

# Effect of General and Spinal Anesthesia on Some Anti-inflammatory cytokines and cell adhesion molecules of Iraqi Women Undergo Cesarean Section: Comparative Study

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## Abstract:-

Both general and spinal anesthesia can be used during caesarean section. Spinal anesthesia is preferred by anesthesiologists and gynecologists because of its beneficial effects for both mothers and their fetuses. Both types of anesthesia affect the inflammatory response and could be associated with impaired immune function through their effects on different cytokines and cell adhesion molecules (E-selectin).

**Key words:** Caesarean section, E-Selectin (SELE), General anesthesia, Interleukin-1 $\beta$  (IL-1 $\beta$ ), Spinal anesthesia, Tumor necrosis factor- $\alpha$  (TNF $\alpha$ ).

## INTRODUCTION

Anesthesia is loss of sensation with or without loss of consciousness.[1] The goals of anesthesia are hypnosis, analgesia and muscle relaxation. This allows patients to undergo surgery without the distress and pain.[2] There are three major types of anesthesia: general, regional, and local.[3] General anesthesia represses activity of the central nervous system and results in loss of consciousness and total absence of sensation.[4] The most common types of regional anesthesia are spinal anesthesia[2], is the injection of local anesthetic solution into the cerebrospinal fluid (CSF) located within the subarachnoid (intrathecal) space to supply analgesia in the pelvis, abdomen or lower extremities.[5] Exposure to surgery and anesthesia affects several of immune system functions.[6] Any kind of surgery harms homeostasis and produces various immunologic, metabolic, and hemodynamic reactions.[7] Anesthesia affects the immune system with the liberation of different cytokines that influence the inflammatory response postoperatively.[8] The neuroendocrine system activation is associated with the response to leukocyte activation, the cytokine network and inflammatory stress through and after operation.[7] As well as leukocyte activation, cell adhesion molecules like selectins play an essential role in the relations between endothelial cells and leukocytes through the inflammatory process.[9] E-selectin is expressed via activated endothelial cells. The selectins have significant roles in the organization of leukocyte engagement and upholding of leukocyte rolling.[10] All types of anesthesia influence the immune system function either by upsetting the function of the immune competent cells or via its influence on the stress response.[11] Cesarean section is the birth of a fetus via laparotomy and then hysterotomy.[12] Both general and spinal anesthesia can be used during caesarean section.[13] Spinal anesthesia is usually preferred by gynecologists and anesthesiologists because of its useful influences for mothers and their babies during caesarean section. Nevertheless, when the spinal anesthesia is contraindicated, the general anesthesia may be used.[14, 15] Regional anesthesia is employed in 95% of births, spinal anesthesia and combined epidural and spinal anesthesia being the most usually utilized regional techniques in elective caesarean section.[16] The spinal anesthesia is generally considered as more safer and practical than general anesthesia, advantages of spinal anesthesia include less newborn exposure to medications, a reduced peril of maternal pulmonary aspiration, no risk of failed endotracheal intubation that may occur in general anesthesia and mother is awake when her baby is born.[13]

General anesthesia requires the use of multiple drugs, most of these drugs influence the neonatal in two ways: via direct influence through placental drug transfer or via indirect influence resulting from maternal biochemical and physiological alterations, that appear to be more important.[17]

A Cochrane Review of 16 studies that comparing between general anesthesia and neuraxial blockade in caesarean sections found no marked variance in Apgar scores of neonatal or the requirement for neonatal resuscitation, and there was no evidence to show that neuraxial anesthesia was superior to general anesthesia for neonatal and mother outcome.[18] The aim of this study was designed to compare the effects of spinal and general anesthesia on some anti-inflammatory cytokines and cell adhesion molecules in the pregnant women undergoing elective caesarean section.

## MATERIALS AND METHODS

This clinical study was carried out on (48) pregnant women undergone caesarean section with age range (17 – 44 years) in Al-Alwaiya maternity teaching hospital during the period of study from August 2016 to November 2016 under supervision of specialist gynecologist and anesthesiologist doctors. Patients classified into two groups according to the type of anesthesia given to the patient:

- Group A: patients undergo a caesarean section under general anesthesia include (24 patients) with a range of age (17-44 years).
- Group B: patients undergo a caesarean section under spinal anesthesia include (24 patients) with a range of age (21-37 years).

The Interleukin-1 $\beta$  (IL-1 $\beta$ ), Tumor necrosis factor- $\alpha$  (TNF $\alpha$ ), E-Selectin (SELE), were determined through this study at zero time (before anesthesia), at 12hrs and 24hrs postoperatively.

**Materials:** The diagnostic kits utilized in this study are IL-1 $\beta$  kit, TNF $\alpha$  kit and E-Selectin kit manufacturing by Elabscience Company/ China. The instruments used in this study are Full Automated ELISA FLx800 manufacturing by Biotec/ USA and Centrifuge manufacturing by Kokusan/ Japan.

## RESULTS AND DISCUSSION

The results showed that the mean level of serum IL-1 $\beta$  in both patient groups was significantly increasing after 12hr and 24hr of anesthesia, and there was no significant differences in its value between 12hr and 24hr of anesthesia, and no significant differences between patients of both groups. Many studies that consistent with the current study had shown that the level of IL-

1β, IL-6, IL-10 concentration were significantly increase after exposure to anesthesia and surgery[6, 19-22]. And other studies had shown that no significant differences in plasma IL-1β, IL-6 and IL-10 concentration were found between patients operated in general and spinal anesthesia[20, 21, 23, 24]. While one study in patients subjecting appendicectomy by using flowcytometric method demonstrated that spinal anesthesia greater inflammatory response than general anesthesia[19, 25].

Other studies have yielded equivocal results regarding the effect of the anesthetic regimen on the differential release of inflammatory cytokines[26-30] There were significant reduction in mean level of serum TNFα and E-Selectin after 12hr and 24hr of anesthesia, and no significance difference in mean of these parameters between 12hr and 24hr of anesthesia in both patient groups. This significant difference was supported by many studies which showed that the level of TNFα were significantly decrease after exposure to anesthesia and surgery[19, 31, 32]. One study which showed that the anesthesia repress mediated cell adhesion E-selectin in static condition. The anesthetics protect organs or

tissues in such cases, and inhibition of adhesion leukocyte via anesthetics has been concerned. However, few is known about the work of anesthesia on adhesion molecules[33].

For serum TNF-α there were no significant differences between patients of both groups and there were significant differences between patients of both groups for serum E-Selectin value. many studies had shown that no significant differences in plasma TNFα concentration were found between patients operated in general and spinal anesthesia[20, 21, 23]. Proinflammatory and anti-inflammatory cytokine profiles were not significantly different in patients undergoing transurethral resection of the prostate under GA or spinal anesthesia[29]. In other study suggested that there was no significant differences in TNF-α value after anesthesia between spinal and general groups[34]. And one study of effects of spinal and general anesthetic techniques in cesarean section on endothelial adhesion molecules inconsistent with the current study, which indicated that the maternal blood values of L-selectin and E-selectin were not different between the GA and SA groups[15].

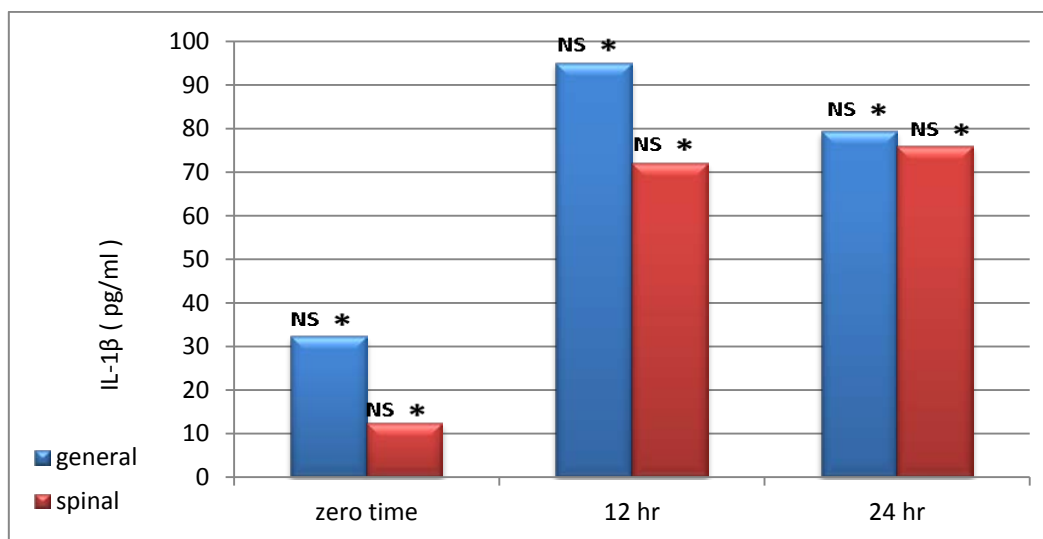
**Table (1): Effect of anesthesia on interleukin 1β (IL-1β) value in pregnant women undergo cesarean section at zero time (before anesthesia), 12hr after anesthesia and 24hr after anesthesia.**

Interleukin 1β value ( pg/ml )			
Groups	Zero time (before anesthesia)	12hr (after anesthesia)	24hr (after anesthesia)
Group A (n=24)	32.3 ± 11.1 <sup>NS *</sup>	95.13 ± 11.3 <sup>NS *</sup>	79.48 ± 12.06 <sup>NS *</sup>
Group B (n=24)	12.4 ± 2.1 <sup>NS *</sup>	72.04 ± 11.9 <sup>NS *</sup>	76.05 ± 11.01 <sup>NS *</sup>
P value	P=0.8	P=0.16	P=0.83

Result are expressed as mean ± SEM

Result with identical superscript (\*) within the same group considered significant difference (p<0.05) in comparison with zero time

Result with identical superscript (NS) within the different group considered no significant difference(p>0.05)



**Figure (1): Effect of spinal and general anesthesia on IL-1β**

**Table (2): Effect of anesthesia on tumor necrosis factor alfa value in pregnant women undergo cesarean section at zero time (before anesthesia), 12hr after anesthesia and 24hr after anesthesia.**

Tumor necrosis factor alfa value ( pg/ml )			
Groups	Zero time (before anesthesia)	12hr (after anesthesia)	24hr (after anesthesia)
Group A (n=24)	58.89 ± 11.48 <sup>NS *</sup>	30.98 ± 7.19 <sup>NS *</sup>	22.56 ± 4.53 <sup>NS *</sup>
Group B (n=24)	50.29 ± 7.78 <sup>NS *</sup>	47.43 ± 12.18 <sup>NS *</sup>	47.52 ± 17.17 <sup>NS *</sup>
P value	P=0.53	P=0.25	P=0.17

Result are expressed as mean ± SEM

Result with identical superscript (\*) within the same group considered significant difference (p<0.05) in comparison with zero time

Result with identical superscript (NS) within the different group considered no significant difference(p>0.05)

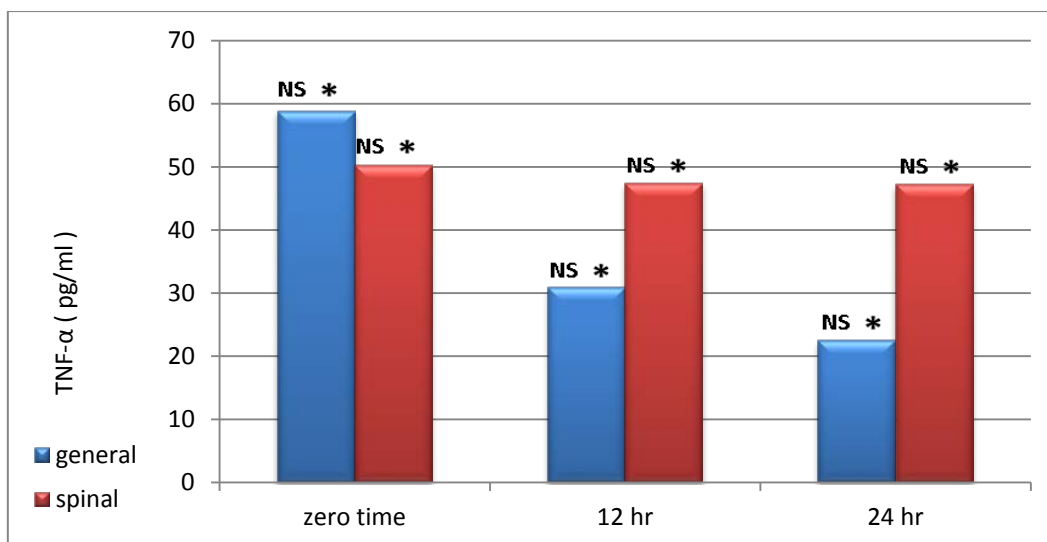


Figure (2): Effect of spinal and general anesthesia on TNF-α

Table (3): Effect of anesthesia on E-selectin value in pregnant women undergo cesarean section at zero time (before anesthesia), 12hr after anesthesia and 24hr after anesthesia.

E-selectin value ( ng/ml )			
Groups	Zero time (before anesthesia)	12hr (after anesthesia)	24hr (after anesthesia)
Group A (n=24)	4217 ± 100 <sup>s *</sup>	3816 ± 203 <sup>s *</sup>	3723 ± 241 <sup>s *</sup>
Group B (n=24)	3350 ± 215 <sup>s *</sup>	2813 ± 140 <sup>s *</sup>	2737 ± 259 <sup>s *</sup>
P value	P=0.001	P=0.001	P=0.008

Result are expressed as mean ± SEM  
 Result with identical superscript (\*) within the same group considered significant difference (p<0.05) compare with zero time  
 Result with identical superscript (s) within the different group considered significant difference (p<0.05)

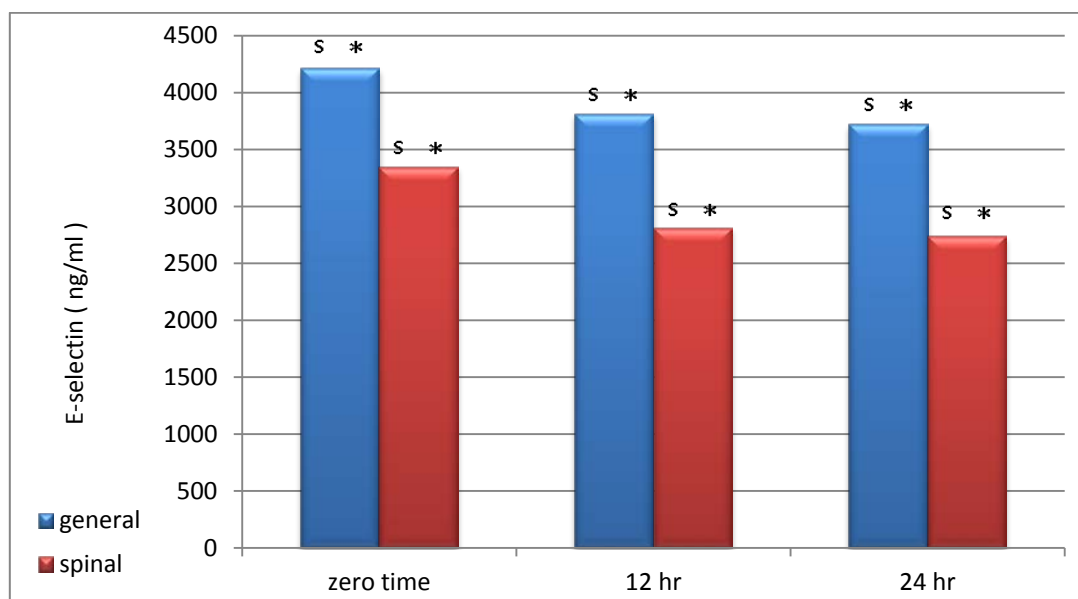


Figure (3): Effect of spinal and general anesthesia on E-selectin

**CONCLUSION:-**

Both general and spinal anesthesia effect the inflammatory response and could be associated with impaired immune function through their effects on different cytokines and cell adhesion molecule (E-selectin). There was no significant difference regarding the anesthetic techniques on inflammatory response, and spinal anesthesia cause more reduction in the cell adhesion molecule (E-selectin) concentration than general anesthesia.

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