

Cardiac Troponin T Level in Pediatric Patients with Respiratory Distress

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List of Contents

Title	Page No.
List of Tables	i
List of Figures	iii
List of Abbreviations	iv
Introduction	1
Aim of the Work.....	4
Review of Literature	
▪ Respiratory Distress	5
▪ Cardiac Troponin.....	39
Patients and Methods	51
Results	61
Discussion	74
References	88
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table (1):	Pulmonary causes of respiratory distress	6
Table (2):	Assessment and initial management of acute asthma.....	26
Table (3):	Causes of pneumonia by age group.....	28
Table (4):	Oral antibiotics in pneumonia.	37
Table (5):	Intravenous and intramuscular antibiotics in pneumonia.	37
Table (6):	Grade of body temperature	53
Table (7):	Normal Heart Rate by Age (beats/minute).....	54
Table (8):	PRESS Scoring System	55
Table (9):	Descriptive statistics of gender for the studied patients.	62
Table (10):	Descriptive statistics of all variables measured for the studied patients.	62
Table (11):	Descriptive statistics of cardiac troponin T level measured for the studied patients.	63
Table (12):	Diagnosis of patients with Respiratory distress	63
Table (13):	Signs and symptoms of Respiratory distress in the studied patients.....	64
Table (14):	Oxygen supplementation and Grading of respiratory distress in the studied patients	65
Table (15):	Frequency distribution of patients' lab. investigations & Anthropometric measurements.....	65
Table (16):	Comparison between cases (with Respiratory distress) & controls (without respiratory distress) as regard Patient characteristics.....	66

List of Tables

Table No.	Title	Page No.
Table (17):	Comparison between cases (with Respiratory distress) & controls (without respiratory distress) as regard Troponin level.	67
Table (18):	Correlation between Troponin level and all studied variables in patients with Respiratory distress.....	68
Table (19):	Correlation between Troponin & all variables in pneumonia patients	69
Table (20):	Correlation between Troponin & all variables in bronciolitis patients	70
Table (21):	Correlation between Troponin & all variables in Bronchial asthma patients	71
Table (22):	Comparing Troponin T Levels according to patient diagnosis.....	73

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Signs of respiratory distress according to site of the disease distress	9
Figure (2):	The Pediatric Assessment Triangle (PAT)	11
Figure (3):	Algorithm management of croup.....	19
Figure (4):	Schematic representation of the cardiac myofibrillar thin filament.....	40
Figure (5):	A model of the molecular arrangement of troponin (Tn), tropomyosin (Tm), and actin in the skeletal muscle thin filament.	41
Figure (6):	Release of troponins in response to cardiomyocytes injury	42
Figure (7):	Necrosis of myocytes and associated inflammatory infiltrate in myocarditis	48
Figure (8):	Comparison between cases (with Respiratory distress) & controls (without respiratory distress) as regard Troponin level.	67
Figure (9):	Correlation between Troponin T level and PRESS score in patients with Respiratory distress.	72

List of Abbreviations

Abb.	Full term
AMI	Acute myocardial infarction
ARIs	Acute respiratory infections
BiPAP	Bilevel positive airway pressure
BMI.....	Body mass index
CAP	Community acquired pneumonia
CHF	Congestive heart failure
CRP.....	C-reactive protein
cTnI	Cardiac troponin I
cTnT	Cardiac troponin T
ECG	Electrocardiographic
ELISA.....	Enzyme-Linked Immunoassay
FeNO.....	Fractional exhaled nitric oxide
Hb	Hemoglobin,
HF	Heart failure
Hib	Haemophilus influenzae type b
ICS	Inhaled corticosteroid
ICU	Intensive Care Unit
LABA	Long acting B2 agonist
LRTIs	Lower respiratory tract infections
MI	Myocardial infarction
O2.....	Oxygen
PAT.....	The Pediatric Assessment Triangle
PEEP	Peak end expiratory pressure
PICU.....	Pediatric intensive care unit
PMN	Polymorphonuclear
PRESS	Pediatrics respiratory severity score
RSV.....	Respiratory syncytial virus
SABA	Short acting b2 agonist
SARS	Severe acute respiratory syndrome
TLC	Total leucocytic count
WHO	World Health Organization

INTRODUCTION

Acute respiratory infections (ARIs) are considered the leading cause of acute illness worldwide and remain the most important cause of infant and young children mortality (*Liu et al., 2014*).

Acute respiratory distress is one of the most common reasons for emergency visits in children under 5 years of age. Usually, the underlying pathology is within the respiratory system, but can also be within other systems such as the cardiovascular or nervous systems (*Sharma et al., 2015; Mehra and Gupta, 2018*).

Respiratory distress is difficulty in breathing characterized by increase in rate and depth of breathing. It causes decreased feeding, cyanosis, grunting, nasal flaring, and intercostal retractions. The most common cause of respiratory distress is pneumonia followed by asthma, croup, and bronchiolitis (*Lekshminarayanan et al., 2013*).

Pneumonia is one of the most infectious causes of death in children worldwide. Pneumonia killed 920 136 children under the age of 5 in 2015, rating 16% of all deaths of children under five years old. Pneumonia affects children in the whole world, but is most widespread in South Asia and Africa. Children can be protected from pneumonia; it can be prevented

with simple interventions, and treated with low-cost medication and care (*WHO, 2016*).

Moreover lower respiratory tract infections (LRTIs) including pneumonia, atypical pneumonia, bronchitis, bronchiolitis, and severe acute respiratory syndrome (SARS), continue to threaten the health of children worldwide and especially in developing countries, where poor nutrition and access health care is scarce (*Eboriadou et al., 2008*).

Troponins are protein molecules that are part of cardiac and skeletal muscle. Three types of troponins exist—troponin I, troponin T, and troponin C. Each subunit has a unique function: Troponin I inhibits the interaction of myosin with actin, Troponin T binds the troponin components to tropomyosin, and Troponin C contains the binding sites for Ca^{+2} that helps initiate contraction (*Rivara et al., 2012*).

Cardiac troponin T can be used as a predictor to mortality in pediatric patients with heart failure, the median cTnT of subjects who died from heart failure was two fold higher than the value in those who survived (*Sadoh and Uduebor, 2017*).

Elevated cardiac troponin T (cTnT) is common in patients with acute respiratory distress, and is associated with worsened clinical outcomes (*Rivara et al., 2012*).

Cardiac function in neonate could be influenced by the severity of respiratory distress and its ventilatory management (*Correale et al., 2009*).

The variations in cardiac troponin T concentration were significantly associated with oxygen requirement (*Clark et al., 2004*).

AIM OF THE WORK

The aim of this study is to determine serum level of cardiac troponin T in children having respiratory distress and to correlate these levels with their clinical and laboratory data.

Working towards improving the morbidity and mortality in children with respiratory distress.

Chapter 1

RESPIRATORY DISTRESS

Definition:

Respiratory distress is effortful respiration due to hunger for air. When respiratory effort is inadequate to sustain the effective gas exchange (oxygenation and removal of CO₂), respiratory failure occurs. Respiratory failure is the end stage of respiratory distress (*Johann et al., 2016*).

Effortful respiration is inspected by:

- Working ala nasi
- Stridor
- Difficulty in breathing or fast breathing
- Wheezing
- Grunting
- Contraction of the scalene muscle
- Contraction of the sternomastoid muscle
- Retraction of the supraclavicular fossa
- Retraction of the suprasternal fossa
- Retraction of the lower ribs during inspiration
- Thoraco-abdominal asynchrony
- Contraction of abdominal muscles
- Cyanosis in severe cases

(Tulaimat and Trick, 2017; Sharma et al., 2015)

It is one of the most common reasons for pediatric emergency department visits and hospitalizations. Many conditions may cause respiratory distress in children. Usually, the underlying pathology is within the respiratory system, but can also be within other systems such as the cardiovascular or nervous systems (*Mehra and Gupta, 2018*).

Causes of respiratory distress:

1- Pulmonary causes:

Table (1): Pulmonary causes of respiratory distress (*Mehra and Gupta, 2018; Mandal et al., 2015; Ida and Thompson, 2014*).

Upper airway disease	Lower airway disease	Lung parenchymal disease
Angioneurotic Edema Choanal atresia Enlarged tonsils or peritonsillar abscess, adenoids Inflamed sinuses Croup Foreign body Epiglottitis laryngeomalacia or laryngeal web Nasal obstruction Retropharyngeal cellulitis or abscess Subglottic stenosis (prolonged intubation)	Bronchiolitis Asthma Foreign Body Para-tracheal lymph node enlargement	Pneumonia ARDS(acute respiratory distress syndrome) Pulmonary edema Pleural effusion Pneumothorax

2- Extrapulmonary causes (*Berliner et al., 2017*):

- **Cardiovascular causes:**

Congenital heart diseases

Acute decompensated heart failure

Cardiac arrhythmias

Myocardial infarction

Cardiac tamponade

- **Neurological and muscle diseases:** e.g.:
diaphragmatic paralysis

- **Heamatological diseases:** e.g.: anemia

- **Metabolic and endocrinal diseases:** e.g.: diabetic
ketoacidosis

- **Gastrointestinal conditions:** e.g.: gastroenteritis
causing severe dehydration.

- **Allergic reactions**

Symptoms of respiratory distress according to the age:

Neonates are commonly presented with poor feeding and irritability, as well as tachypnea, retractions, working ala nasi, grunting, and cyanosis (*Hardy and Naga, 2015*).

Infant older than one month, grunting is less common; however, tachypnea, retractions, and cyanosis are common and may be accompanied by a persistent cough, irritability and refusing feeding (*Hardy and Naga, 2015*).

Toddlers and preschoolers most often present with tachypnea. They may have vomiting, headache, sweating, chest pain (pleuritic), vague abdominal pain and confusion (*Cruz and Wunderlink, 2017*).

Assessment of a child with respiratory distress:

General examination:

- Fever
- Cyanosis
- Changes in alertness
- Tachycardia
- Nasal flaring

Chest examination:

- Tachypnea
- Stridor
- Wheezing
- Use of accessory muscles

Pulse oximeter:

- Low oxygen saturation

(De-Barsi et al., 2010; Sharma et al., 2015)