of RD actually reflects the underlying pathology. Measurement of the SPO2 and the SAS was most crucial in the evaluation of the babies. Most babies with high SAS had dramatic improvement in the SAS and SPO_2 values as they improved. Such was observed in the preterm who received surfactant therapy with the bubble CPAP.

Preeclampsia and Eclampsia were the most prevalent maternal conditions associated with NRD. A significant

proportion of mothers of this study had no identifiable underlying obstetric condition. Only a few of them presented with PROM, preterm labor and fetal distress contrary to other reports[7,---].

NRD protracted morbidity warranted prolonged admission, which duration ranged 10 days (48.1%) or more (51.9%). A large population of preterm,< 37 weeks (61.8%) among these: 33.8% <28 weeks and 66.2% were <32weeks,warranted this. Thus, the major determinant of duration of stay in our setting is the gestational maturity, which is often complicated by protracted morbidity. Similar observations from Ethiopia[24] supports this finding.

The mortality rate of 27% is similar to what has been reported by Tochie et al[19] from Yaoundé. They reported similar etiologic factors but their main causes of mortality were neonatal sepsis and respiratory distress syndrome.

This report is limited by the duration of the period of the study as a much longer duration might have enabled a conclusive observation of changes in the admission pattern by gender; more females were admitted than males, this might have influenced the observation that more females were admitted with RD. The results of this study cannot represent the general trend in our region as studies from other centers with a lower preterm admission rate report Sepsis as the dominant cause of admission with RD.

Conclusion

Respiratory distress syndrome in preterm babies' accounts for a significant proportion of admissions related to NRD. Newborn respiratory distress was an important cause of morbidity accounting for high mortality in our setting.

Recommendations

Preventive measures should target preterm births. Anticipation prior to the baby's delivery, early referral and preparation for the arrival of the baby will reduce the stress or work of breathing and improve adaptation to their extra-uterine respiratory transition and quality of life.

Conflict of Interest: None
Funding: None

Acknowledgments

The authors gratefully acknowledge the superlative care provided to the babies by both the team of resident doctors and the nurses in the neonatal unit.

References

1. Stoller JK, Hill NS. Respiratory monitoring in critical care in Goldman's cecil Medicine, twenty fourth edition 2012. Edited by: Lee Goldman and *Andrwe I. Schafer. ISBN 978-1-4377-1604-7.doi.org/10.1016/C2009-0-42832-0.*
2. Warren JB, Anderson JM. Newborn respiratory disorders. *Pediatrics in review. 2010; 31 [12]: 487-496. Doi:https://doi.org/10.15421.pir.31-112-487.*
3. Gallacher DJ, Hart K, Kotecha S. Common respiratory conditions of the newborn. *Breathe.2016; 12:30-42.*
4. Hedstrom AB, Gove NE, Mayock DE, Batra M. Performance of the Silverman Andersen Respiratory Severity Score in predicting PCO2 and respiratory support in newborns: a prospective cohort study. *J Perinatology. 2018; 38:505–511 https://doi.org/10.1038/s41372-018-0049-3.*
5. Hibbard JU, Wilkins I, Sun L, Gregory K, Haberman S, Hoffman M et al. Respiratory morbidity in Late preterm births. JAMA. 2010; 304[4]: 419-425.doi: 10.1001/jama.2010.1015.
6. Reuter S, Moser C, Baack M. Respiratory Distress in the Newborn. *Pediatr Rev. 2014 Oct; 35(10): 417–429.doi: 10.1542/pir.35-10-417.*
7. Kuti BP, Mohammed LO, Oladimeji OI, Ologun BG, Kuti DK, Fawale OO. Respiratory distress in Nigerian neonates: Prevalence, severity, Risk and etiological factors and outcome. *Niger J Basic clinical Sci 2018; 15:42-49.*
8. Moshiro R, Perlman JM, Mdoe P, Kidanto H, KvalØy JT, Ersdal HL. Potential causes of early death among newborns in a rural Tanzanian hospital. *PLos one. 2019: 2; 14[10]: doi: 10.1371/journal.pone.0222935.eCollection 2019.*
9. Swarnkar K, Swarnkar M. Neonatal respiratory distress in early neonatal period and its outcome. *Int J Biomed Adv Res. 2015; 6[09]: 643-647.*
10. Adebami OJ, Joel-Medewase VI, Agelebe E, Ayeni TO,Kayode OV, Odeyemi OA, Oyedeji GA. Determinants of outcome in newborns with respiratory distress in Oshogbo, Nigeria. *Int J Res Med Sci. 2017; 5: (4): 1487-1493. doi.org/10.18203/2320-6012.ijrms20171252.*
11. LoMauro A, Aliverta A. Physiology masterclass: extreme of age newborn and infancy. *Breathe. 2016; 12: 65-68. Doi: 10.1183/20734735.013315.*
12. Koos BJ, Rajaee AF. Fetal breathing movement and changes at birth. *Adv Exp Med Biol. 2014; 814: 89-101. doi: 10.1007/978-1-4939-1031-1_8.*

13. Edwards MO, Kotecha SJ, Kotecha S. Respiratory distress of term newborn infant. *Pediatr Respir Rev. 2013; 14[1]: 29-37.*
14. LiWang, Shuqing Tang, Hui Liu , Juan Ma, Bingyi Li , Li-Wu1, Zhichun Feng and Yuan Shi. The Underlying Causes of Respiratory Distress in Late-Preterm and Full-Term Infants Are Different From Those of Early-Preterm Infants. *Iran J Pediatr. 2020 October; 30 (5):e104011.*
15. Tefera M, Assefa N, Mengistie B, Abrham A, Teji K, Worku T. Elective Cesarean Section on Term Pregnancies Has a High Risk for Neonatal Respiratory Morbidity in Developed Countries: A Systematic Review and Meta-Analysis. *Front. Pediatr., 25 June 2020 | https://doi.org/10.3389/fped.2020.00286.*
16. Baseer KAA, Mostafa Mohamed M, Abd-Elmawgood EA. Risk Factors of Respiratory Diseases Among Neonates in Neonatal Intensive Care Unit of Qena University Hospital, Egypt. *Ann Glob Health. 2020; 86(1): 22, 1–9. DOI: https://doi.org/10.5334/aogh.2739.*
17. Kue DSM, Ngoue JE, Motaze ACN, Nanfack AS, Njom-Nlend AE. Respiratory Distress in Full and Post Tern Neonates: Prevalence, Etiologies and Outcomes in a Tertiary Health Center in Yaoundé. *Open J Pediatrics*. 2021, 11, 351-359. https://www.scirp.org/journal/ojped.
18. Tochie JN, Choukem SP, Langmia RN, Barla E, Koki-Ndombo P. Neonatal respiratory distress in a reference neonatal unit in Cameroon: an analysis of prevalence, predictors, etiologies and outcomes. *Pan Afr Med J. 2016; 24:152. DOI: 10.11604/pamj.2016.24.152.7066. Human Research Education and Network (HREN), Yaoundé, Cameroon.*
19. Tochie JN, Sibetcheu AT, Danwang C, Mbonda AN, Kamla I, Ayissi G, Nkeck JR, Dany Ngwanou H, Temgoua MN. The epidemiology, risk factors, mortality rate, diagnosis, etiologies and treatment of neonatal respiratory distress: a scoping review.2020. DOI: https://doi.org/10.21203/rs.3.rs-131366/v1.
20. Stylianou-Riga P, Boutsikou T, Kouis P, Kinni P, Krokou M, Ioannou A, Siahanidou T, Iliodromiti Z, Papadouri T, Yiallouros PK, Iacovidou N. Maternal and neonatal risk factors for neonatal respiratory distress syndrome in term neonates in Cyprus: a prospective case–control study. *Ital J Pediatr.2021: 47(1):129.*
21. Kommawar A, Borkar R, Vagha J, Lakhkar B, Meshram R, Taksandae A. Study of respiratory distress in newborn. *Int J Contemp Pediatr. 2017;4(2):490-494.* www.obgproject.com/2020/07/06/*antenatal-corticosteroids-plus-magnesium-sulfate-in-extremely-preterm-infants-neurodevelopmental-outcomes.*
22. Lutgendorf MA, Ippolito DL,Mesngon MT,Tinnemore D,Dehart MJ, Dolinsky BM, Napolitano PG. Effect of Dexamethasone Administered With Magnesium Sulfate on Inflammation-Mediated Degradation of the Blood–Brain Barrier Using an In Vitro Model. *Reprod Sci. 2014; 21 (4) 483-491.*
23. Enyew EF, Bitew DA, Gelagay AA (2022) Incidence, time to recovery and predictors among neonates admitted with respiratory distress to the neonatal intensive care unit at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2021. *PLoS ONE 17(12): e0278887. https://doi.org/10.1371/journal.pone.0278887*