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Research Article

Frequency of Surgical Site Infection among Patients Undergoing Caesarean Section Receiving Care-Bundle Approach

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ABSTRACT

Background: Surgical Site Infection (SSI) prevention is a worldwide priority. According to estimates, adopting evidence-based guidelines can avoid up to 60% of surgical site infections. Main component of this prevention is use of care-bundle approach.

Objective: To determine the frequency of SSI among patients undergoing caesarean section receiving care-bundle approach.

Methodology: A prospective cohort study was carried out at department of obstetrics and gynecology, Fauji Foundation Hospital, Rawalpindi, Pakistan from 1st January 2024 to 31st May 2024. 500 women aged between 18-35 years admitted for both emergency and elective caesarean section were selected following exclusion and inclusion criteria. Evidence based care bundle was applied during caesarean section. Patients were assessed for any signs of infections (i.e., indurate skin margin, mucopurulent discharge and wound dehiscence) before discharge from hospital and then at 4 weeks post caesarean.

Results: In our study, among patients undergoing Caesarean section (C-section) and receiving care-bundle approach, SSI was found in 44 (8.80%) women.

Conclusion: This study concluded that the frequency of SSI among patients undergoing caesarean section receiving care-bundle approach was within worldwide acceptable rate of 8.80%.

Keywords: Caesarean; Surgical Site Infection (SSI); Care-bundle approach

INTRODUCTION

Caesarean delivery is the most common procedure in obstetrics [1]. In 2014, nearly 1.3 million caesarean deliveries were performed [2]. Most mothers recover unusual from a caesarean birth, but some develop a surgical site complication in the incision line. The rate of SSI ranges from 3% to 15% worldwide [3]. The incidence of Surgical Site Infections (SSI) among caesarean section patients has been reported in various studies, ranging from 3% to 18% [4].

Surgery-related surgical site infections lower quality of life, lengthen hospital stays, raise the risk of morbidity and death and increase the need for readmissions and re-interventions [5]. In the United States of America (USA), surgical site infections account for 36% of all health care-associated infections, putting 8 million US patients at risk for developing an SSI annually [6].

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One of the nation's key priorities is preventing surgical site infections. Antibiotic-resistant bacteria are growing more common, which makes SSI prevention important in the modern world. Majority of SSIs have been found to be preventable by using evidence-based guidelines, appropriate screening and optimization of pre-operative risk factors [7,8].

Care-bundle approach has been adopted to reduce SSI. This approach includes various simple measures done pre, intra and post- operatively and found to be effective in reducing SSI. Surveillance is an essential system of measuring SSIs [9]. It is common in high-income countries for a wide range of surgical procedures but in low-income countries very few studies have been done on SSI surveillance systems. The aim of this study is to determine the frequency of caesarean delivery SSI with care-bundle and to establish a clinical-based SSI surveillance system to reduce caesarean delivery SSI.

METHODOLOGY

A prospective cohort study was conducted at department of obstetrics and gynaecology, Fauji Foundation Hospital (FFH), Rawalpindi from 1st January 2024 to 31st May 2024. Non-probability, consecutive sampling was used to calculate sample size of 500 with 95% confidence level, 1.5% margin of error and taking percentage of SSI in caesarean section as 3.0%. Women aged 18-35 years, admitted for both emergency and elective caesarean section were included in the study. Exclusion criteria involved having diabetes, obesity, anemia and previous history of wound infection.

After approval from hospital ethical committee, patients were recruited according to above mentioned selection criteria. All patients were assessed before caesarean section and written informed consent was taken. Evidence based care bundle was applied before, during and after caesarean section. Patients were assessed for any signs of infections (i.e., indurate skin margin, mucopurulent discharge and wound dehiscence) before discharge from hospital and then at 4 weeks post caesarean.

Following data collection, data was entered in Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were performed for the discrete variables. For continuous variables (age, weight, parity) means and SD were calculated. For categorical variables, frequencies and percentages were determined. Effect modifiers like age, weight and parity were controlled by stratification. After stratification and applying the Chi-square test, a p value below 0.05 was considered statistically significant.

A surgical site infection was defined infection within 30 days of the procedure, diagnosed clinically as indurate skin margin, mucopurulent discharge and wound dehiscence. Bundle care meant preoperative intravenous ceftriaxone 1 g, povidone-iodine skin preparation, use of clippers instead of razor, vaginal cleansing by povidone-iodine, removal of placenta by traction of umbilical cord, change of surgical gloves during abdominal closure, suture closure of subcutaneous tissue if wound thickness greater than 2 cm, suture skin closure instead of staple closure, dressing removal between 24 and 48 hours, having a bath after dressing removal.

RESULTS

Age range in this study was from 18 to 35 years with mean age of 28.67 ± 3.19 years. Majority of the patients 469 (93.80%) were between 26 to 35 years of age. Mean parity in our study was 2.38 ± 1.16. Mean weight of women was 63.65 ± 8.20 kg.

In our study, frequency of SSI among patients undergoing C-section receiving care-bundle approach was found in 44 (8.80%) women (Figure 1). Stratification of surgical site infection with respect to age groups and parity is shown in Tables 1 and 2 respectively. Table 3, has shown the stratification of surgical site infection with respect to weight.

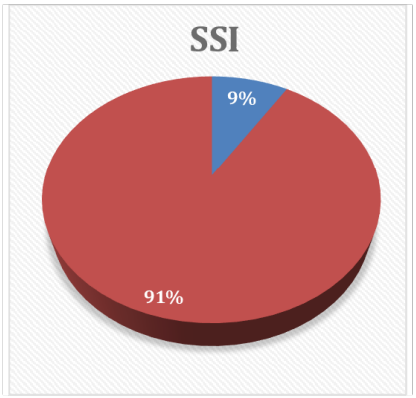

Figure 1: Frequency of SSI among patients undergoing caesarean section receiving care-bundle approach (n=500). **Note:** (■) Yes; (■) No.

Age (in years)	Surgical Site Infection (SSI)		p value
	Yes	No	0.859
18-25	3	28	
26-35	41	428	

Table 1: Stratification of SSI with respect to age groups.

Parity	Surgical Site Infection (SSI)		p value
	Yes	No	0.350
≤3	37	405	
>3	07	51	

Table 2: Stratification of SSI with respect to parity.

Weight (Kg)	Surgical Site Infection (SSI)		p value
	Yes	No	0.052
≤60	10	171	
>60	34	285	

Table 3: Stratification of SSI with respect to weight.

DISCUSSION

Peri-operative bundles of evidence-based practices to reduce SSIs have been introduced into non-obstetric surgical patients with well-defined results [10-13]. We can expect similar outcomes in the obstetric population. Infection rates have been successfully decreased by using "bundles" of preventative measures during surgical operations. These strategies enclose administering antibiotic prophylaxis within one hour prior to incision, ceasing antibiotic use within 48 hours post-surgery, conducting hair removal shortly before the operation, ensuring intra-operative normo-thermia of at least 35.5°C, and regulating blood glucose during the immediate postoperative period and extending for 48 hours thereafter [7].

We have conducted this study to determine the frequency of SSI among patients undergoing C-section receiving care-bundle approach. In our study, frequency of SSI among patients undergoing caesarean section receiving care-bundle approach was found in 44 (8.80%) women. Erritty et al. [14] in his study has found the importance of surgical site infection after elective caesarean section as 4.8%, which is much lower than our study. Similarly a 50% reduction in post caesarean SSI was noted over the 14-month period, by implementing care bundle and using multidisciplinary team approach [15].

The incidence of post-CS SSIs appears to vary with a geographical region with higher rates in underdeveloped countries, as illustrated by an average of 7.3% (range, 1.7%-10.4%) among in-patients in Sub-Saharan Africa [16], compared with surveys in European countries conducted from 2008-2013 which reported rates from 1.75%-4.78%, which included in-patients and post-discharge patients [17].

A retrospective cohort study at Madinah maternity and children hospital, obstetrics and gynecology department, Madinah, Saudi Arabia, was conducted from December 2011 to December 2013; where 8544 medical records of women delivered by caesarean section were reviewed and the rate of surgical site infection during the year 2012 was compared with its rate during the year 2013. There were 167 cases of surgical site infections following caesarean sections in 2012. During 2013 (after administration of prophylactic antibiotic to all women delivered by Caesarean section), 109 cases were complicated by surgical site infection among 4470 delivered by caesarean section. Statistical analysis clearly demonstrates a significant difference in infection rates ($p<0.001$) between year 2012 and 2013; with higher rate of infection in 2012 which was 4% compared to 2.4% during the year 2013 [18].

As part of the SSI prevention package, adequate preoperative antibiotic prophylaxis can prevent post-CS-SSIs or lower their incidence [19,20]. The antibiotic should be administered 60 min before incision to ensure adequate blood and tissue concentrations throughout the operation [21]. Although a single 1 g intravenous dose of ceftriaxone [22], is suggested in our local antibiotic therapy guidelines with clindamycin as an alternate drug and metronidazole if there is history of Premature Rupture of Membranes (PROM) or when anaerobes are suspected. 145 (5.4%) of the 4149 patients who were included in an observational prospective cohort trial to assess the effectiveness of ampicillin and ceftriaxone as prophylactic antibiotics in avoiding post C-section SSIs went on to develop SSI in spite of taking either medication [23]. The incidence of SSI can also be reduced by the surgical approach used by the surgeon, as research indicates that suture closure of subcutaneous tissue reduces the risk of wound complications if the wound thickness is greater than 2 cm (Relative Risk (RR) 1.03; 95% Cumulative Incidence (CI) 0.36-2.76) and that suture skin closure is less likely to result in complications than staple skin closure (adjusted RR 0.43; 95% CI 0.23–0.78). Also measures like preoperative hair removal with clippers, iodine skin preparation and dressing removal within 48 hours after surgery have also been found to help in reducing surgical site infections [2].

CONCLUSION

This study concluded that the frequency of SSI among patients undergoing caesarean section receiving care-bundle approach was 8.80%. So, we recommend that care-bundle approach should be applied in every woman undergoing caesarean to reduce the rate of surgical site infections as well as morbidity of these patients.

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