A Study of Postoperative Sepsis in Ain Shams University Children's Hospital

Thesis

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in **Pediatrics**

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بسْمِ اللّهِ الرّحمَنِ الرّحيمِ

(...رَبِّ أوزِعنِي أن أشكُرَ نِعمَتَكَ
الّتِي أنْعَمْتَ عَلَيَّ و عَلى والِدَيَّ

و أنْ أعْمَلَ صَالِحاً تَرْضَاهُ و أدْخِلْنِي
بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ)

صدق الله العظيم

النمل.. اية رقم ١٩

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List of Abbreviations

CBC	Complete blood count
CDC	Center for disease and prevention
CI	Confidence interval.
CLABSI	Central line associated blood stream infection.
CVC	Central venous catheter
ETT	Endotracheal tube
ICU	Intensive care unit.
IFN	Interferons.
Il-٦r	Interleukein-٦ receptor.
LBW	Low birth weight.
MODS	Multiorgan dysfunction syndrom.
NNIS	National nosocomial infection survillance.
NO	Nitric oxide.
OR	Odd ratio.
PICCS	Peripheral inserted central catheter
PICU	Pediatric intensive care unit.
Pt	Platelets
SDD	Selective decontamination of digestive tract.
SD	Stander deviation
SHP-٢	Srchomology٢-contaning tyrosine phosphase.
SIRS	Systemic inflammatory response syndrom
SSI	Surgical site infection.
TLC	Total leucocytic count
TNF	Tumor necrotic factor.
TPN	Total parenteral nutrition.
VAP	Ventilator acquired pneumonia.
WHO	World health of organization.
Wt	Weight

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Introduction

Sepsis and septic shock are common conditions in the surgical intensive care unit (ICU). Sepsis is a generalized activation of the immune system in the presence of clinically suspected or culture-proven infection associated with extreme manifestation of infectious process that leading to increasing resource utilization and poor outcom. Severe sepsis is sepsis with organ system dysfunction. Septic shock is sepsis with hypotension without other causes ***(Levy et al., ٢٠٠٣).*** Surgical patients can be defined as a high risk group for developing sepsis, as procedures evoke substantial metabolic, hematologic and immunologic responses ***(Todd et al., ٢٠١٠).***

Surgical patients compose ٢٨,٦٪ of all severe sepsis patients and have similar mortality to medical patients ***(Angus et al., ٢٠٠١).*** Surgical site infections (SSI) occur in ٢٪ to ٥٪ of all patients who undergo inpatient surgery, and are associated with increases in morbidity and health-care expenditures ***(Anderson et al., ٢٠٠٨).*** The National Healthcare Quality Reports estimated ١١,٦ cases of post-operative sepsis per ١،٠٠٠ elective surgery discharges with hospital length of stay longer than ٣ days (***Agency for Healthcare Research and Quality, ٢٠٠٥).***

The rate of postoperative sepsis increased from ٠,٧٪ in ١٩٩٧ to ١,٣٪ in ٢٠٠٦. During the same period the rate of severe sepsis actually tripled from ٠,٣٪ to ٠,٩٪. The major underlying cause was pneumonia which was followed by wound infection

but mortality related to sepsis decline from ٤٤٪ in ١٩٩٧ to ٣٤٪ in ٢٠٠٦ ***(Caroline ٢٠٠٩)***.

Surgery in newborns poses a major challenge all over the world. The poorly developed anatomical, physiological, metabolic and immunological functions and the stress of adjusting to postnatal life makes the newborn a unique patient ***(Rowe, ١٩٩٨), (Osifo and Oriaifo, ٢٠٠٨).***

Postoperative sepsis result in significant morbidity (due to antibiotic usage, reoperation, prolonged hospital and intensive care unit [ICU] stays and longer periods of mechanical ventilation and inotropic support), and contribute to an increase in mortality ***(Guardia et al., ٢٠٠٨).***

Incidence of surgical site infection is an important indicator for surgical outcome, particularly in pediatric surgery. The incidence of postoperative wound infection in children varies significantly from ١,٦٪ to ١٨,٧٪ ***(Brown and Eremm, ٢٠٠٧)*** even up to ٢٧٪ for contaminated operations and up to ٣٠-٤٠٪ for dirty infected operation ***(Sangrasi and Leghari, ٢٠٠٨)***.

Few studies to date have identified risk factors associated with the development of postoperative sepsis in the pediatric population. Casanova and colleagues prospectively studied ٣،٧٠٠ children admitted postoperatively to a single university hospital. They identified ٨ factors associated with development of an postoperative sepsis: wound classification, type of operation, duration of operation, use of peripheral venous

catheter, use of central venous catheter, use of urinary catheter, number of diagnoses and postoperative length of stay (***Linam et al., ٢٠٠٩),*** ICU stays, younger age and use of ventilator ***(Valera et al., ٢٠٠١).***

Gram-positive organisms, particularly methicillin-sensitive S*taphylococcus aureus* (MSSA) and methicillin-resistant S*taphylococcus aureus* (MRSA), are the most common pathogens involved in postoperative sepsis ***(Weigelt et al., ٢٠٠٩).***

Interleukin ٦ is a protein encoded by IL٦ gene, it act as both a pro-inflammatory and anti-inflammatory cytokine through its inhibitory effect on TNF-alpha and IL-١ and activation of IL-١٠, IL-٦ is one of the most important mediators of fever and acute phase response ***(Mastorakos and Ilias, ٢٠٠٧)***.

Aim of the Work

To assess frequency of postoperative sepsis among infants during the first year of life and its relation to the following risk factors. Moreover, to assess the value of IL-٦ as a predictive marker for post-operative sepsis.

١) Number of previous operations.

٢) Operation time > ١ hour.

٣) Type of operation, preoperative prophylactic antibiotics.

٤) Use of ventilator and other invasive procedures.

٥) Use of centeral venous catheter.

٦) Use of total parenteral nutrition.

Chapter (I)
Postoperative sepsis

Stages of sepsis:

***Systemic inflammatory response syndrome (SIRS*):**

SIRS is defined by the presence of ٢ or more of the following:

١) Temperature greater than ٣٨,٠°C or less than ٣٦,٠°C

٢) Heart rate > ٢ SD above normal age value.

٣) Respiratory rate > ٢SD above normal age value or arterial carbon dioxide tension below ٣٢ mm Hg

٤) White blood cell (WBC) count higher than ١٢،٠٠٠/µL, or lower than ٤٠٠٠/µL, or including more than ١٠٪ bands

(Gustot, ٢٠١١).

Sepsis: SIRS plus a culture documented infection; it must result from infection rather than from any of the noninfectious insults that may cause SIRS ***(Harrois et al., ٢٠٠٩).***

Sever sepsis: sepsis plus organ dysfunction, hypotension or hypoperfusion (including but not limited to lactic acidosis, oliguria or acute mental status changes), organ dysfunction syndrome is the presence of altered organ function in an acutely ill patient such that homeostasis cannot be maintained without intervention. Primary MODS is the direct result of a well-defined insult in which organ dysfunction occurs early and can be directly attributable to the insult itself. Secondary MODS develops as a consequence of a host response and is identified

within the context of SIRS. The inflammatory response of the body to toxins and other components of microorganisms causes the clinical manifestations of sepsis ***(Brun-Buisson et al., ١٩٩٦), (Ali, ٢٠١٢).***

Septic shock: is sepsis with hypotension (systolic blood pressure < ٩٠ mm Hg or a reduction of ٤٠ mm Hg from baseline) despite adequate fluid resuscitation **(*Adrie et al., ٢٠٠٥*).**

Epidemiology:

Estimating the exact incidence of sepsis throughout the world is difficult. Studies vary in their methods of determining the incidence of sepsis. Current estimates suggest that the incidence of sepsis is greater than ٥٠٠،٠٠٠ cases per year. Reported prevalence rates for SIRS of sepsis range from ٢٠٪ to ٦٠٪ ***(Adrie et al., ٢٠٠٥).***

A French study found that severe sepsis was present in ٦,٣٪ of all admissions to the intensive care unit (ICU). Approximately ٤٠٪ of patients with sepsis may develop septic shock. Patients who are at risk include those with positive blood cultures ***(Martin et al., ٢٠٠٩).***

Prognosis

In one study, mortalities were ٧٪ with SIRS, ١٦٪ with sepsis, ٢٠٪ with severe sepsis and ٤٦٪ with septic shock.

A multicenter prospective study published in the *Journal of the American Medical Association* reported a mortality of ٥٦٪