



Incidence and Analysis of Risk Factors Causing Surgical Site Infections after Caesarean Section in a Tertiary Care Hospital

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ABSTRACT:INTRODUCTION:Wound complications following caesarean section is a common complication that accounts for significant extension of hospital stays. The infection rate following caesarean section ranges from 3 to 15 % with an average of about 6%. But when prophylactic antimicrobial was given the incidence was less than 2%. The surveillance of SSIs brings about the awareness to the present day modern surgeon about the proper use of prophylactic and therapeutic antibiotics and strict aseptic technique and adequate monitoring and support with novel surgical, pharmacological and non pharmacological aids. This study was undertaken to study the incidence of SSI after caesarean section at first referral units and identify microorganisms as well as risk factors leading to it.

METHODS:It is a prospective study conducted in department of Obstetrics and Gynaecology, Old government hospital, Siddhartha medical college, Vijayawada, Andhra Pradesh from December 2017 to December 2019. 10% of the total caesarean sections (700 cases) in the study period were taken as study sample, as total number cesarean sections were very high during the study period. Detailed history was taken from the study group to establish proper diagnosis and to know about the presence of the risk factors regarding SSI.

RESULTS:In our study of 700 patients, 40 cases developed wound infections which accounts for 5.7%. The commonest type was superficial wound infection in which 24 cases were noted accounts for 3.4% and only one fascial dehiscence was noted which accounts for 0.1%. 94.3% population had no infection. 81.8% of wound infections occurred in age group of 31-35yrs and 44.7% of wound infections were seen in age group 26-30 yrs. 7.1% of the emergency LSCS cases were infected and 1.2% of the elective LSCS cases had wound infection. 54.2% of cases with BMI >30 had wound infections and 24% of cases with BMI 25-

29.9 had wound infections. 16% of cases with anaemia developed wound infections and only 4% of cases with out anaemia developed infection. Various pathogens isolated by culture in present study were citrobacter, Escherichiacoli, enterococcus, klebsiella, pseudomonas and staphylococcus aureus. Most common organism was staphylococcus aureus which accounts for 50%.

CONCLUSION:Post operative abdominal wound infection represents a substantial burden of disease both for patients and the healthcare services in terms of morbidity, mortality and economic costs. Although surgical wound infections cannot be completely eliminated, a reduction in the infection rate may have significant benefits. chorioamnionitis, PROM, obstructed labor, preeclampsia, increased surgical time, increased BMI pose risk for wound infections. Whereas chorioamnionitis and obstructed labor showed increased risk of wound infections. Wound infections increased hospital stay also. Knowledge of these risk factors would help the obstetrician in avoiding this complication and help to decrease the maternal morbidity postoperatively.

KEYWORDS:Caesarean section, Surgical site infection, wound infection.

I. INTRODUCTION

Wound complications following caesarean section is a common complication that accounts for significant extension of hospital stays¹. The infection rate following caesarean section ranges from 3 to 15 % with an average of about 6%. But when prophylactic antimicrobial was given the incidence was less than 2%². Before the mid 19th century postoperative patients developed "irritative fever", purulent discharge from their incisions, sepsis and rarely death³. Surgical site infections complicate a significant number of patients who undergo caesarean section. Many risk



factors for wound infections have been described which include: 1) maternal factors such as tobacco use, limited prenatal care, obesity, corticosteroid use, Diabetes mellitus and hypertension 2) Intrapartum and operative factors like chorioamnionitis, premature rupture of membranes, prolonged labor particularly second stage, large incision length, subcutaneous tissue thickness > 3cm, lack of antibiotic prophylaxis, emergency delivery and excessive blood loss⁴. According to CDC's National Nosocomial Infection Surveillance System 38% of all nosocomial infections in surgical patients are SSIs. Surgical site infection is the 2nd most common infectious complication following caesarean section after urinary tract infection. It delays the recovery, prolongs hospitalization, necessitates readmission, adds to hospital bills and other morbidities as well as mortalities⁵. The surveillance of SSIs brings about the awareness to the present day modern surgeon about the proper use of prophylactic and therapeutic antibiotics and strict aseptic techniques and adequate monitoring and support with novel surgical and pharmacological and non pharmacological aids. This study was undertaken to study the incidence of SSI after caesarean section at first referral units and identify microorganisms as well as risk factors leading to it.

II. MATERIALS AND METHODS

Type of study : Prospective study

Place of study : Department of Obstetrics and gynaecology, Old government hospital, Siddhartha Medical College, Vijayawada.

Period of study : From December 2017 to November 2019

INCLUSION CRITERIA

- All women who developed surgical site infection after caesarean section conducted at GGH Vijayawada

EXCLUSION CRITERIA

- Pts referred to GGH vijayawada from outside hospital postoperatively after caesarean section
- Pts who have pre existing skin infections around the site of surgical wound.

Study sample: 10% of the total caesarean sections (700 cases) in the study period were taken as study sample, as total number caesarean sections were very high during the study period.

Study procedure:

Method of sampling was random. After caesarean section history was taken and physical examination was conducted on each patient admitted in OBG wards with surgical site infections. Women undergoing caesarean section

and fulfilling the inclusion criteria were offered to participate in the study. All cases in which caesarean section was done outside GGH Vijayawada and with skin infections at the suture site were excluded from the study. All the necessary information regarding the study was explained to the patients or their valid guardian. Informed and written consent was taken from the patients or their guardian willing to participate in the study. Detailed history was taken from the study group to establish proper diagnosis and to know about the presence of the risk factors regarding SSI. Thorough physical examination was done in each case. Only essential investigations were done for proper diagnosis and reduction of risk. All of the pre-operative factors related to SSI present in the patient were noted down in the data sheet. After proper preparation, patients were sent to operation theatre for operation.

Strict aseptic precautions were followed during the surgery. Proper techniques were practiced as far as possible. The operation procedure and related pre operative factors were observed directly and recorded in the data collection sheet instantly. During the post-operative period, all the patients were closely monitored everyday up to the discharge of the patient from the hospital.

If any sign or symptom of infection appeared during the period then proper investigations were instituted for the diagnosis of disease and to assess the type and severity of the infection. If any collection of pus identified swab was taken and sent for culture and sensitivity test to microbiology department. Appropriate antibiotic was given to every patient both preoperative and post-operative periods.

Proper management was given to each of the patients of surgical site infection. Antibiotics were changed according to the report of culture and sensitivity test. Post-operative events were recorded in the data sheet during every day follow up. After completing the collection of data, it was compiled in a systematic way.

Variables studied:

Dependent variable: Abdominal surgical site infection (SSI).

Independent variables:

- Body mass index
- Age
- Socioeconomic status
- Haemoglobin level
- Comorbidities like HTN, diabetes mellitus, Bronchial asthma, obesity, immunodeficiency, thyroid dysfunctions etc



- Elective/emergency
- List of bacteria isolated from wound site and culture and sensitivity
- Time since the rupture of membranes before CS
- Chorioamnionitis ,obstructed labor
- **Data collection**
- Data was collected by pre-tested structured questionnaire. Data was collected from all the respondents by direct interview after getting informed written consent from them or from their legal guardian.
- **Data analysis**
- Data analysis was done both by using computer and manually. Calculated data was arranged in systematic order, presented in various tables,figures and statistical analysis was made .
- **Statistical analysis:**
- Data was entered in MS-Excel and analyzed in SPSS V21. Descriptive statistics were represented with frequencies and percentages. Chi-square test, Fisher exact test were calculated. P less than0.05 was considered as statistically significant.

III. RESULTS

This is a prospective study and was carried out to determine factors causative of surgical site infections after cesarean section that will be helpful in reducing rate of surgical site infections.700 cases who underwent cesarean section were selected randomly from Obstetrics and Gynaecology Department of Siddhartha

Medical College and Hospital during the period of December 2017 to November 2019. All cases were evaluated clinically.Only essential investigations necessary for diagnosis and preoperative assessment were carried out before operations. Postoperatively swab was sent for culture and sensitivity test in every case with discharge from the wound or collection of pus anywhere in the abdominal area.

The incidence of wound infection was determined .The incidence of wound infections in various risk factors like BMI, anaemia, chorioamnionitis, obstructed labor, PROM was studied.The impact of duration of operation,type of skin incision and skin closure on wound complications were noted.The antibiotic sensitivity pattern for the organisms isolated was also studied.

INCIDENCE OF WOUND INFECTION

In our study of 700 patients ,40 cases developed wound infections which accounts for 5.7%. The various types of wound infections seen in the present study are superficial wound infection(SWI),superficial wound disruption (SWD) and fascial dehiscence(FD).The commonest type was superficial wound infection in which 24 cases were noted accounts for 3.4% and only one fascial dehiscence was noted which accounts for 0.1%. 94.3% population had no infection..81.8% of wound infections occurred in age group of 31-35yrs and 44.7% of wound infections were seen in age group 26-30 yrs. No infections were noted in age group 18-19 yrs.According to pearson chi-square test p is < 0.001 which is statistically significant.

TABLE : 1WOUND INFECTIONS WITH REFERENCE TO AGE

Variable	Category	Infection			
		Present		Absent	
		Count	%	Count	%
AGE	18-19yrs	0	0%	38	100.0%
	20-25yrs	10	1.7%	594	98.3%
	26-30yrs	21	44.7%	26	55.3%
	31-35yrs	9	81.8%	2	18.2%
Total		40	5.7%	660	94.3%
P<0.001					

It is demonstrated that 60% of women with socioeconomic status 5 had wound infection and 12.9% of women with socioeconomic status 4

had wound infection.Accordind to pearson chi-square test p value is <0.001 which is statistically significant .So lower socioeconomic status is a



significant risk factor for wound infection. 7.1% of the emergency LSCS cases were infected and 1.2% of the elective LSCS cases had wound infection. According to Pearson chi-square test p value is equal to 0.002 which is statistically significant. 54.2% of cases with BMI >30 had

wound infections and 24% of cases with BMI 25-29.9 had wound infections. It can be seen from the table that the rate of wound infections increased significantly in obese cases. According to Pearson chi-square test p value is < 0.001 which is statistically significant.

TABLE : 2 WOUND INFECTIONS WITH REFERENCE TO BMI

Variable	Category	Infection			
		Present		Absent	
		Count	%	Count	%
BMI	<18.5	1	5.0%	19	95.0%
	18.5-24.9	8	1.4%	573	98.6%
	25-29.9	18	24.0%	57	76.0%
	> 30	13	54.2%	11	45.8%
Total		40	5.7%	660	94.3%
P<0.001					

16% of cases with anaemia developed wound infections and only 4% of cases with out anaemia developed infection. According to Pearson chi-square test p value is <0.001 which is statistically significant. So anaemia is a significant risk factor for wound infection.

TABLE :3 WOUND INFECTIONS WITH REFERENCE TO ANAEMIA

Variable	Category	Infection			
		Present		Absent	
		Count	%	Count	%
ANAEMIA	Present	16	16.0%	84	84.0%
	Absent	24	4.0%	576	96.0%
Total		40	5.7%	660	94.3%
P<0.001					

Out of 700 cases 63 had hypertensive disorders and 25% of cases with hypertensive disorders had wound infection. According to Pearson chi-square test p value is <0.001 which is statistically significant.

TABLE:4 WOUND INFECTION WITH REFERENCE TO HYPERTENSIVE DISORDERS

Variable	Category	Infection			
		Present		Absent	
		Count	%	Count	%
PREECLAMPSIA,	Present	21	25.0%	63	75.0%



CHRONIC HYPERTENSION AND ECLAMPSIA	Absent	19	3.1%	597	96.9%
Total		40	5.7%	660	94.3%
P<0.001					

29.2% of cases with diabetes in pregnancy had wound infection and only 4% of nondiabetic women had wound infection. And p value is <0.001 which is statistically significant according to pearson chi-square test. So diabetes in pregnancy is a significant risk factor.

TABLE :5 WOUND INFECTIONS WITH REFERENCE TO DIABETES

Variable	Category	Infection			
		Present		Absent	
		Count	%	Count	%
GESTATIONAL DIABETES MELLITUS AND OVERT DIABETES MELLITUS	Present	14	29.2%	34	70.8%
	Absent	26	4.0%	626	96.0%
Total		40	5.7%	660	94.3%
P<0.001					

20.9% of cases with PROM had wound infection and only 4.1% of cases without PROM had wound infection. According to pearson chi-square test p value is <0.001 which is statistically significant and indicates association. 66.7 % of cases with chorioamnionitis had wound infection and p value is < 0.001 which is statistically significant and indicates chorioamnionitis is a significant risk factor for wound infection. 50% of cases with obstructed labor had wound infection. According to pearson chi-square test p value is equal to 0.02 which is statistically significant. When duration of operation was more than 2 hours 61.9

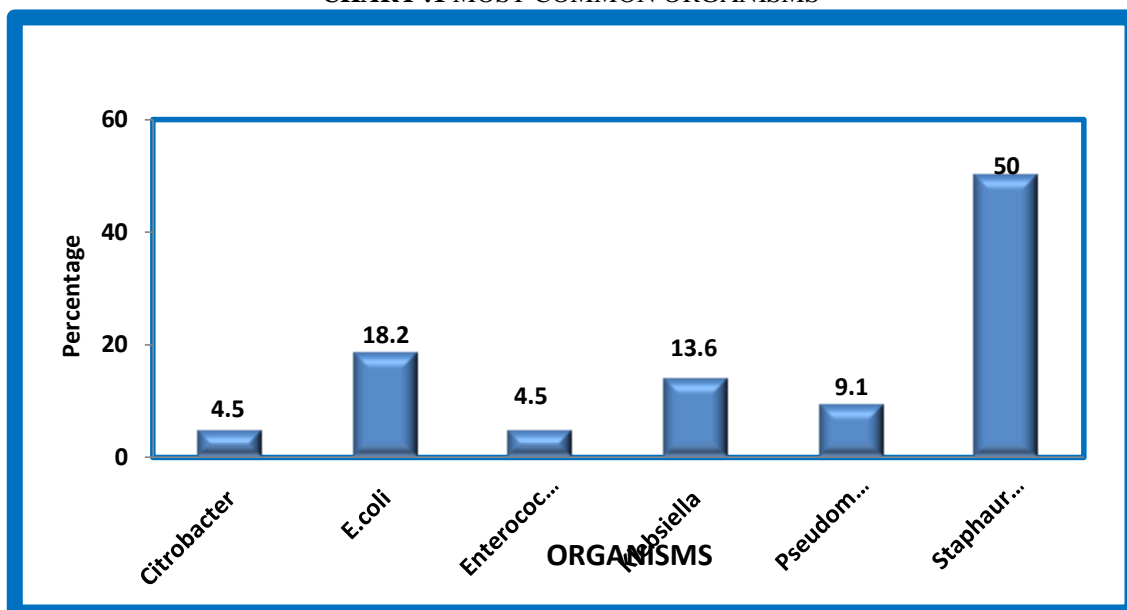
% cases had wound infection and only 1% cases had wound infection when duration is less than one hour. According to pearson chi-square test p value is < 0.001 which is statistically significant.

Most Commonly Obtained Organisms

Various pathogens isolated by culture in present study were citrobacter, Escherichia coli, enterococcus, klebsiella, pseudomonas and staphylococcus aureus . Most common organism was staphylococcus aureus which accounts for 50%.



CHART :1 MOST COMMON ORGANISMS



IV. DISCUSSION

Despite the advances in the operative techniques and a better understanding of the pathogenesis of the wound infections, postoperative wound infections continue to be a major source of morbidity for the patients undergoing LSCS. The current study was done with 700 women with both elective and emergency LSCS during December 2017 to November 2019 in department of OBG, Siddhartha medical college, Old GGH, Vijayawada. The wound infection rates after caesarean section vary from 2.8 -26.8 % reported in literature. The incidence of wound infection in the present study was 5.7%. The study conducted by A.R.Mahale et al,(2008) showed an incidence of 8.6%⁶. In a study by Vijayan , et al (2016) incidence of SSIs was 4.1% which was less compared to our study⁷. Ageing has been reported to increase the likelihood of postoperative wound infection owing to the decreased immune competence with increasing age . In present study majority of the caesarean sections were emergency LSCS(76.1%) as the hospital of present study is a tertiary care referral centre and majority of cases were referred from other hospitals due to several complications. 7.1% among all emergency lscs were having wound infection. Only 1.2% of elective LSCS were infected. In study by Vijayan et al cases with emergency LSCS had more risk of SSIs compared to elective surgeries. Emergency surgery predisposes to infection⁷. In present study majority of population belongs to lower middle class(class 3)(99.3%) .But 60 % of the lower socioeconomic status(class 5) population were infected which

contributes to major portion of SSIs . Body mass index of more than 25 has been shown to effect the outcome of surgery. The local changes such as increase in adipose tissue ,a need for larger incision ,decreased circulation to fat tissue ,operations taking more time and thus increasing the chances of contamination, an increase in local tissue trauma related to retraction contribute to an increased incidence of SSI in these patients . In a study by Vijayan et al (2016) around 83.3% of study subjects had normal BMI and 13.8% had overweight. BMI was seen to influence the outcome of surgery in terms of an increased rate of infection⁷. In present study majority of the population BMI between 18.5 to 24.9 and only 24 cases had BMI >30 who were obese. But 54.2 % of the obese cases had wound infection and 24% of the overweight cases had wound infection. Patients with anaemia were seen to be more prone to SSI. It is generally agreed that anaemia diminishes resistance to infection and is frequently associated with puerperal sepsis. Pre operative anaemia is an important predictor of infection and has been proved by several other studies. In study of Vijayan et al (2016) anaemia was found to be significantly associated with SSI with p value of 0.043⁷. There is significantly increased incidence of SSI in patients with hypertensive disorders in study by Vijayan et al (2016) and p value is 0.0007⁷. In present study 84 cases out of 700 have hypertensive disorders in pregnancy which accounts for 12% .

Hyperglycemia has several deleterious effects on host immune function, most notably on neutrophil function .Poor control of glucose during



surgery and in the perioperative period increases the risk of infection and worsens outcome from sepsis. In study of Vijayan et al (2016) patients with diabetes mellitus were seen to be more prone to infection and there is significant association with p value of 0.00006⁷. In present study 48 cases out of 700 had diabetes and 29.2% of diabetes cases had wound infection. Premature Rupture of Membranes is associated with the largest bacterial inoculums and liquor gets infected and infection supervenes. Several studies have shown that cases of prolonged /obstructed labor are associated with higher incidence of SSI⁸. In present study 61.9% cases with surgery more than 2 hours were infected and only 1 % of cases with duration less than 1 hour were infected. Vijayan et al (2016) found that use of perioperative antibiotics significantly reduces SSI in the study⁷. In present study all the cases received preoperative antibiotic before caesarean section.

V. CONCLUSION

Caesarean section has become one of the commonest surgical procedures in obstetric practice .The incidence of wound infections after caesarean section in this study was 5.7%. Post operative abdominal wound infection represents a substantial burden of disease both for patients and the healthcare services in terms of morbidity ,mortality and economic costs. Although surgical wound infections cannot be completely eliminated, a reduction in the infection rate may have significant benefits.

This study confirms that risk factors like anaemia, hypertension, diabetes mellitus, chorioamnionitis, PROM, obstructed labor, preeclampsia, increased surgical time ,increased BMI pose risk for wound infections. Whereas chorioamnionitis and obstructed labor showed increased risk of wound infections. Wound infections increased hospital stay also.

The commonest organism isolated was staphylococcus aureus .Superficial wound infection was commonest wound infection which was treated by daily dressings and antibiotics.

Correcting malnutrition, anaemia, stabilizing diabetes and eradicating all infections such as urinary tract infection, proper preparation of skin, proper surgeons scrubbing, and using proper surgical technique can decrease the risk of postoperative wound infections.

Knowledge of these risk factors would help the obstetrician in avoiding this complication and help to decrease the maternal morbidity postoperatively.

Based on sensitivity pattern of different isolates of bacteria ,an empiric antibiotic therapy in postcaesarean infection can be implemented.

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