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ORIGINAL ARTICLE

# Lung ultrasound as early diagnostic tool in neonatal respiratory distress syndrome (RDS)



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## KEYWORDS

Respiratory distress syndrome (RDS);  
Down score;  
Chest X-ray;  
Chest ultrasound

**Abstract** *Aim of the work:* To study the value of lung ultrasound as early diagnostic tool in RDS.

*Subjects and methods:* Forty preterm neonatal patients were admitted to the neonatal intensive care unit in Madina national hospital suffering from respiratory distress syndrome (RDS). Diagnosis of RDS was based on clinical features, radiographic findings and arterial blood gases analysis. All patients were subjected to full maternal history including: age, parity, gravidity, and previous abortions, still births, neonatal deaths, and acute and/or chronic medical problems, thorough clinical examination including weight, length, head circumference and abdominal circumference, vital signs, systemic (neurological, cardiovascular and abdominal) and local examination, pulse oximetry, Down score at first 6 h of life. Laboratory investigations (complete blood count, C-reactive protein, random blood sugar, Blood culture, arterial blood gases, kidney and liver function, Serum electrolytes, plain chest X-ray (P.A. and lateral views) and chest ultrasound) were performed.

*Results:* A significant correlation was found between ultrasound and radiographic assessments of RDS but ultrasound tends to overestimate the diagnosis. From our study ultrasonography can be used as a diagnostic tool in the diagnosis of RDS and to follow up the effect of treatment.

*Conclusions:* Chest ultrasound cannot replace standard chest X ray in diagnosing potential causes of neonatal respiratory failure because of its tendency to over-diagnose RDS, but useful for excluding RDS and as a screening method for diagnosis of RDS.

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## Introduction

Neonatal respiratory distress syndrome (RDS) also known as hyaline membrane disease, is a condition of increasing respiratory distress, commencing at, or shortly after, birth and increases in severity until progressive resolution among the survivors, usually between the 2nd and 4th day [1]. It is due at least in part, to insufficiency of pulmonary surfactant and

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is mainly confined to preterm infants. RDS patients present with respiratory distress (tachypnea, grunting, recession and cyanosis) and respiratory failure. Edema is frequently seen on the 2nd day due to fluid retention and capillary leak. The diagnosis can be confirmed by X-ray showing ground glass appearance and air bronchograms, although these radiological features are not pathognomonic of RDS [2]. Enormous efforts have been made to understand the pathophysiology of RDS and to optimize the care of those infants, which has led to improvement in the morbidity and mortality. The mortality rate of RDS decreased by approximately 50% during the last decade with the advancement of surfactant therapy [3]. The diagnosis of RDS is usually based on the clinical picture and the chest X-ray, which expose the infant to ionized radiation [3]. Now, lung ultrasound is not included in the diagnostic work-up of neonatal respiratory disease. Only a few studies have addressed this topic [4].

### Aim of the work

To establish the role of lung ultrasound as early diagnostic tool in RDS, hence reducing the number of chest X-ray exposures in the neonates.

### Patients and methods

This study was conducted on 40 preterm neonates. They were delivered in Madina national hospital and were admitted in the Neonatal Intensive Care Unit suffering from respiratory distress syndrome, during the period from October 2013 to October 2014. Twenty-seven neonates representing 67.5% were males and thirteen cases representing 32.5% were females. Fifteen were delivered vaginally and Twenty-five delivered by section. Their Gestational age (GA) ranged from 29 weeks to 35 weeks with a mean of 33 weeks. Their birth weight ranged from 1 kg to 2.5 kg with a mean of 1.6 kg. Diagnosis of RDS was based on clinical features, radiographic findings and arterial blood gas analysis.

#### Inclusion criteria:

- Preterm neonates (<37 weeks) suffering from respiratory distress within the first 6 h of life.
- Birth weights appropriate for gestational age.

#### Exclusion criteria:

- Full term newborns.
- Preterm neonates suffering from respiratory distress after 6 h of life.
- Preterm admitted in NICU for other causes than respiratory distress syndrome e.g. congenital anomalies, neonatal sepsis, and birth trauma.

For all cases the following was done:

#### (1) Complete maternal history:

Full maternal history including: age, parity, gravidity, and previous abortions, still births, neonatal deaths, and acute and/or chronic medical problems.

Detailed perinatal history was obtained including antenatal history, drug intake, antepartum hemorrhage, premature rupture of membranes, duration of labor, mode

of delivery, Apgar score at 1 & 5 min as well as methods and duration of resuscitation.

#### (2) Thorough clinical examination:

- Measurements: weight, length, head circumferences and abdominal circumference.
- Assessment of the gestational age using new Ballard score.
- Vital signs: temperature, pulse, respiratory rate and blood pressure.
- *System examination:*
  - Neurological evaluation including activity, fontanelles and reflexes.
  - Cardiovascular: heart rate, rhythm, peripheral perfusion in both upper and lower limbs, heart sounds and murmurs.
  - Abdominal: umbilicus, hernia, liver, spleen, kidneys, voiding of urine and passage of stools.
  - Lungs: Respiratory rate, presence or absence of retractions and grunting, air entry, additional sounds.
  - Noninvasive oxygen monitoring, pulse oximetry.
  - Down score: the score at 12–18 h of age provided the best estimate of prognosis (see Table 1).
  - Score:
    - <4 = follow up.
    - 4–7 = clinical respiratory distress; monitor arterial blood gases.
    - >7 = respiratory failure [5].

#### (3) Laboratory investigations:

- Complete blood count.
- C-reactive protein.
- Random blood sugar.
- Blood culture.
- Blood gases: (pH-PCO<sub>2</sub>-PO<sub>2</sub>-HCO<sub>3</sub>-BE).
- Kidney function tests (urea, creatinine).
- Liver function tests aspartate aminotransferase (AST) alanine aminotransferase (ALT).
- Serum electrolytes: Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>++</sup>.

#### (4) Chest radiography:

- Chest X-ray:
  - Posterior anterior view was taken within 6th hours after birth.
  - X-ray findings were classified according to severity into:
    - Mild RDS: hypovolemic lung reticulogranular mottling or without air bronchograms.

**Table 1** Down score.

	0	1	2
Cyanosis	None	In room air	In 40% FIO <sub>2</sub>
Retractions	None	Mild	Severe
Grunting	None	Audible with stethoscope	Audible without stethoscope
Air entry	Clear	Decreased or delayed	Barely audible
Respiratory rate	Under 60	60–80	Over 80 or apnea

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