Respiratory Distress and Its Outcome among Neonates Admitted to Neonatal Intensive Care Unit of Mukalla Maternity and Child Hospital, Yemen

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Abstract

**Background:** Respiratory distress is one of the most common causes of admission in neonatal intensive care unit.

**Objective:** To determine the causes and to study the various risk factors associated with development of respiratory distress and outcomes of respiratory distress in neonates admitted to neonatal care unit of Mukalla Maternity and Child Hospital in Al-Mukalla city, Hadhramaut Governorate, Yemen.

**Patients and Methods:** This is a prospective study covering the 12-month period between April 2018 to March 2019 to neonates admitted to neonatal care unit of Mukalla Maternity and Child hospital.

**Results:** A total of 430 patients were admitted to the neonatal care unit. Number of cases presented with respiratory distress was 250, representing 58.1% of all cases admitted. The most frequent underlying cause for respiratory distress in children was respiratory distress syndrome (44%), followed by transient tachypnea of the newborn (18.8%), birth asphyxia (14%), meconium aspiration syndrome (12%), and other causes (11.2) (CHD 10(4%), sepsis (3.2%), congenital pneumonia (2.4%), and congenital anomalies (1.6%). The majority of cases of respiratory distress syndrome and transient tachypnea of newborn were males with statistical significant difference. The outcome of neonatal respiratory disorders was: cure in 40.4% of cases, patients discharged with complications in 10.4% of cases, and death in 49.2% of cases. The highest case fatality rate of neonatal respiratory distress diseases were respiratory distress syndrome (81.8%) followed by meconium aspiration syndrome (56.7%) and birth asphyxia (34.3%).

**Conclusion:** Respiratory distress syndrome was the main cause of respiratory distress followed by transient tachypnea of newborn.

**Keywords:** Respiratory distress, neonate, causes, outcome, risk factor, NICU.

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Introduction

Respiratory distress (RD) is a challenging problem and is one of the most common causes of admission in neonatal intensive care unit (NICU) [1]. Respiratory distress is reported in 13.3–88% of ill neonates [2-7]. A wide variety of pathologic lesions may be responsible for respiratory disturbances, including pulmonary, airway, cardiovascular, central nervous, infection, and other disorders [8]. Some risk factors increase the likelihood of neonatal respiratory disease; prematurity, meconium stained amniotic fluid, cesarean delivery, gestational diabetes, maternal chorioamnionitis and presence of prenatal ultrasonographic findings such as oligohydramnios or structural lung abnormalities [9]. Irrespective of the underlying etiology, neonatal respiratory diseases NRD has been reported to contribute to poor neonatal outcomes particularly in the developing countries [6,10]. Therefore, any healthcare professional who cares for newborn babies should easily recognize the symptoms and signs of respiratory distress, distinguish between various causes and initiate management strategies to prevent significant complications or death [11]. The aim of this study was to determine the causes and to study the various risk factors associated with development of RD and outcomes of respiratory distress in neonates admitted to NICU of Mukalla Maternity and Child Hospital (MMCH).

Patients and Methods

This is a prospective study covering the 12-month period between April 2018 to March 2019 to neonates admitted to NICU of MMCH in Al- Mukalla city, Hadhramaut Governorate, Yemen. Out of 430 neonates admitted to NICU of MMCH during study period 250 of them had RD which constituted 58.1% of all cases admitted.

Inclusion criteria: Were all neonate admitted to NICU in MMCH with a diagnosis of NRD. Exclusion criteria: Babies weight less than 1000 gms and babies less than 28 wks of age were excluded from the study. The following information's were recorded: The maternal data included: maternal age at pregnancy, parity, maternal hypertension, maternal diabetic, multiple gestation, antepartum hemorrhage, maternal fetal infection, Pre-eclampsia, mode of delivery, prolonged labor. Neonatal data included : Gender, gestational age, birth weight.

Definition of terms

Neonatal respiratory distress: The presence of one or more of the following signs: tachypnea > 60 breaths/min, or signs of labored breathing (expiratory grunting, nasal flaring, intercostal recessions, xyphoid recessions, or thoraco-abdominal asynchrony), with or without cyanosis [4].Diagnostic criteria for RDS were considered by the presence of clinical sign, such as grunting, flaring, tachypnea, retractions, requiring a respiratory support (supplemental oxygen requirement and/or non-invasive or invasive ventilation). Typical radiological findings were reticulogranular patterns, air bronchograms and ground glass appearance [12]. Transient tachypnea of newborn (TTN) is characterized by the early
onset of tachypnea (>60 breaths/min), sometimes with retractions or expiratory grunting and occasionally with cyanosis that is relieved by minimal O2 supplementation (<40%). The chest generally sounds clear without crackles or wheeze, and the chest radiograph shows prominent perihilar pulmonary vascular markings, fluid in the intralobar fissures, and rarely small pleural effusions [13].

Birth asphyxia was presumed in outborns when there was a history that the baby had failed to cry or breathe at birth [14]. Apgar score was used in all inborn; a score <7 in the first minute and fifth minute was regarded as asphyxia [14].

Meconium aspiration syndrome was defined as the onset of respiratory distress after birth with meconium-stained body and liquor with or without features of air leaks[15] Chest radiograph may show widespread patchy or homogenous opacities infiltrates and evidence of air trapping[15]. Diagnosis of sepsis was made when the baby had a bacterial growth on blood culture or cerebrospinal fluid culture, respectively [16].

Case Fatality Rate (CFR) = (No. of deaths due to certain disease/ Total cases from that disease) x100 [17].

**Statistical analysis**

The collected data were coded, tabulated, and statistically analyzed using SPSS program and version 17. Data were described using frequencies and percentages. The differences between proportions were tested using chi-square test. A p-value less than 0.05 was considered statistically significant.

**Results**

From April 2018 to March 2019, a total of 430 patients were admitted to the NICU. Number of cases presented with respiratory distress was 250, representing 58.1% of all cases admitted. Due to the small percentage of congenital heart disease, congenital anomalies, congenital pneumonia, sepsis, they were combined as the term of others for subsequent analysis.

Table (1) illustrates that babies delivered by CS showed significantly high rates of both RDS and TTN when compared to delivered by vaginal delivery. Prolonged labor were significantly associated with TTN, BA and MAS. None of the other maternal characteristics were associated with causes of NRD.

Table (2) illustrates no significant association between maternal hypertension, maternal diabetes, multiple gestation and causes of NRD.

Table (3) shows no significant association between antepartum hemorrhage, maternal fetal infection, pre-eclampsia and causes of NRD.

Table (4) illustrates that the majority of cases of RDS and TTN were male with statistical significant difference. The only neonatal RD disorders that were associated with low birth weight was RDS. It was found that RDS was significantly associated with prematurity, while TTN and MAS were significantly associated with full term.

Table(5) shows the highest case fatality rate of neonatal respiratory distress diseases were RDS (81.8%) followed by MAS.
(56.7%), BA (34.3%), congenital anomalies (25%), CHD (20%) and neonatal sepsis (12.5).

Table (6) summarizes the underlying illnesses of NRD in this study, compared with results from previous studies.

Figure (1) summarizes the most frequent underlying causes for NRD were respiratory distress syndrome (RDS) 110 (44%), followed by transient tachypnea of the newborn (TTN) 47 (18.8%), birth asphyxia (BA) 35 (14%), meconium aspiration syndrome (MAS) 12 (12%), others 28 (11.2).

Figure (2) shows that the outcome of NRD was: cure in 40.4% of cases, patients discharged with complications in 10.4% of cases, and death in 49.2% of cases.

Table (1): Relationship of maternal age, parity, mode of delivery, prolonged labor and causes of NRD

| Causes of RD | Total (N=250) | Maternal age (year) | P-value |
|--------------|---------------|---------------------|---------|
|              | <35 (< 200) N (%) | >35 (> 50) N (%) |         |
| RDS          | 110            | 90 (81.8)           | 20 (18.2) | 0.52 |
| TTN          | 47             | 36 (76.6)           | 11 (23.4) | 0.51 |
| BA           | 35             | 30 (85.7)           | 5 (14.3)  | 0.36 |
| MAS          | 30             | 23 (76.7)           | 7 (23.3)  | 0.62 |
| Others       | 28             | 21 (75)             | 7 (25)    | 0.48 |

| Causes of RD | Total (N=250) | Parity | P-value |
|--------------|---------------|--------|---------|
|              | Primiparous (60) N (%) | 1-2 (100) N (%) | >3 (90) N (%) |         |
| RDS          | 110            | 30 (27.3) | 45 (40.9) | 35 (31.8) | 0.28 |
| TTN          | 47             | 14 (29.8) | 17 (36.2) | 16 (34)   | 0.30 |
| BA           | 35             | 8 (22.8) | 12 (34.3) | 15 (42.9) | 0.86 |
| MAS          | 30             | 4 (13.3) | 17 (56.7) | 9 (30)    | 0.15 |
| Others       | 28             | 4 (14.3) | 9 (32.1) | 15 (53.6) | 0.20 |

| Causes of RD | Total (N=250) | Mode of delivery | P-value |
|--------------|---------------|------------------|---------|
|              | Vaginal delivery (73) N (%) | Cesarean delivery (177) N (%) |         |
| RDS          | 110            | 25 (22.7) | 85 (77.3) | 0.04 |
| TTN          | 47             | 20 (42.6) | 27 (57.4) | 0.02 |
| BA           | 35             | 15 (42.9) | 20 (57.1) | 0.05 |
| MAS          | 30             | 5 (16.7) | 25 (83.3) | 0.11 |
| Others       | 28             | 8 (28.6) | 20 (71.4) | 0.93 |

| Causes of RD | Total (N=250) | Prolonged labor | P-value |
|--------------|---------------|----------------|---------|
|              | Yes (175) N (%) | No (75) N (%) |         |
| RDS          | 110            | 74 (67.3) | 36 (32.7) | 0.40 |
| TTN          | 47             | 25 (53.2) | 22 (46.8) | 0.006 |
| BA           | 35             | 30 (85.7) | 5 (14.3)  | 0.03 |
| MAS          | 30             | 26 (86.7) | 4 (13.3)  | 0.04 |
| Others*      | 28             | 20 (71.4) | 8 (28.6)  | 0.86 |
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*RDS : Respiratory distress syndrome  
TTN : Transient tachypnea of newborn  
**BA: Birth asphyxia  
MAS : Meconium aspiration syndrome  
Others (congenital heart disease, congenital pneumonia, sepsis and congenital anomalies)  
Congenital anomalies(diaphragmatic hernias, tracheoesophageal fistula, congenital lobar emphysema)

Table (2): Relationship of maternal hypertension, maternal diabetes, multiple gestation and causes of NRD

| Causes of RD | Maternal hypertension | P-value |
|--------------|------------------------|---------|
|              | Yes(N=15)              | No(N=235) |
| RDS          | 5(4.5)                 | 105(95.5) | 0.39 |
| MAS          | 3(6.4)                 | 44(93.6)  | 0.90 |
| BA           | 2(5.7)                 | 33(94.3)  | 0.93 |
| MAS          | 4(13.3)                | 26(86.7)  | 0.08 |
| Others       | 1(3.6)                 | 27(96.4)  | 0.57 |

| Causes of RD | Maternal diabetes | P-value |
|--------------|-------------------|---------|
|              | Yes(N=10)         | No(N=240) |
| RDS          | 5(4.5)            | 105(95.5) | 0.21 |
| TTN          | 1(2.1)            | 46(97.9)  | 0.58 |
| BA           | 0(0.0)            | 35(100)   | 0.42 |
| MAS          | 2(6.7)            | 28(93.3)  | 0.37 |
| Others       | 2(7.1)            | 26(92.9)  | 0.32 |

| Causes of RD | Multiple gestation | P-value |
|--------------|--------------------|---------|
|              | Yes(N=6)           | No(N=244) |
| RDS          | 3(2.7)             | 107(97.3) | 0.76 |
| TTN          | 2(4.3)             | 45(95.7)  | 0.36 |
| BA           | 1(2.9)             | 34(97.1)  | 0.84 |
| MAS          | 0(0.0)             | 30(100)   | 0.67 |
| Others       | 0(0.0)             | 28(100)   | 0.71 |

Table (3): Relationship of antepartum hemorrhage, maternal fetal infection, pre-eclampsia and causes of NRD

| Causes of RD | Antepartum hemorrhage | P-value |
|--------------|------------------------|---------|
|              | Yes(N=18)              | No(N=232) |
| RDS          | 8(7.3)                 | 102(92.7) | 0.96 |
| TTN          | 2(4.2)                 | 45(95.8)  | 0.39 |
| BA           | 5(14.3)                | 30(85.7)  | 0.09 |
| MAS          | 3(10)                  | 27(90)    | 0.52 |
| Others       | 0(0.0)                 | 28(100)   | 0.25 |

| Causes of RD | Maternal fetal infection | P-value |
|--------------|---------------------------|---------|
|              | Yes(N=15)                 | No(N=235) |
| RDS          | 5(4.5)                    | 105(95.5) | 0.90 |
| TTN          | 3(6.4)                    | 44(93.6)  | 0.72 |
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| Birth asphyxia | 35 | 1(2.9) | 34(97.1) | 0.46 |
| MAS | 30 | 3(10) | 27(90) | 0.28 |
| Others | 28 | 3(10.7) | 25(89.3) | 0.23 |

| Causes of RD | Total (N=250) | Pre-eclampsia | P-value |
| | | Yes (6) | N (%) | N (244) | N (%) |
| RDS | 110 | 2(1.8) | 108(98.2) | 0.44 |
| TTN | 47 | 0(0.0) | 47(100) | 0.73 |
| BA | 35 | 1(2.9) | 34(97.1) | 0.35 |
| MAS | 30 | 0(0.0) | 30(100) | 0.99 |
| Others | 28 | 0(0.0) | 28(100) | 0.95 |

Table (4): Relationship between sex of neonates, gestational age, birth weight and causes of NRD

| Causes of RD | Total (N=250) | Male (180) | Female (70) | P-value |
| | | N (%) | N (%) |
| RDS | 110 | 90(81.8) | 20(18.2) | 0.002 |
| TTN | 47 | 28(59.6) | 19(40.4) | 0.03 |
| BA | 35 | 21(60) | 14(40) | 0.09 |
| MAS | 30 | 18(60) | 12(40) | 0.12 |
| Others | 28 | 23(82.1) | 5(17.9) | 0.211 |

| Causes of RD | Total (N=250) | <2.5(165) | 2.5-3.9(74) | ≥4(11) | P-value |
| | | N (%) | N (%) | N (%) | |
| RDS | 110 | 80(72.7) | 30(27.3) | 0(0) | 0.04 |
| TTN | 47 | 30(63.8) | 15(32) | 2(4.2) | 0.72 |
| BA | 35 | 20(57.2) | 11(31.4) | 4(11.4) | 0.23 |
| MAS | 30 | 17(56.7) | 10(33.3) | 3(10) | 0.25 |
| Others | 28 | 18(64.3) | 8(28.6) | 2(7.1) | 0.83 |

| Causes of RD | Total (N=250) | Preterm<3 | Fullterm 37-42 | Postterm >16 | P-value |
| | | 7 w(142) | 42(92) | N (%) | N (%) | N (%) | |
| RDS | 110 | 100(90.9) | 10(9.1) | 0(0.0) | P < 0.001 |
| TTN | 47 | 2(4.3) | 40(85.1) | 5(10.6) | P < 0.001 |
| BA | 35 | 15(42.9) | 16(45.7) | 4(11.4) | 0.24 |
| MAS | 30 | 10(33.3) | 18(60) | 2(6.7) | 0.006 |
| Others | 28 | 15(53.6) | 8(28.6) | 5(17.8) | 0.340 |
Table (5): Frequency of causes of NRD and their outcome

| Causes          | Immediate outcome | Case fatality rate (%) | Total N=250 |
|-----------------|-------------------|------------------------|-------------|
|                 | Cured N=101       | Discharged with complication N=26 | Died N=123 |
| RDS             | 15                | 5                      | 90          | 81.8        | 110        |
| TTN             | 47                | 0                      | 0           | 0           | 47         |
| Birth asphyxia  | 15                | 8                      | 12          | 34.3        | 35         |
| MAS             | 11                | 2                      | 17          | 56.7        | 30         |
| CHD             | 0                 | 8                      | 2           | 20          | 10         |
| Neonatal sepsis| 6                 | 1                      | 1           | 12.5        | 8          |
| Congenital pneumonia | 6               | 0                      | 0           | 0           | 6          |
| Congenital anomalies | 1         | 2                      | 1           | 25          | 4          |

Table (6): Underlying illnesses of NRD in this study, compared with results from previous studies

| Study                  | Current study | Abdelrahman et al., (3) | Tochie et al., (4) | Rao and Rao (5) | Abou Faddan and Abdelaziz. (6) | Rijal and Shrestha (7) |
|------------------------|---------------|-------------------------|-------------------|-----------------|-------------------------------|-----------------------|
| Published year         | 2019          | 2014                    | 2016              | 2017            | 2018                          | 2018                  |
| Country                | Yemen         | Sudan                   | Cameroon          | India           | Egypt                         | Nepal                 |
| Number of cases        | 250 (52.9%)   | 100 (56.5%)             | 334 (47.5%)       | 200 (13.3%)     | 487 (52.9%)                   | 109 (34.3%)           |
| RDS                    | 110 (44%)     | 15 (15%)                | 47 (14%)          | 64 (32%)        | 223 (45.8%)                   | 13 (11.9%)            |
| TTN                    | 47 (18.8%)    | 28 (28%)                | 83 (25%)          | 18 (9%)         | 83 (17%)                      | 17 (15.6%)            |
| Birth asphyxia         | 35 (14%)      | -                       | 27 (8%)           | 37 (18.5%)      | -                             | 13 (11.9%)            |
| MAS                    | 30 (12%)      | 6 (6%)                  | 37 (11%)          | 70 (35%)        | 9 (1.8%)                      | 23 (21.1%)            |
| Others                 |               |                         |                   |                 |                               |                       |
| CHD                    | 10 (4%)       | 9 (9%)                  | -                 | 7 (3.5%)        | -                             | 7 (6.4%)              |
| Neonatal sepsis        | 8 (3.2%)      | 24 (24%)                | 103 (31%)         | -               | -                             | 18 (6.5%)             |
| Congenital pneumonia   | 6 (2.4%)      | 18 (18%)                | 37 (11%)          | 2 (1%)          | 86 (17.7%)                    | 2 (1.8%)              |
| Congenital anomalies   | 4 (1.6%)      | 18 (18%)                | 37 (11%)          | 2 (1%)          | 86 (17.7%)                    | 2 (1.8%)              |
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Discussion

We had observed that, the most frequent underlying cause for RD in children was RDS 44% of cases, followed by TTN 18.8%, birth asphyxia 14%, MAS (12%), others 11.2% (CHD 4%, sepsis 3.2%, congenital pneumonia 2.4%, and congenital anomalies 1.6%. Compared to previous studies [3-7], our results showed some similarities and
differences. This wide variation in proportion of causes of respiratory distress among various studies may be due to antenatal care in that community, availability of obstetricians including trained birth attendants, use of preventive measures during antenatal period, proportion of term and preterm deliveries, non-uniform inclusion criteria, various other factors such as status of community and type of facilities in institution [18]. The first important cause of respiratory distress in this study was RDS, which was found to be 110(44%). Similarly, RDS was found to be the first cause of respiratory distress with a proportion of 45.8% by Abou-Faddan and Abdelaziz [6] and Sabzehei et al., (36.6%) [19]. Low proportion were found by Rijal and Shrestha (11.9%) [7], abdulrahaman et al., (15%) [3] and Tochie et al., (14%) [4]. This can be explained by a higher proportion of neonates in our study were premature. In the current study, it was observed that cesarean delivery was significantly higher in RDS (77.3% versus 22.7% for babies with normal vaginal delivery ,p=0.04). This is in agreement with the results of other studies [6,7,20,21]. Respiratory distress syndrome (RDS) occurs primarily in premature infants; its incidence is inversely related to gestational age and birth weight. Surfactant deficiency (decreased production and secretion) is the primary cause of RDS [12]. In the current study, it was also observed that low birth weight was significantly higher in RDS (72.7% versus 27.3% for babies with normal weight ,p=0.04) [6,7,20]. The premature and low-birth-weight neonates usually have pulmonary immaturity and limited respiratory muscle strength. It is important to make a diagnosis and find the etiology to provide appropriate management to prevent preterm delivery [24]. Transient tachypnea of newborn was the second most common cause of respiratory distress found in 47(18.8%) with similar proportion as reported by other
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studies [6,7]. But, kommawar et al., found TTN was the most common cause of respiratory distress in newborns with proportion of 40%. [25]. In the study done by Sodawat et al., a transient tachypnea of newborn was found to be the commonest of respiratory distress in newborns with incidence of (32.6%) [18].

In the current study, it was observed that cesarean delivery was significantly higher in TTN (57.4% versus 42.6% for babies with normal vaginal delivery, p=0.02). This is consistent with previously reported findings [7,26]. These have been attributed to delayed or abnormal fetal lung fluid clearance due to the absence of the hormonal changes that accompany spontaneous labor [27]. Transient tachypnea of newborn is believed to be secondary to slow absorption of fetal lung fluid, resulting in decreased pulmonary compliance and tidal volume and increased dead space [13]. It was also observed that prolonged labor was significantly higher in TTN (53.2% versus 46.8% for babies with normal labor, p=0.006), which is consistent with other results [26,27,28]. Prolonged labor may cause dysfunctional catecholamine regulation, mild pulmonary capillary leak and myocardial dysfunction [28]. In the current study, it was observed that male gender was significantly higher in TTN (59.6% versus 40.4% for female, p=0.03). This is in agreement with the results of other studies [26,27]. It was also observed that full term was significantly higher in TTN, which is consistent with other results [6,26]. Birth asphyxia constituted 35(14%) of the total respiratory distress cases in our study. A proportion of birth asphyxia of 12.2% and 11.9% were found by kommawar et al., [25] and Rijal and Shrestha [7] respectively. Very low proportion were found by Sabzehei et al., (1.1%) [19]. It was observed that prolonged labor was significantly higher in BA (85.7% versus 14.3% for babies with normal labor, P=0.03). This was agreement with other studies [29,30]. It is clear that when labor is prolonged, there is a high probability for the fetus to become distressed[31] Meconium aspiration syndrome constituted 30(12%) of the total respiratory distress cases in our study. Proportion of MAS of 9.3% and 11% were found by Sodawat et al., [18] and Tochie et al. [4] respectively. Very high proportions were found by Rao and Rao (35 %) [5]. It was observed that prolonged labor was significantly higher in MAS (86.7% versus 13.3% for babies with normal, p=0.04). This is consistent with previously reported findings [32,33]. Probably because this is the referral hospital catering more than 250 km radial distance hence the referred patient took longer time to reach the hospital. It was also observed that full term was significantly higher in MAS, which is consistent with other results [33,34]. This was related to maturity and increased levels of intestinal hormone, motilin with increasing gestational age [34]. The immediate outcome of NRD is cure in 40.4%, patients discharged with complications are 10.4% and death occurred in 49.2% of cases. In a study done by Abdelrahman et al., [3] the immediate outcome of NRD is cure in 56%, patients
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Discharged with complications are 8% and
death occurred in 36% of cases. Sabzehei et
al., [19] reported that 19.3 of infants with
NRD died of the disease. Sodawat et al., [18]
found that overall death among cases of
respiratory distress was 28%. But, Rao and
Rao [5] found a very low death rate among
NRD (2.5%). Comparison between the
causes and their fatalities in this study
revealed that hyaline membrane disease has
case fatality rate of (81.8) followed by MAS
(56.7%) and BA (34.3%). This result is
consistence with other studies [5,6,10]. In a
study done by Sodawat et al., the fatality rate
were 47.58% for RDS, 42.24% for sepsis,
35.71% for MAS, 35.55% for HIE and
33.33% for cases of CHD[18]. Kommawar et
al., [25] reported the highest case fatality rate
were 61.6% for HMD, 17.4% for BA and
8.13% for MAS. The high fatality rate can
be explained by the higher percentages of
preterm and LBW, inadequate antenatal care,
less use of steroid in prematurity antenatal,
less meticulous management of high risk
pregnancies. In addition to our study was
conducted in children hospital, which
represents the reference hospital for neonates
of high risk pregnancies and complicated
deliveries and lack of surfactant replacement
therapy in our hospital and mechanical
ventilation. In conclusions respiratory
distress was the major cause of admission in
our NICU. The most common causes of
respiratory distress were RDS, perinatal
asphyxia, and MAS. The common cause of
death was RSD. RDS is significantly
correlated with cesarean section, prematurity,
male sex and low birth weight, while
prolonged labor were significantly associated
with TTN, BA and MAS. From this study we
may recommend the followings; early
detection and appropriate management of
risk factor is essential to ensure better
outcome in all infants presenting with
respiratory distress. Good antenatal care with
prompt management of high risk
pregnancies. Early recognition of potential
risk factors for respiratory distress will be
helpful in decreasing the burden associated
with neonatal respiratory distress.

Proper training of physicians in the
management of neonatal respiratory distress,
including availability of equipped NICU with
ventilator and surfactant facilities.

Conflict of interest
The research protocol and the
questionnaires were conducted according to
principles of the Declaration of Helsinki, as
well as reviewed and approved by the college
ethical research committee. Verbal consents
were also taken from the parents and
caregivers of children involved in the study.

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