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Prevalence of Respiratory Distress Syndrome in Neonates

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ABSTRACT

Background: Acute respiratory distress syndrome is defined as acute diffuse inflammatory lung injury causing increased pulmonary vascular permeability with increased lung weight, loss of aerated lung tissues leading to hypoxemia and bilateral radiographic opacities associated with increased venous admixture, increased physiological dead space and decreased lung compliance. **Aim of work:** to determine the prevalence rates of respiratory distress syndrome (RDS) in neonates in King Abdulaziz Hospital, Taif city, Saudi Arabia and to find out the most important causes of RDS in preterm babies in Taif city. **Methods:** a cross-sectional questionnaire based study carried out in Saudi Arabia, Taif city, King Abdulaziz Hospital from January to June 2016 (6 months period) on preterm neonates. **Results:** 57.1% of newborn were male gender and 42.9% were female, 4.4% of babies were extreme preterm, 86.5% were preterm, 4.4% were late preterm and 4.7% were full term, the prevalence rate of RDS in newborn was 54.7% in the 6 months of this study. **Conclusion:** RDS is one of the major problems among newborns and a major reason for increased morbidity and mortality among infants. Preterm babies are the main risk factor for development of RDS. Mother's illnesses, especially hypertension and Diabetes are very strong risk factors for the disease in preterm babies. Cesarean delivery, especially in preterm babies and male gender stays other important risk factors for RDS.

Keywords: Respiratory Distress Syndrome , Neonates,SA.

INTRODUCTION

Berlin definition of acute respiratory distress syndrome (ARDS) is the recent definition, it defines ARDS as acute diffuse inflammatory lung injury causing increased pulmonary vascular permeability with increased lung weight, loss of aerated lung tissues leading to hypoxemia and bilateral radiographic opacities associated with increased venous admixture, increased physiological dead space and decreased lung compliance[1]. Acute respiratory disease is the leading cause for hospitalization in neonatal intensive care units. RDS considered to be the major reason for increased mortality and morbidity among infants. Neonatal respiratory distress syndrome (RDS) occurs in infants whose lungs have not yet fully developed. It can also be due to genetic problems with lung development. Most cases of RDS occur in babies born before 37 to 39 weeks. The more premature the baby is, the higher the chance of RDS after birth. The problem is uncommon in babies born full-term (after 39 weeks) [2]. Respiratory distress syndrome (RDS) is diagnosed by the presence of at least two of the following clinical signs: tachypnea (>60/min), dyspnea with inspiratory subcostal or intercostal retractions, nasal flaring, expiratory grunting and cyanosis in room air. Most frequently diagnosis of RDS occurs during the first 48 hours with transient tachypnea of the newborn, infections, meconium aspiration syndrome, hyaline membrane disease (HMD) and perinatal asphyxia [3]. The incidence of ARDS ranges from 1.5 cases per 100000[4] to nearly 79 cases per 100000[5] with European countries reporting a lower incidence than USA [6].Understanding the incidence of ARDS is important because of the costly medical care and high mortality rate associated with the disease. Since there were limited studies about the prevalence of the acute respiratory distress syndrome in neonates in Saudi Arabia, the purpose of this paper is to examine the prevalence of acute respiratory distress syndrome in neonates in Saudi Arabia. Hopefully, this report will increase awareness of respiratory distress syndrome in Saudi Arabia. The given results will guide clinical decision and improve the outcomes. Treatment for respiratory distress syndrome (RDS) usually begins as soon as an infant is born, sometimes in the delivery room. Most infants who show signs of RDS are quickly moved to a neonatal intensive care unit (NICU). The most important treatments for RDS include: surfactant replacement therapy, breathing support from a ventilator or nasal continuous positive airway pressure (NCPAP) machine which makes premature infants breathe better and oxygen therapy. Antibiotics may be given to infants to control infection. Supportive therapy for infants is carried out

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by using a radiant warmer or incubator to keep infants warm and reduce the risk of infection, monitoring of blood pressure, heart rate, breathing, and temperature through sensors taped to the babies' bodies. Sensors are used on fingers or toes to check the amount of oxygen in the infants' blood. Giving fluids and nutrients through needles or tubes inserted into the infants' veins to prevent malnutrition and promotes growth. Nutrition is critical to the growth and development of the lungs. Later, babies may be given breast milk or infant formula through feeding tubes that are passed through their noses or mouths and into their throats in addition to checking fluid intake to make sure that fluid doesn't build up in the babies' lungs[7].

AIM OF WORK

Aim of this study is to determine the prevalence rates of respiratory distress syndrome (RDS) in neonates in King Abdulaziz Hospital, Taif city, Saudi Arabia and to find out the most important causes of RDS in preterm babies in Taif city.

METHODS

This is a cross-sectional study carried out in Saudi Arabia, Taif city, King Abdulaziz Hospital from January to June 2016 (6 months period). First there was a preparatory period for selecting the title, taking permissions, preparing the questionnaire and carrying out a pilot study, this was followed by field work for data collection, data entry and analysis, followed by another period for writing the reports. All neonates at King Abdulaziz Hospital at Taif city (Males and females) were eligible for inclusion in the study. All neonates that treated at King Abdulaziz Hospital in Taif city were invited to participate in the study by filling the study questionnaire through their mothers or their files. Inclusion criteria: after taking approval from hospital Ethics committee, all neonates with respiratory distress were included in the study. Consent was taken from the parents or legal guardian of the neonates. All demographic data and investigation findings were noted. Exclusion criteria: patients not fulfilling inclusion criteria and cases with incomplete data were excluded from the study. Data collection instrument: a self-administered questionnaire was used. It consists of personal information and background information. A multiple choice valid questionnaire was utilized to evaluate the incidence of respiratory distress syndrome in the neonates. Correct answers were assigned a score of "1" whereas an incorrect answer or don`t know response or missing answers were assigned a score of "0". The researchers distributed a self-administered questionnaire to the mothers of the target population by direct contact with them. The data were verified by hand then coded and entered to a personal computer. Thanks and appreciations were used to encourage the participants to be involved in the study. Statistical design: data were processed using (SPSS) software version 22. Ethical considerations were arranged by taking permission from the regional research and ethical committee at King Abdulaziz Hospital Taif. Approval from the dean of the faculty of medicine was obtained and individual consent was filled by mothers of participants in the questionnaire or throughout their files.

RESULTS

Tables (1) the prevalence of Respiratory distress (RD) &Respiratory distress syndrome (RDS) in KING ABDULAZIZ hospital, Taif city, Saudi Arabia

Total number of patients admitted to KING ABDULAZIZ hospital in 6 months	Number of RD& RDS patients	Number of RDS patients	Number of death cases	Number of missed files	Prevalence of RD & RDS in the period of the research (6 months)	Prevalence of RDS alone in the period of the research (6 months)	Percentage of dead cases	Prevalence of missed cases
503	395	275	12	96	78.5%	54.7%	2.4%	19.1%

Table 1 showed that the total number of patients admitted to KING ABDULAZIZ hospital in Taif city for 6 months of the research was 503newborn, the number of all RS and RDS cases was 395 with a prevalence percentage of 78.5%. Number of RDS cases alone was 275 with prevalence of 54.7%. Percentage of dead cases was 2.4% and the prevalence of missed cases was19.1%.

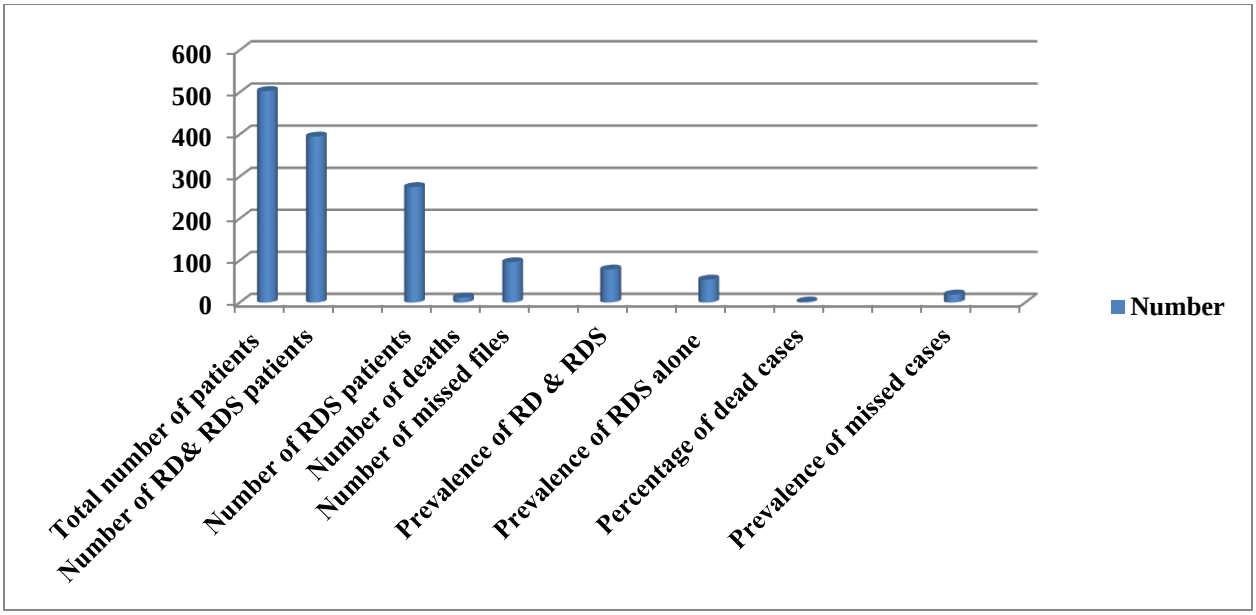

Figure (1) showing the prevalence of Respiratory distress (RD) &Respiratory distress syndrome (RDS) in KING ABDULAZIZ hospital, Taif city, Saudi Arabia

Table (2) the mean age of the mothers and their gestational age in weeks (Mean ±SD), minimum and maximum

Parameter	(Mean ± SD) N=275	Minimum	Maximum
Age of the mother	29.4± 6.36 Years	17	46
Gestational age	33.2 ±3.14 weeks	24	42
Parity	2.48±1.8	0	9

Table 2 showed that the mean age of the mother's was29.4± 6.36 year, the mean gestational age of mother's was 33.2 ±3.14week and the mean parity was2.48±1.8

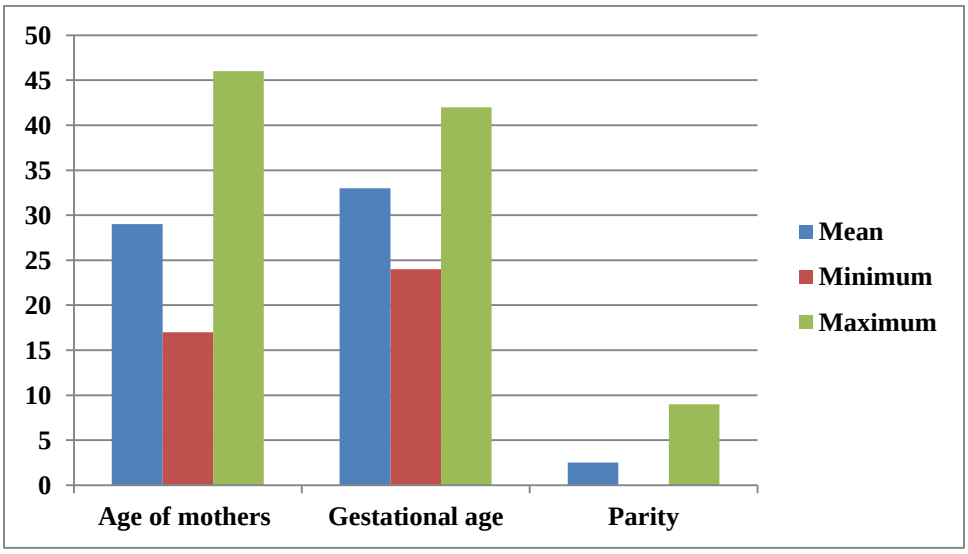

Figure (2) showing the age mean of the mothers and their gestational age in weeks (Mean ±SD)

Table 3: the maternal and birth history in percentage

Parameter	Percentage %	
	Yes	No
Booked patients	39.6%	60.4%
Mothers receiving antenatal care	43.3%	56.7%
History of consanguinity	31.6%	68.4%
History of Diabetes	4.4%	95.6%
History of hypertension	3.3%	96.7%
History of PROM	20.4%	79.6%
History of Abruptio placenta	3.3%	96.7%
History of placenta previa	4.4%	95.6%
Normal labor	35.6%	
Cesarean section	63.3%	
Ventouse labor	0.36%	
Antenatal steroids	47.3%	52.7%
Antenatal antibiotics	32%	68%
Use of ventilator	60.4%	39.6%
Surfactant ttt	61.8%	38.2%
Age of the baby	1 day	
Male gender	57.1%	
Female gender	42.9%	
Extreme preterm	4.4%	
Preterm	86.5%	
Late preterm	4.4%	
Full term	4.7%	

Table 3 showed that 39.6% of patients were booked while 60.4% was not booked, 43.3% of mothers had antenatal care but 56.7% don't, 31.6% had history of consanguinity and 68.4% were not, 4.4% of mothers were diabetic while 95.6% were healthy, 3.3% of mothers had hypertension and 96.7% were not hypertensive, 20.4% had premature rupture of membrane (PROM) during delivery while 79.6% didn't, 3.3% had history of Abruptio placenta and 96.7% had not, 4.4% had history of placenta previa but 95.6% didn't have placenta previa, 35.6% of mothers delivered by normal labor, 63.3% delivered by cesarean section while 0.36% undergone ventouse labour, no babies suffered from umbilical cord around neck during delivery, 47.3% of babies received antenatal steroids and 52.7% didn't receive, 32% were treated by antibiotics while 68% didn't. 60.4% of newborn were put on a ventilator while 39.6% were not put, 61.8% were treated by surfactant but the other 38.2% did not receive surfactant therapy. All the newborn were 1 day age at the time of the research, 57.1% of newborn were male gender and 42.9% were female, 4.4% of babies were extreme preterm, 86.5% were preterm, 4.4% were late preterm and 4.7% were full term.

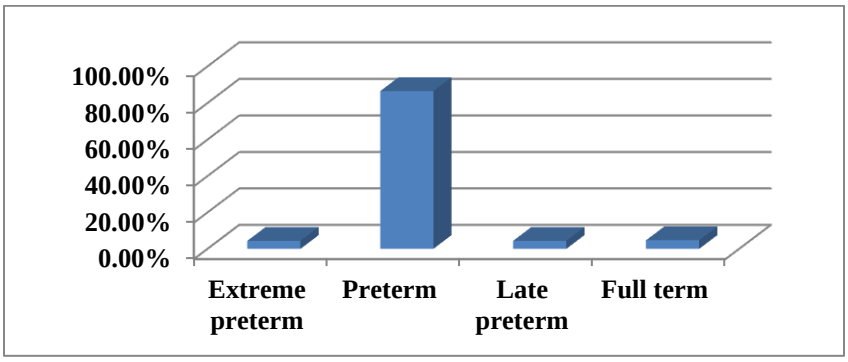

Figure (3) showing the percentage of extreme preterm, preterm, late preterm and full term

Table 4 The Abgar score of patients after 1 and 5 minutes in percentage

Abgar score 1	53.5% of patients had good score > 7	46.5% of patients had bad score < 7
Abgar score 5	92.4% of patients had good score > 7	7.6% of patients had bad score < 7

Table 4showed that 53.5% of patients had Abgar score 1 > 7 while 46.5% had Abgar score 1< 7. While 92.5% had Abgar score 5 > 7 and 7.6% had Abgar score 5 < 7

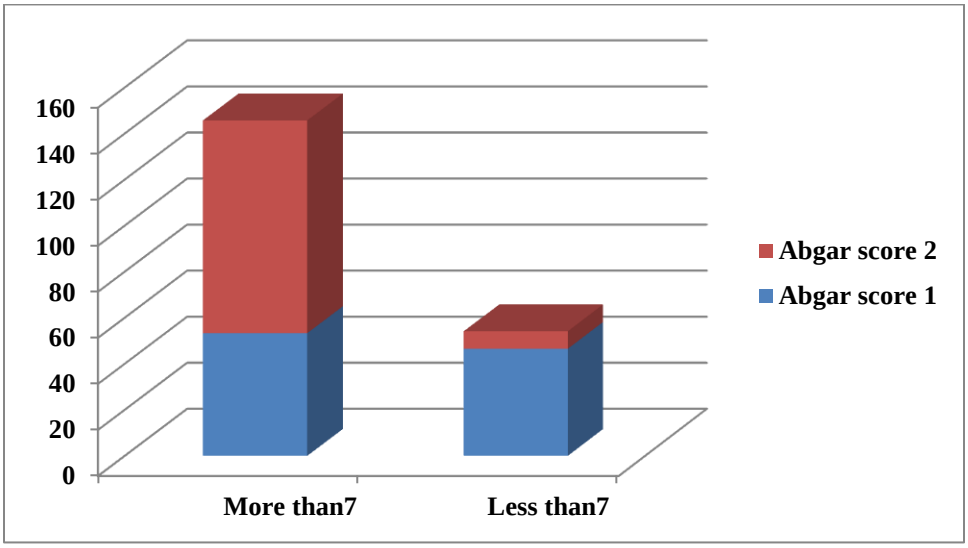

Figure (3) showing Abgar score of patients after 1 and 5 minutes in percentage

DISCUSSION

Respiratory distress (RD) is a challenging problem and one of the most common causes of admission in Neonatology Intensive Care Units (NICU), it may occur due to respiratory or non-respiratory diseases **kresimir et al. (2017**) [8]**.** Various factors are responsible for RD in newborn as pneumonia, sepsis, pneumothorax, persistent pulmonary hypertension, and congenital malformations, but respiratory distress syndrome (RDS) is the most contributing cause of morbidity and mortality among preterm and term neonates. Physical findings are noted soon after birth and include; tachypnea, shallow breathing, expiratory grunting, sub costal and intercostal retractions, cyanosis and nasal flare. Extremely immature neonates may develop apnea and/or hypothermia **(Gupta *et al.* 2009)**[9]**.** The greatest risk factor for respiratory distress syndrome is prematurity. Other risk factors of the disease are white male gender, diabetic mothers, cesarean section delivery, second-born twins and infants with a family history of respiratory distress syndrome. Secondary surfactant deficiency may occur in infants with intrapartum asphyxia, pulmonary infections, pulmonary hemorrhage, meconium aspiration pneumonia and

oxygen toxicity along with barotrauma to the lungs. On the contrary the incidence of respiratory distress syndrome decreases with the maternal use of antenatal steroids, prolonged rupture of membranes and pregnancy induced maternal hypertension**(Qiu *et al.* 2008)** [10]**.** This study searched for the prevalence of respiratory distress syndrome in Children' hospital in Taif city in a period of 6 months. Along the 6 months of the research the prevalence of RDS was 54.7%. **Ramesh *et al.* (2017)** [11] studied the prevalence of antenatal steroids coverage in preterm labor and its influence on neonatal respiratory morbidity and mortality in kanyakumari district, India, they found that the incidence rates of RDS ranged from 86% at 24 weeks to less than 1% at 39 weeks, they mentioned that RDS should be anticipated in any preterm delivery, condition where amniotic fluid indices indicate pulmonary immaturity, and in any infant born to a diabetic mother. **Saboute *et al.* (2015)** [12] concluded in their research that the incidence of respiratory distress syndrome among preterm infants

admitted to neonatal intensive care unit as a retrospective study in Akbarabadi Hospital, Tehran, Iran**,** that RDS was frequent in preterm neonates with gestational age less than 32 weeks with incidence of 65.6% of all preterm infants. In Korwatia the incidence rate of RDS of preterm was accessed by **kresimir *et al.* (2017)** [8] who studied the causes of respiratory distress among neonates of gestational age 32 weeks and more in Osijek hospital, during the year 2016, they found that 20% of admitted newborn in NICU have RD, 34% of preterm babies or older than 32 weeks, and 12% of term babies had RD. **Sharma *et al.* (2017)** [13] detected that the prevalence of ARDS in children in the United States, Europe and Australia was 2-12.8 cases /100,000 people per year, the authors stated that the incidence of pediatric ARDS is different than adult and it's relatively rare but it is also under diagnosed due to lack of specific guideline, he also mentioned that in North America, multicenter study reported that 1-4% of children undergoing mechanical ventilation had ARDS among children hospitalized in Pediatric ICU. In Saudi Arabia **Saeed *et al.* (2013)** [14] determine the prevalence and etiology of respiratory distress in the newborns delivered in Armed Forces Hospital Sharurah Kingdom of Saudi Arabia over a period of one year from January 2008 to December 2008, they deduced that the overall prevalence of respiratory distress (RD) was 4.24%; 19.7% in preterm and 2.3% in full term. The greatest risk factor for respiratory distress syndrome is prematurity, 86.5% of our infants were preterm, both extreme and full term newborn constitute 4.4% while only 4.7% of patients were full term, while [11] found incidence rates of RDS ranged from 86% at 24 weeks to less than 1% at 39 weeks, [14] detected 19.7% of preterm had RDS and 2.3% of full term had the disease in Sharurah hospital, Saudi Arabia. Similarly **kresimir et al. (2017)** [8] found that 20% of admitted newborn in NICU have RD, 34% were preterm older than 32 weeks, and 12% of new born were terms babies, so we got a relatively higher percentages among the previous studies, **Rahul *et al.* (2017)** [11] explained these variations due to different predisposing factors in each study and variations in health care facilities in various countries. As regard death rate we had 2.4% of cases died along the 6 months of the research, many studies revealed that the mortality rate in children suffering from ARDS is lower than adult and ranges between 18-27%, although data from Australian study suggested that children mortality due to ARDS is quiet high (35%) as observed in adult **(Lopez *et al.* 2012).** [15] **Demirakca *et al*. (2015)** [16] studied the adjunctive therapies for treatment of severe respiratory failure in newborns; he reported mortality rate of 10.3% in RDS newborn babies which is different from our results. On the other hand the results of **Singh (2010)** [17] who studied the causes of respiratory distress among neonates of gestational age 32 weeks and more and reported that neonates with RD are 2-4 times more likely to die than those without RD. **Cochi *et al.* (2016)** [18] mentioned that the overall survival rate of RD is improving considering in-hospital mortality over several observational studies, he explained variations in mortality rates in different studies by differences in risk factors, availability of diagnostics, ability to recognize ARDS and some selection biases affecting clinical trials. The incidence of RDS increases with decreasing gestational age, and infants born below 30 weeks gestation are at the greatest risk for RDS **Sakonidou and Dhaliwa(2015)** [19]**.** In this work 4.4% of RDS cases were extreme preterm, the gestational age of their mothers ranged from 24 to 29 weeks, 86.5%were preterm babies with mother's gestational age ranged from 30-36 weeks while 4.4% and 4.7% of newborn were late preterm and full term respectively, so our results were matching with those of **Sakonidou and Dhaliwa(2015)** [19]. Talking about the risk factors which increase the incidence and prevalence of RDS, we investigated the mode of delivery of our mothers which was 63.3% and 35.6% for cesarean section and normal labor respectively, with respect to maternal health 4.4% of mothers had DM while 95.6% were normal and 3.3% were hypertensive while 96.7% had normal blood pressure. **Bricelj *et al.* (2017)** [20] concluded that combination of prematurity, cesarean birth and hypertension act independently to increase the risk of RDS in newborn when he searched for neonatal respiratory morbidity in late-preterm births in pregnancies with and without gestational diabetes mellitus. **De Luca *et al.* (2009)** [21] studied insulin treatment of maternal diabetes mellitus and respiratory outcome in late-preterm and term singletons; he mentioned that there are two main concerns in attempting to link DM and the respiratory status of the newborn at birth which interact with prematurity and the route of delivery, he stated that the incidence of prematurity in

pregnancies with DM is known to be increasing, especially in poorly controlled DM with frequent hyperglycemic events. **Lawn *et al.* (2005)** [22] also reported that infants born to diabetic women have certain distinctive characteristics, including large size and high morbidity risks. The neonatal mortality rate is in diabetic mothers is five times over that of infants of non-diabetic mothers and is higher at all gestational ages and birth weight for gestational age (GA) categories. On the other hand, the risk of respiratory distress in near-term and full-term infants has been found to be up to 3.9-fold higher when the birth occurs by caesarean section, these results were in accordance to our work. With respect to drug history 47.3% of mothers received antenatal steroids while 52.7% didn't receive, in the same context 32% of mothers were treated by antibiotics and 68% didn't receive antibiotics. Maternal corticosteroid therapy can prevent neonatal RDS when it is administered to the mother at least 24 to 28 hours before delivery as stated by **Kumar (2017)**. [23] **Gupta et al. (2009)** [9] mentioned antenatal steroids and prolonged rupture of membranes as factors decreasing the rate of RDS, the later constitutes 20.4% of our mothers in comparison to 79.6% of mothers didn't had PROM.

American College of Obstetricians and Gynecologists Committee (2016) [24] recommended a single course of corticosteroids for pregnant women between 24 weeks and 33 weeks of gestation who are at risk of preterm delivery within 7 days, including those with ruptured membranes and multiple gestations.

Bonanno *et al.* (2009) [25] explained that corticosteroid stimulation of developmentally regulated gene expression and physiologic functions result in maturation of the lungs and some other tissues. Antenatal steroids accelerate development of type 1 and type 2 pneumocystis, leading to structural and biochemical changes that improve both lung mechanics and gas exchange. Induction of type 2 pneumocystis increases surfactant production by inducing production of surfactant proteins and enzymes necessary for phospholipid synthesis. He also mentioned other effects of antenatal corticosteroids as induction of pulmonary beta-receptors, which play a role in surfactant release and absorption of alveolar fluid when stimulated. Another way for management of RDS in addition to antenatal steroids was the use of surfactant therapy and breathing support from a ventilator. In this research 61.8% of preterm received surfactant treatment in comparison to 38.2% those who didn't receive, in addition 60.4% of newborn were supported by a ventilator while the other 39.6% was not supported by a ventilator. **Liu *et al.* (2017)** [26] mentioned that surfactant therapy combined with ventilation can improve the clinical symptoms and blood gas analysis index of ARDS neonates and he concluded that surfactant therapy was proved to be effective as preventive and rescue treatment of RDS in neonates. This work attempted for measuring the prevalence of RDS in newborn of King Abdul-Aziz hospital in Taif city and giving highlights about the most common risk factors of the disease in addition to various management options.

CONCLUSION

RDS stays one of the major problems among newborns and it is considered to be the major reason for increased morbidity and mortality among infants, with prevalence rate of 54.7% in 6 months in this study. Preterm babies are the main risk factor for development of RDS. Mother's illnesses, especially hypertension and Diabetes are very strong risk factors for the disease in preterm babies. Cesarean delivery, especially in preterm babies and male gender stays other important risk factors for RDS. Further advances in our understanding of genetic origin of the disease will help many newborns with RDS.

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