



# **Pentraxin-3 in Diagnosis of Early Onset Neonatal Sepsis**

*Thesis*

Submitted For Partial Fulfillment of Master Degree  
In Pediatrics

*By*

***Mohamed Elsayed Abd Rabou***

*M.B., B.Ch, 2013*

*Faculty of medicine, Ain Shams University*

*Under Supervision of*

**Prof. Dr. Maha Hassan Mohamed**

Professor of Pediatrics

Faculty of medicine – Ain Shams University

**Dr. Ramy Mohamed Mahmoud**

Assistant Professor of Clinical Pathology

Faculty of Medicine – Ain Shams University

**Dr. Noha Mokhtar Kamal Barakat**

Lecturer of Pediatrics

Faculty of Medicine – Ain Shams University

**Ain Shams University**

**Faculty of Medicine**

**2022**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢



## Acknowledgement

First of all, thanks **Allah**, the merciful, the beneficent for helping me during this work.

I would like to express my indebtedness and deepest gratitude to **Prof. Dr. Maha Hassan Mohamed**, Professor of Pediatrics, Faculty of Medicine, *Ain Shams* University for her valuable advice, guidance and constructive criticism, also for the invaluable assistance and efforts she devoted in the supervision of this study.

I'll never forget, how co-operative was **Dr. Noha Mokhtar Kamal**, Lecturer of Pediatrics, Faculty of Medicine, *Ain Shams* University, also she was encouraging all the time. It is honorable to be supervised by her.

I would like also, to express my great thanks to **Dr. Ramy Mohamed Mahmoud**, Assistant professor of clinical pathology, and Faculty of Medicine – *Ain Shams* University. His valuable advises and continuous support facilitated completing this work.

I would like to thank all the staff members of the Pediatrics department.

Finally, I would like to express my appreciation and gratitude to all my family, especially my caring and loving parents who enlighten my life.

 *Mohamed Elsayed Abd Rabou*

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## List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
<b>CBC</b>	: Complete blood count
<b>CDC</b>	: Centers for Disease Control and Prevention
<b>CHIKV</b>	: Chikungunya virus
<b>CMV</b>	: Cytomegalovirus
<b>CNS</b>	: Central nervous system
<b>COL</b>	: Collagen
<b>CONS</b>	: Coagulase-negative staphylococci
<b>CRP</b>	: C-reactive protein
<b>CSF</b>	: Cerebrospinal fluid
<b>CT</b>	: Computed tomography
<b>DC</b>	: Dendritic cells
<b>ECM</b>	: Extracellular matrix
<b>ECs</b>	: Endothelial cells
<b>EEG</b>	: Electroencephalogram
<b>ELBW</b>	: Extremely low birth weight
<b>ELISA</b>	: Enzyme-Linked Immunosorbent Assay
<b>EOS</b>	: Early onset sepsis
<b>FG</b>	: Fibrinogen
<b>FGFs</b>	: Fibroblast growth factors
<b>GBS</b>	: Group B streptococci
<b>HA</b>	: Hyaluronic acid complex
<b>HC</b>	: Heavy chain
<b>HCC</b>	: Hepatocellular carcinoma
<b>HDL</b>	: High density lipoprotein
<b>HPeV1</b>	: Human parechovirus 1
<b>HSV</b>	: Herpes simplex virus
<b>i.v</b>	: Intravenous
<b>IAP</b>	: Intrapartum antibiotic prophylaxis
<b>IFN-<math>\gamma</math></b>	: Interferon gamma

<b>IL-12</b>	:	Interleukin-12
<b>Ip</b>	:	Intraperitoneal
<b>IRF3</b>	:	Interferon regulatory factor 3
<b>IV</b>	:	Intravenous
<b>IVA</b>	:	Influenza virus type A
<b>LE</b>	:	leukocyte esterase
<b>LOS</b>	:	late onset sepsis
<b>LOX-1</b>	:	low-density lipoprotein receptor-1
<b>LP</b>	:	lumbar puncture
<b>LPS</b>	:	Lipopolysaccharides
<b>MABP</b>	:	Mean arterial blood pressure
<b>MHV-1</b>	:	Murine hepatitis virus strain 1
<b>MRI</b>	:	Magnetic resonance imaging
<b>NETs</b>	:	Neutrophil extracellular traps
<b>NICU</b>	:	Neonatal intensive care unit
<b>OMVs</b>	:	Outer membrane vesicles
<b>ox-LDL</b>	:	Oxidized low density lipoproteins
<b>PCR</b>	:	Polymerase chain reaction
<b>PIC</b>	:	Preinitiation complex
<b>Plg</b>	:	Plasminogen
<b>PSA</b>	:	prostate-specific antigen
<b>PTX 3</b>	:	Pentraxin 3
<b>ROS</b>	:	Risk of sepsis
<b>RRV</b>	:	Ross River virus
<b>RSV</b>	:	Respiratory syncytial virus
<b>SCLC</b>	:	Small-cell lung carcinoma
<b>SEM</b>	:	Skin, eye, and mouth
<b>SIRS</b>	:	Systemic inflammatory response syndrome
<b>SMCs</b>	:	Smooth muscle cells
<b>SNAP11</b>	:	Score for neonatal acute physiology-II
<b>SREC-I</b>	:	Scavenger receptor expressed by ECs I
<b>TF</b>	:	Tissue factor
<b>Th</b>	:	T helper

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*List of Abbreviations*

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<b>TNF-<math>\alpha</math></b>	:	Tumor necrosis factor alpha
<b>UTI</b>	:	Urinary tract infection
<b>WBCs</b>	:	White blood cells



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## ABSTRACT

**Background;** Neonatal sepsis is one of the most important causes of neonatal morbidity and mortality. Symptoms and signs of neonatal sepsis can be silent; therefore, laboratory investigation is necessary in cases of doubt or if there are risk factors. Pentraxin 3 is a prototype of the long pentraxin family. It is effective in the early phase of inflammation and it is detected as an early marker of sepsis in neonates, **Aim and objectives;** to evaluate the diagnostic value of Pentraxin 3 in early neonatal sepsis, **Subjects and methods;** This study is a prospective cohort study, was carried out on 80 neonates with risk factors for early-onset sepsis at Ain Shams University hospital, **Result;** Pentraxin 3 in sepsis group positive in 91.2% (sensitivity 91.2% -- specificity 82.6%), Rodwell score (sensitivity 79.4% -- specificity 82.6), Score for Neonatal Acute Physiology II (SNAP II )score (sensitivity 76.5% -- specificity 82.6%) so these scores were significant independent predictors for sepsis, **Conclusion;** PTX 3 could be used as a new biomarker of neonatal sepsis with high sensitivity and specificity. It is already elevated in the umbilical cord, so measuring serum PTX3 might be useful in the prediction of infection in newborns

**Keywords:** Diagnosis, marker, neonate, pentraxin 3, Early onset sepsis.

# Introduction

**G**lobally, sepsis is still one of the major causes of morbidity and mortality in neonates, despite recent advances in healthcare units. The estimated global burden for neonatal sepsis was 2,202 (95% CI: 1,099–4,360) per 100,000 live births, with mortality between 11% and 19% (**Fleischmann-Struzek et al., 2018**) (**Wu et al., 2009**). More than 40% of under-five deaths occur in the neonatal period, resulting in 3.1 million newborn deaths each year (**UNICEF et al., 2011**).

Two types of neonatal sepsis have been observed: early-onset sepsis when features of sepsis present within 24 hours in 85%, between 24-48 hours in 5% and a smaller percentage of patients present within 48-72 hours (**Klinger et al., 2009**); and late-onset sepsis where the disease manifests beyond 72 hours (**Van den Hoogen et al., 2009**). Early treatment of neonatal sepsis is associated with improved outcomes, so that rapid diagnosis is the key to reducing this burden (**Obiero et al., 2015**).

The most common risk factors associated with early-onset sepsis (EOS) are preterm delivery, low birth weight, premature rupture of membranes, maternal urinary tract infection, and maternal group B Streptococcal colonization while late-onset sepsis (LOS) is associated with central/umbilical catheters, mechanical ventilation and parenteral nutrition (**Cortese et al.,**

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**2016).** Clinical manifestations of neonatal sepsis are nonspecific. These include temperature instability, respiratory distress, apnea, poor feeding, lethargy, irritability, convulsions, hypotonia, poor perfusion, and abdominal distension (**Shah & Padbury, 2014**).

Pentraxins are an evolutionarily conserved group of pattern recognition glycoproteins which share a pentraxin-like domain in the C terminus. The pentraxin family has been implicated in humoral innate immunity. Depending on their structure, pentraxins are divided into short and long pentraxin families. C-reactive protein (CRP) and serum amyloid P-component (SAP) are the two short pentraxins, while long pentraxins include pentraxin 3 (PTX3) and neuronal pentraxins (**Liu et al., 2014**) (**Cieř Slik and, Hrycek, 2015**).

PTX3 acts as an acute phase reactant protein as its blood levels, which is low in normal conditions (less than 2 ng/ml), increase dramatically to a peak of 200–800 ng/ml within 6–8 hours during endotoxic shock, sepsis and other inflammatory conditions (**Mantovani et al., 2008**).