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Incidence, Risk factors and Outcome of Respiratory Distress Syndrome in Term Infants at Academic Centre, Jeddah, Saudi Arabia

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ABSTRACT

Introduction: Respiratory distress syndrome (RDS) is a respiratory disorder of neonates that manifests itself within few hours after delivery. It is one of the most common causes of admission to neonatal intensive care unit (NICU) and respiratory failure in neonates. **Aim:** The aim of this study was to determine the incidence, risk factors, and the short-term outcomes of RDS in term infants born in an academic tertiary care center at King Abdul-Aziz University Hospital (KAUH), Jeddah, Saudi Arabia. **Methods:** Data of all infants admitted to the NICU at the academic center between January 1st 2016 and December 31st 2016 were retrospectively collected. Cases were all term infants who were admitted to NICU with the diagnosis of RDS during the study period. Controls were term infants and 1:1 matched for the date of birth (one or two days from the date of birth of the case) and received routine newborn care. **Results:** Fifty-nine term infants (59/3601, 1.64%) were admitted to the NICU with RDS and 59 control infants were matched during the study period. Infants with RDS were significantly of lower birth weight and had lower Apgar scores at one and five minutes. Although there was a higher number of cesarean section and PROM in the RDS group, but that didn't reach statistical significance. Three infants (5.1%) died in the RDS group. **Conclusion:** Respiratory distress in term infants is still a significant cause of admission to NICU and a predisposing factor for neonatal mortality and morbidity. Preventative and anticipatory measures should be further explored to decrease the burden of this disease.

Keywords: infant, newborn, incidence, risk factors, tertiary care centers.

1. INTRODUCTION

Respiratory distress syndrome (RDS) is a respiratory disorder of neonates that manifests itself immediately after delivery (1). It is one of the most common causes of admission to neonatal intensive care unit (NICU) (2) and respiratory failure in neonates (3). Some of the contributing factors to the development of RDS include maladaptation or delayed adaptation, existing disorder such as surgical or congenital anomalies, and acquired infections (4). Respiratory distress syndrome is a frequent neonatal morbidity worldwide with reported prevalence of 18.5% in France (5), 4.24% in Pakistan (6), and 20.5% in China (7). Respiratory distress syndrome is not uncommon in term infants (3, 8). It was found that 6.8% of RDS cases are in term or near-term infants (9). In another study, 48/1986 (2.42%) neonates developed RDS, of which 7 (14.6%) were more than 2500 grams

(10). The reported incidence of RDS in a center in Pakistan was 1.72%, of which 6.38% were term infants (11). A local study from Altayef reported a prevalence of 0.15% (13/ 8634) in infants born at more than 37 weeks gestation (12). Reported risk factors associated with RDS include male gender, caesarian section delivery, maternal medical conditions such as hypertension or diabetes, chorioamnionitis, and multiple pregnancies (6, 13, 14, 15). Prognosis of RDS depends on the severity and underlying cause (7). A center in China reported a mortality rate of 3.9% (8/205) in full term neonates with RDS (15).

2. AIM

The aim of this study was to determine the incidence, risk factors, and the short-term outcomes of RDS in term infants born in an academic tertiary care center at King Abdul-Aziz University Hospital (KAUH), Jeddah, Saudi Arabia.

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3. METHODS

Study design

We retrospectively collected data of all infants admitted to the NICU at KAUH, a level II and III unit at an academic center, Jeddah, Kingdom of Saudi Arabia, between January 1st 2016 and December 31st 2016. The NICU at KAUH is a 34-beds unit and serves primarily low and middle-class population in an urban city. It provides care to around 400-500 newborns per year.

Our source population was all term infants delivered at KAUH from January 1st 2016 to December 31st 2016. We excluded infants with major congenital anomalies. Cases were all term infants who were admitted to NICU with the diagnosis of RDS. We matched 1:1 control group, which included term infants born within one or two days from the date of birth of the case and received routine newborn care. Data were retrospectively collected from electronic database and paper-charts of both infants and their mothers.

A trained research team member collected the data according to predefined definition of variables agreed upon by research team. The effect of the following maternal factors on the risk of RDS in term infants was explored: booking status, maternal age, parity, diabetes, hypertension, premature rupture of membrane (PROM), chorioamnionitis and mode of delivery.

We also collected information about infants' characteristics including birth weight, gestational age, sex, and Apgar scores at the first and fifth minutes of age. In-hospital mortality and length of hospital stay were the outcome measures collected for this study.

Definition of variables

Respiratory distress syndrome was defined by the constellation of three clinical signs, including respiratory distress, oxygen requirement, and findings on chest X-ray (16). The booking status of the pregnant mother was determined by reviewing maternal chart for the number of antenatal visits. Un-booked woman was defined as a mother who only had one visit or failed to seek antenatal care services in KAUH or other modern healthcare facility (17). Premature rupture of membrane was defined as rupture of membrane more than 18 hours prior to labor (18). Chorioamnionitis was defined clinically by the combination of fever, maternal-fetal tachycardia, uterine tenderness, and/or foul-smelling amniotic fluid (19).

Sample size and statistical analysis

We recruited all term infants who were admitted to NICU with the diagnosis of RDS in the study period and we matched 1:1 control for every case. Categorical and continuous variables were described using frequencies and associated percentages and means with associated standard deviations (SD) respectively. For comparisons of continuous and categorical variables, t-test and Chi-square test were applied respectively. A p-value less than 0.05 was considered significant.

The incidence of RDS in our study was calculated as the number of term infants with RDS divided by the total number of infants born at term during the study period.

Ethical considerations

The Institutional review board (IRB) at King Abdul-Aziz University Hospital (KAUH) approved this study.

4. RESULTS

Three thousands and six hundreds and one (3601) infants were born at full term in KAUH during the study period. Fifty-nine infants were admitted to the NICU with the diagnosis of RDS. The incidence of RDS was 1.64 % (59/3601).

Maternal and infants characteristics are depicted in Table (1). There were no significant differences between cases and controls in any of the maternal characteristics. Infants with RDS were significantly of lower birth weight and had lower Apgar scores at one and five minutes. Although there was a higher number of cesarean section and PROM in the RDS group, the difference didn't reach statistical significance.

The mean duration of hospital stay for term infants with RDS was 13.9 ±33 days. Three infants died in the RDS group with mortality rate 5.1% .

	Term infants with RDS N=59	Term infants who received routine care N=59	P value
Maternal characteristics			
Age (years)	30.3 (6.8)	28.4 (5.3)	0.101
Parity	1(0, 2)	1 (1,2)	0.894
Booked	41 (69.5)	46 (78)	0.403
Diabetes	1(1.7)	0 (0)	1.000
Hypertension	3 (5.1)	4 (6.8)	1.000
Premature rupture of membrane	7 (11.9)	3 (5.1)	0.322
Chorioamnionitis	0 (0)	0(0)	-
Intrapartum fever	1 (1.7)	0 (0)	1.000
Cesarean section	31 (52.5)	30 (50.8)	0.479
Elective cesarean section	10 (16.9)	9 (15.3)	0.403
Infants characteristics			
Gestational age	38.9 (1.4)	38.5 (1.7)	0.127
Birth weight	2853 (790)	3106 (515)	0.041*
Male	31 (52.5)	30 (50.8)	1.0
Apgar score at one minute	8 (6,9)	9 (8,9)	<0.001*
Apgar score at five minutes	9 (8,10)	10 (9,10)	<0.001*

Table 1. Maternal and infants characteristic. *Significant at p<.05.

*Results are expressed as frequency (%) or mean (±SD)

5. DISCUSSION

Respiratory distress syndrome is a challenging problem and one of the most common causes of admission in NICU (11). In this study, the incidence of RDS among full term neonates was 1.64. Higher incidence rates were reported by earlier studies from India (4.2%) (20), Turkey (7%) (21), and Sudan (4.83%) (22). Further, prospective

multicenter study in Italy, reported a lower (1.16%) incidence of RDS in full term neonates (23).

Recognition of risk factors for respiratory distress in neonates is crucial for development of preventive and early treatment strategies (24). The current study revealed absence of significant differences between cases and controls in any of the maternal characteristics. Although there was a higher number of cesarean section and PROM in the RDS group, but that didn't reach statistical significance. The association between cesarean section and RDS was explored in previous studies (25, 26). Furthermore, Gouyon et al. (27) studied risk factors of RDS in term infants and concluded that elective cesarean section is the main risk factor for respiratory distress in term infants. Thus, it is evident that the onset of spontaneous labor is associated with rapid clearance of fetal lung fluid and lung maturation (28). A recent systematic review supported the continued use of a single course of antenatal corticosteroids to accelerate fetal lung maturation in women at risk of preterm birth. The use of steroids was associated with a reduction in the most serious adverse outcomes related to prematurity including moderate and severe RDS (29).

Infants with RDS in our study had significantly lower birth weight and lower Apgar scores at one and five minutes. Similarly, Condò et al. (26) concluded that low-birth weight in term infants was the main risk factor for RDS.

Early recognition of respiratory distress and initiation of appropriate treatment is important to ensure optimal outcomes. In our study the mortality rate among term infants with RDS was 5.1%. Greater mortality rates were reported in the first week of life of full-term neonates with RDS in India (20). Widespread use of oxygen and continuous positive airway pressure might explain this difference in RDS-specific mortality. Liu et al. (30) studied the characteristics of full-term infants with RDS, and they reported a high mortality rate associated with severe infection complicating the course of the disease.

We would like to acknowledge some of the limitations of this study. The retrospective nature of the study did not allow us to collect more information about other variables to study their association with the incidence of RDS. Additionally, small sample size did not allow logistic regression analysis to determine the specific odds for various risk factors and might be responsible for not reaching significant difference between groups.

We took measures to decrease selection bias by including all term infants with RDS born in the specified study period and by using systematic sampling to match the controls.

6. CONCLUSION

Low birth weight and low Apgar score are the main risk factors of RDS in full-term neonates in our sample. A Prospective multicenter study recruiting larger numbers of term neonates is highly warranted.

Respiratory distress in term infants is still a significant cause of admission to NICU and a predisposing factor for neonatal mortality and morbidity.

Preventative and anticipatory measures should be further explored to decrease the burden of this disease.

Author's contribution: Each author gave substantial contributions to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. Each author had a part in article preparing for drafting or revising it critically for important intellectual content, and each author gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

- **Author's Contribution:** Each author gave substantial contribution to the conception or design of the work and in the acquisition, analysis and interpretation of data for the work. Each author had role in drafting the work and revising it critically for important intellectual content. Each author gave final approval of the version to be published and they agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
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REFERENCES

1. Respiratory Distress Syndrome | National Heart, Lung, and Blood Institute (NHLBI) [Internet]. Nhlbi.nih.gov. Available from: <https://www.nhlbi.nih.gov/health/health-topics/topics/rds>
2. Horowitz K, Feldman D, Stuart B, Borgida A, Ming Victor Fang Y, Herson V. Full-term neonatal intensive care unit admission in an urban community hospital: the role of respiratory morbidity. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2011; 24(11): 1407-1410.
3. Liu J1, Shi Y, Dong JY, Zheng T, Li JY, Lu LL, et al. Clinical characteristics, diagnosis and management of respiratory distress syndrome in full-term neonates. *Chin Med J (Engl)*. 2010; 123(19): 2640-2644.
4. Gallacher D, Hart K, Kotecha S. Common respiratory conditions of the newborn. *Breathe*. 2016; 12(1): 30-42.
5. Chalacon M, Debillon T, Plantaz D, Ego A. Facteurs de risque de détresse respiratoire chez les prématurés modérés (32 à 34 semaines d'aménorrhée) [Internet]. *Médecine humaine et pathologie*. 2012. Available from: <https://dumas.ccsd.cnrs.fr/dumas-00687041/document>
6. Saeed Z, Lutufullah G, Hassan R. Prevalence and Aetiology of Respiratory Distress in newborns. *PAFMJ*. 2013 Mar; 63: 1.
7. Qian L, Liu C, Guo Y, et al. Current status of neonatal acute respiratory disorders: a one-year prospective survey from a Chinese neonatal network. *Chin Med J (Engl)*. 2010; 123: 2769-2775.
8. Jian Wang, Xuehua Liu, Tong Zhu, and Chaoying Yan. Analysis of neonatal respiratory distress syndrome among different gestational segments. *Int J Clin Exp Med*. 2015; 8(9): 16273-16279.
9. Bouziri A, Ben Slima S, Hamdi A, et al. Acute respiratory distress syndrome in infants at term and near term about 23 cases. *Tunis Med*. 2007; 85: 874-879.

10. K Nagendra, Wilsom CG, Ravichander B, Sood S, Singh SP. Incidence and Etiology of Respiratory Distress in Newborn. *Med J Armed Forces India*. 2017; 55(4): 331-333.
11. Ghafoor T, Mahmud S, Ali S, Dogar SA. Incidence of respiratory distress syndrome. *Journal of the College of Physicians and Surgeons, Pakistan : JCPSP*. 2003; 13(5): 271-273.
12. Bakr, A. and Abbas, M. Severe respiratory distress in term infants born electively at high altitude. *BMC Pregnancy and Childbirth*. 2006; 6(1).
13. Reuter S, Moser C, Baack M. Respiratory Distress in the Newborn. *Pediatrics in Review*. 2014; 35: 417.
14. Hansen AK, Wisborg K, Uldbjerg N, Henriksen TB. Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study. *BMJ*. 2008; 336: 85-87.
15. Jing Liu, Na Yang, Ying Liu. High-risk Factors of Respiratory Distress Syndrome in Term Neonates: A Retrospective Case-control Study. *Balkan Med J*. 2014; 31(1): 64-68.
16. Aggarwal R, Deorari AK, Paul VK. Fluid and electrolyte management in term and preterm neonates. *Indian J Pediatr*. 2001; 68(12): 1139-1142.
17. Mutihir JT, Nyiputen YA. The unbooked patient: A lingering obstetric pathology in Jos, Nigeria. *Journal of obstetrics and Gynaecology*. 2007; 1; 27(7): 695-698.
18. Popowski T, Goffinet F, Maillard F, Schmitz T, Leroy S, Kayem G. Maternal markers for detecting early-onset neonatal infection and chorioamnionitis in cases of premature rupture of membranes at or after 34 weeks of gestation: a two-center prospective study. *BMC Pregnancy Childbirth*. 2011; 11: 26.
19. *Am J Obstet Gynecol*. 2015 ;213(40): S29-S52.
20. Kumar A, Bhat BV. Epidemiology of respiratory distress of newborns. *Indian journal of pediatrics*. 1996; 63(1): 93-98.
21. Fedakar A, Aydogdu C. Clinical features of neonates treated in the intensive care unit for respiratory distress. *The Turkish journal of pediatrics*. 2011; 53(2): 173-179.
22. Abdelrahman SM, Hamed SM, Nasr A. Neonatal respiratory distress in Omdurman Maternity Hospital, Sudan. *Sudanese journal of paediatrics*. 2014; 14(1): 65-70.
23. Rubaltelli FF, Dani C, Reali MF, et al. Acute neonatal respiratory distress in Italy: a one-year prospective study. *Italian Group of Neonatal Pneumology. Acta paediatrica (Oslo, Norway : 1992)*. 1998; 87(12): 1261-1268.
24. Edwards MO, Kotecha SJ, Kotecha S. Respiratory distress of the term newborn infant. *Paediatric respiratory reviews*. 2013; 14(1): 29-36; quiz -7.
25. Sun H, Xu F, Xiong H, et al. Characteristics of respiratory distress syndrome in infants of different gestational ages. *Lung*. 2013; 191(4): 425-433.
26. Condo V, Cipriani S, Colnaghi M, et al. Neonatal respiratory distress syndrome: are risk factors the same in preterm and term infants? *The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet*. 2017; 30(11): 1267-1272.
27. Gouyon JB, Ribakovskiy C, Ferdynus C, Quantin C, Sagot P, Gouyon B. Severe respiratory disorders in term neonates. *Paediatric and perinatal epidemiology*. 2008; 22(1): 22-30.
28. Ramachandrappa A, Jain L. Elective Cesarean Section: It's Impact on Neonatal Respiratory Outcome. *Clinics in perinatology*. 2008; 35(2): 373-vii.
29. Roberts D, Brown J, Medley N, Dalziel SR. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. *The Cochrane database of systematic reviews*. 2017; 3: Cd004454.
30. Liu J, Shi Y, Dong JY, et al. Clinical characteristics, diagnosis and management of respiratory distress syndrome in full-term neonates. *Chinese medical journal*. 2010; 123(19): 2640-2644.