Cardiac Troponin T Level in Pediatric Patients with Respiratory Distress

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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 sydrome (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:

Gerneral 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)