CORRELATION OF PRE-OPERATIVE LEUKOCYTOSIS WITH POST-OPERATIVE WOUND INFECTION IN CAESAREAN-SECTION

Sadia Zaineb, Amina Akbar, Saira Mahboob, Mobeen Ikram

Combined Military Hospital Okara/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To assess the frequency of preoperative leukocytosis and its association with wound infection.
Study Design: Prospective-cross sectional, analytical study.
Place and Duration of Study: Department of Gynecology and Obstetrics, Combined Military Hospital, Thall, from Jan to Dec 2017.
Methodology: After the approval of hospital ethics committee, 340 pregnant ladies undergoing both elective and emergency cesarean section were included in our study. The outcome of our study was the frequency of preoperative leukocytosis and its association with postoperative wound infection. SPSS version 20 was used to analyze data. The qualitative data was presented as frequency and percentage. Chi-square was used to analyze significance. A *p*-value ≤0.05 was taken as significant.
Results: Frequency of preoperative leukocytosis was 121 (36.6%). A total of 111 (64.1%) pregnant ladies had pre-operative leukocytosis without post-operative wound infection versus 10 (66.6%) in patients with wound infection, *p*≤0.05, odd ratio 3.77. The sensitivity of pre-op total leukocyte count (TLC) for prediction of post-op wound infection was 66.6% (95% CI 38.3 to 88.8%) and specificity of 65.1% (59.5% to 70.34%). Most patients, 13 (86.6%), with wound infection required only debridement and intravenous antibiotics: IV linezolid and metronidazole; rest 2(13.4%) required secondary suturing for patient recovery.
Conclusion: Preoperative leukocytosis was common in parturient undergoing cesarean section incidence of wound infection was low in this study. The post-operative wound infection risk is shown to correlate with the preoperative leukocytosis.

Keywords: Preoperative leukocytosis, Postoperative wound infection, Sensitivity, Specificity.

INTRODUCTION

Surgical site infections after cesarean section happen in 2.6% to 4.5% of lower segment cesarean section[1-3]. It is associated with increased length of stay, morbidity, maternal mortality and cost of care[4]. The cost of surgical site infection after cesarean section in the USA is estimated to range from $2852 to $3842 per case[5]. Puerperal sepsis has been reported to result in at least 75,000 maternal deaths worldwide each year. Most of these deaths occur in low-income third world countries with reported morbidity of 0.1-0.6 per 1000 deliveries in the high income countries[6]. International guidelines are published and updated regularly by various societies for prevention of surgical site infection (SSI)[7,8]. Studies have shown that emergency lower segment caesarean section (LSCS), chorioamnionitis, poorly controlled diabetes, BMI> 35kg/m^2, category 2 or 3 LSCS and manual extraction off placenta and skin closure with staples to be high risk factors for post-cesarean section wound infection[9]. Various tests/scoring systems are used to assess the risk of post operative surgical site infection. These include Onodera's Prognostic Nutritional index (which is based on serum albumin and lymphocyte count) and Surgical Site Infection Risk Score (SSIRS) which is a multi-factorial scoring system, and amniotic fluid C-reactive protein[10-12]. Newer technologies like infrared thermography are being investigated as a method for prediction of surgical site infection[13].

Total leukocyte count (TLC) has been studied to predict post-operative complication with equivocal results. A raised TLC has been shown

Correspondence: Dr Saira Mahboob, Graded Anesthetist, SD-154, Askari-V, Walton Airport, Gulberg III Lahore, Pakistan
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to increase the length of stay and risk of deep postoperative wound infection[14,15]. The patients who are at higher risk of postoperative infection may require vigilant monitoring and a prophylactic multi-modal antimicrobial regime and longer duration of perioperative antimicrobial therapy. There is scarcity of data to show the association of pre operative elevated total leukocyte count with the risk of postoperative wound infection in cesarean section. The objective of our study was to correlate the frequency of pre-operative leukocytosis with post-operative wound infection. If found significant, pre-operative raised total leukocyte count can be used to identify patients at risk of post-operative surgical site infection. This can help in early diagnosis and prompt management to improve maternal outcomes and reduce morbidity and mortality.

METHODOLOGY

After the approval of the Hospital Ethics Committee, the prospective-cross sectional, analytical study was conducted at Department of Gynecology and Obstetrics, Combined Military Hospital, Thall, for a duration of 1 year form January to December 2017. A total of 560 pregnant ladies presented to emergency as well as outdoor of our department. Patients with clinical signs and symptoms of pneumonia and urogenital tract infections were excluded from our study. A 340 patients who underwent LSCS were included in our study by consecutive sampling. Preoperative preparation and decision regarding requirement and urgency of LSCS was assessed and decided by a single, classified gynecologist/obstetrician. All the patients had pre-operative complete blood picture done, including TLC. All the patients underwent LSCS based on obstetric indications that was decided by a classified gynecologist. For the pro-phylaxis of surgical infection intravenous amoxacillin/clavulanate 1.2g was given preoperatively and intravenous amoxacillin/clavulanate 1.2g with amikacin 80mg were continued 08 hourly for 03 days post-operatively. The patients were then followed for a duration of 2 weeks for development of wound infection. As culture and sensitivity testing of wound tissue was not available at our institute, the gynecologist made a clinical diagnosis of postoperative infection as evidenced by skin induration, swelling, pain, discharge or skin wound dehiscence. Patients who were diagnosed with wound infection were treated with intravenous linezolid and metronidazole along with an anti-inflammatory drug serratiopeptidase. After informed consent, data were collected on a pre-designed proforma. Our primary outcome was the frequency leukocytosis and the association of preoperative raised TLC with wound infection. The secondary outcome was the requirement of antibiotic therapy and re-suturing.

The data were analyzed using SPSS-20. The qualitative data were presented as frequency and percentage. Chi square (Fischer exact test) used to analyze significance. The quantitative data presented as mean ± standard deviation. Independent sample t-test was used to calculate association between preoperative leukocytosis and wound infection. A p-value ≤0.05 taken as significant.

RESULTS

A total of 340 patients underwent lower segment cesarean section at our institute. Ten patients were excluded from final analysis due to incomplete data. The mean age was 27.4 years ± 5.8 in our study population. A frequency of preoperative leukocytosis was 121 (36.6%) of our study population. A total of 15 (4.5%) patient were diagnosed with wound infection. The demographic profile is tabulated as table-I.

A total of 111 (35.2%) patients without wound infection had leukocytosis versus 10 (66.7%) in patients with wound infection, p= 0.024. The odds ratio for raised TLC/wound infection was 3.77 (95%CI 1.24 - 11.17). The association of severity of leukocytosis with wound infection is given as table-II.

The mean TLC was 15.94 x 10^9/L ± 4.97 in infected patients versus 11.67 x 10^9/L ± 4.49 in non-infected parturient, p-value=0.000. The sensitivity of pre-op TLC for prediction of post-op wound infection was 66.6% (95% CI 38.3 to 88.8%) and specificity of 65.1% (59.5% to 70.34%), positive predictive value (PPV) 8.3% (95% CI

5.8% to 11.8%) and negative predictive value (NPV) 97.6% (95.6% to 98.8%) and accuracy of 65.15% (59.7% to 70.3%). Most of patients 13 (86.6%) with wound infection required only debridement and intravenous antibiotics: intravenous linezolid and metronidazole; rest 2 (13.4%) required secondary suturing for patient recovery.

Table-I: Demographic profile of study participants.

Variable	330 (%)
Nature of LSCS	
Emergency	313 (94.9%)
Elective	17 (5.1%)
Antenatal Care	
Yes	64 (19.4%)
No	266 (80.6%)
Referral from Doctor	
Yes	189 (57.3%)
No	141 (42.7%)
Obstetric History	
Primigravida	105 (31.8%)
2-4 delivery	133 (40.3%)
Grand Multiparida	92 (27.9%)

Table-II: Association of wound infection in study.

Variable		Wound Infection		*p*-value
		No (n=315)	Yes (n=15)	
TLC ($x\ 10^9$/L)	Normal	203 (64.4%)	5 (33.3%)	0.0005
	11-15	64 (20.3%)	2 (13.3%)	
	>15	47 (14.9%)	8 (53.3%)	

DISCUSSION

In our study, pre-operative leukocytosis has been shown to be significantly associated with the risk of post-operative wound infection. As we excluded patients with suspicion of pneumonia, genitourinary tract infection; so we can safely say that the leukocytosis was not related to sepsis due to these causes. However, we didn't exclude chorioamnionitis as a cause of raised TLC and cannot comment if it's a confounding factor for wound infection. We started prophylactic antimicrobial and continued for 3 days postoperativly as most of our patients had poor nutritional status, personal hygiene and dusty climate in our region. As we didn't have the option of culture and sensitivity of wound tissue or pus, our treatment for wound infections was empirical with linezolid and metronidazole.

Risk factors for post-operative infectious complications including wound infections have been studied extensively. Tariq *et al* identified increased age >70 years, obesity, ASA physical status ≥III, presence of diabetes mellitus, hypertension and anemia (all *p*-value ≤0.0001) as independent risk factors for postoperative wound infections in various surgeries[16]. Similarly, Gull *et al* reported an incidence of 73 (12.65%) of wound infection after coronary artery bypass grafting surgery. They reported diabetes mellitus (43.5%), smoking (31.1%), hyperlipidemia (20.3%), previous stroke (6.84%) to be independent risk factors for wound infection; *p*-value <0.05[17].

Limited data is available regarding utility of pre-operative leukocyte count as a predictor of post-operative wound infection. Katehrine *et al* have reported that post partum leukocyte was increased especially in patient who had labor before cesarean section (*p*-value <0.001). However, change on leukocyte count was similar whether parturient had labor or not (22% increase in post-cesarean)[18]. Ijaz *et al* reported a sensitivity of 80.7% with a specificity of 35.1% of TLC to identify complicated appendicitis. They reported a significantly higher TLC of 11.78 ± 2.19 in simple appendicitis vs 14.22 ± 3.23 in complicated appendicitis; *p*-value 0.01. They also reported a significantly raised C-reactive protein and serum total bilirubin in complicated appendicitis, *p*<0.001 in both tests[19]. Mahmood *et al* reported a significantly higher incidence of post-operative wound disruption in patients with pre-operative asymptomatic leukocytosis (1.3% vs 0.4%, *p*= 0.001). They also reported a higher incidence of superficial incisional SSI (3.6% vs 3.1%); deep incisional SSI (0.6% vs 0.4%) and deep SSI (0.7% vs 0.3%); which was not statistically significant (*p*-value >0.05)[20]. Szender *et al* reported an increa-

sed risk of post-operative complication, 440 per 1000 surgery in patients with asymptomatic pre-operative leukocytosis versus 341 per 1000 surgeries without leukocytosis. However, they studied patients undergoing surgery for ovarian cancer. The was also increased risk of infectious morbidity (RR 1.34, 95% CI 1.05-1.70) and death (RR 2.41, 95% CI 1.34 - 4.32)[21].

In the study, no long term morbidity and mortality associated with wound infections were studied. Secondly, we didn't study the difference in pre-operative and postoperative leukocyte count. Thirdly, we didn't study the differential leukocyte counts as predictor of wound infection. A larger study with multivariate analysis is required to validate the utilization of leukocytosis as predictor of postoperative wound infection.

RECOMMENDATIONS

Preoperative leukocytosis can be used to identify patient at risk of postoperative wound infection for early diagnosis and prompt management may be initiated to prevent maternal morbidity.

CONCLUSION

Preoperative leukocytosis was common in parturient undergoing cesarean section incidence of wound infection was low in this study. The post-operative wound infection risk is shown to correlate with the preoperative leukocytosis.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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