

# Surgical site infections post cesarean section

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## Abstract

**Background:** Surgical site infections are among the most common hospital acquired infections. They make up to 14-16% of inpatient infections. Objective of present study was to evaluate the risk factors associated with surgical site infections in caesarian cases, the bacteria causing wound infections in obstetric operations, the antibiotic sensitivity and resistance pattern of the pathogens isolated.

**Methods:** 100 women with wound infection during hospital stay or within 30 days following caesarean section were taken for the study. These case records were thoroughly studied and noted. Pus samples were collected from the wound site with help of sterile swabs under aseptic precautions and immediately transported to microbiology laboratory for culture and sensitivity.

**Results:** Most of the patients belonged to the age group of 21-25 years, contributing to 55% of the cases. Majority of the women are from rural areas (71%). 57% of the cases were unbooked. 90% of the SSI were seen in emergency surgeries and 10% in elective surgeries. Anaemia (48%) was the most common medical risk factor followed by hypertensive disorders 25%. The risk of post-operative infection has been found to be proportional to volume of blood loss during cesarean section and duration of surgery. Staphylococcus aureus was found to be predominant organism of wound infection of which 21% were MRSA followed by Klebsiella and E. coli.

**Conclusions:** Proper assessment of risk factors that predispose to SSI is critical for the development of strategies for reducing the incidence of SSI and for identifying high risk patients requiring intensive postoperative surveillance. We can conclude that reduction in intraoperative blood loss and duration of surgery can reduce the incidence of Postoperative infections. Also Pre-operative antibiotics should not be made mandatory in all lower segment caesarean section as no significant difference has been found in the infection rate in spite of giving preoperative antibiotics.

**Keywords:** Surgical site infection, post cesarean section

## Introduction

Surgical site infections are among the most common hospital acquired infections. They make up to 14-16% of inpatient infections <sup>[1]</sup>. The increasing incidence of cesarean deliveries worldwide has contributed to greater wound morbidity <sup>[2]</sup>. The incidence of cesarean section

in India was 7.1% in 1998 and there is 16.7% rise in the rates annually in India [3]. The rates of SSI are considered as an indicator of the quality of surgical and postoperative care provided by the hospitals [4]. Knowledge of the organisms causing SSI and their antibiotic sensitivity and resistance patterns provide an insight into the current antibiotic prescription practices and the factors affecting these practices. The present study helps to know the risk factors and the organisms causing SSI in our hospital and their sensitivity to different antibiotics which help in formulating infection control practices.

## Methods

This was a cross sectional descriptive study conducted at J.K. Loan Hospital Kota with a sample size of 100.

## Inclusion criteria

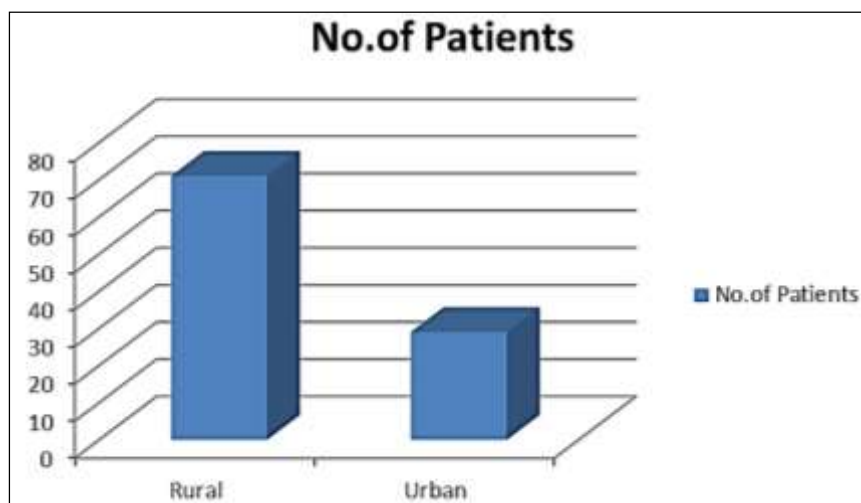
- Women with wound infection during hospital stay or within 30 days following lower segment caesarean section, using the criteria for CDC5 (The center for disease control and prevention)
- The operations included are Caesarean section.

## Exclusion criteria

- Women with wound infection after 30 days following caesarean section.
- Surgeries other than caesarean section.
- Women who fulfill the inclusion criteria were enrolled in the study. Diagnostic criteria were maternal fevers accompanied by spontaneous parting of wound or purulent discharge from the wound with or without positive bacterial culture/local swelling [6].
- Demographic information, potential risk factors, operative findings, the amount of blood loss were recorded. Pus sample collected from the wound sent for culture and sensitivity.

**Table 1:** Nativity

	No. of Patients	%
Rural	71	71
Urban	29	29

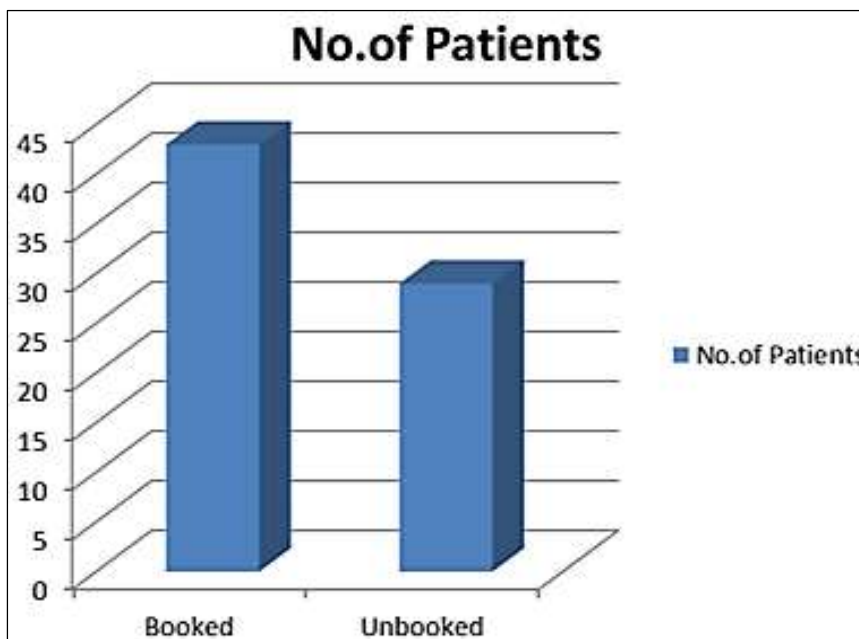


**Fig 1:** Demographic representation of distribution of patients.

Most of the patients belongs to the rural area (71%) and 29% urban area.

**Table 2:** Antenatal Visits

	No. of Patients	%
Unbooked	57	57
Booked	43	43

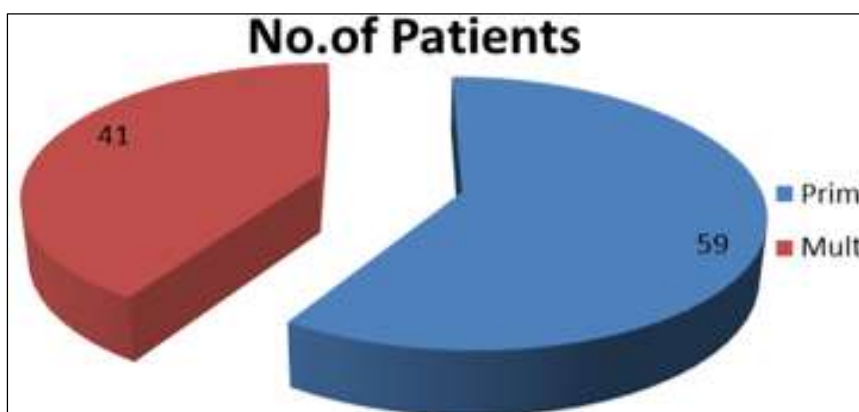


**Fig 2:** Graphical representation of antenatal visits of patients

Most of the patients were unbooked (57%) and 43% booked.

**Table 3:** Gravity

	No. of Patients	%
Primi	59	59
Multi	41	41



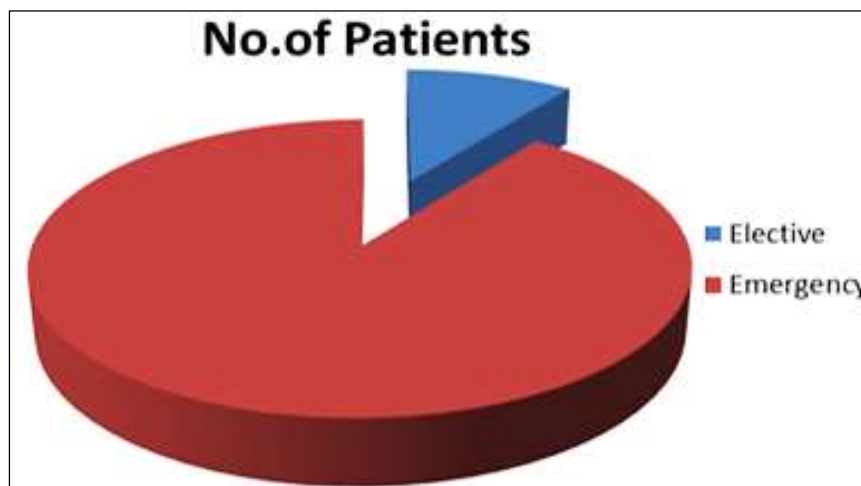
**Fig 3:** Figure showing gravity of patients

Most of the patients were primi (59%) and 41% were multi.

So we can conclude that gravity does not have any direct relationship with post-operative wound infections.

**Table 4:** 90% of the SSI were seen in Emergency surgery

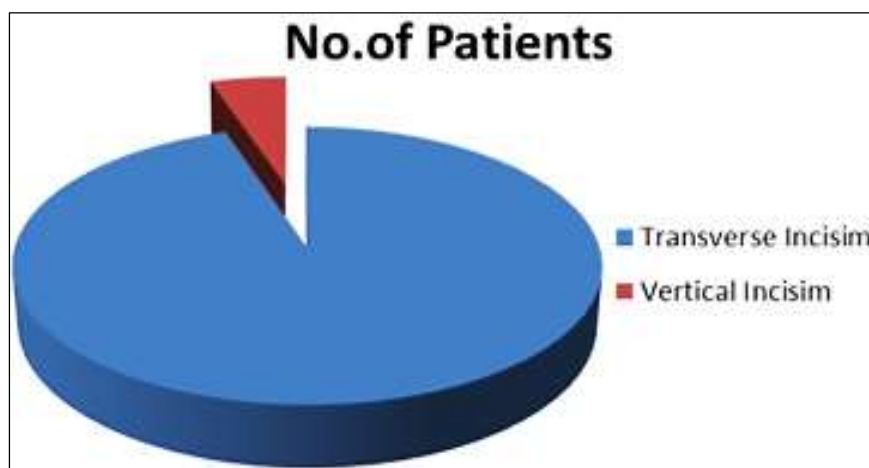
	No. of Patients	%
Elective	10	10
Emergency	90	90

**Fig 4:** Graphical representation of elective and emergency caesarean section

Most of the patients were Emergency surgeries (90%). So elective planning of caesarean section can probably prevent post-operative wound infection.

**Table 5:** Type of Incision 95% of the case have Transverse incision

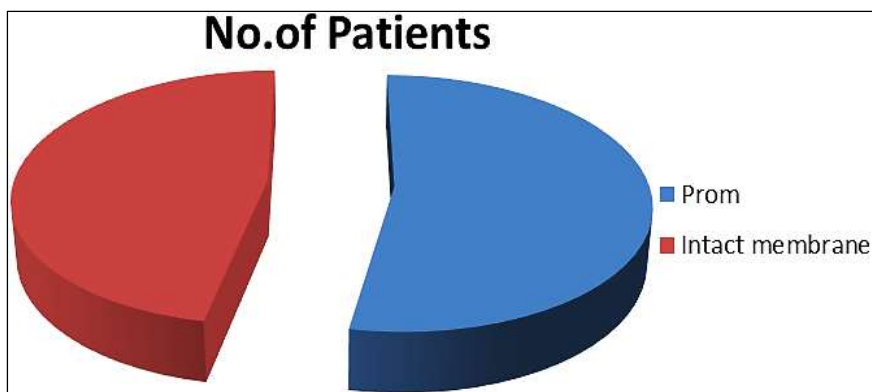
	No. of Patients	%
Transverse Incision	95	95
Vertical Incision	5	5

**Fig 5:** Figure showing type of incision Most of the patients were having Transverse Incision (95%).

Type of incision has not much significance on post-operative wound infection.

**Table 6:** Rupture of membrane prior to caesarean section

	No. of Patients	%
Prom with leaking per vaginally	33	33
Intact membrane with leaking per vaginally	67	67

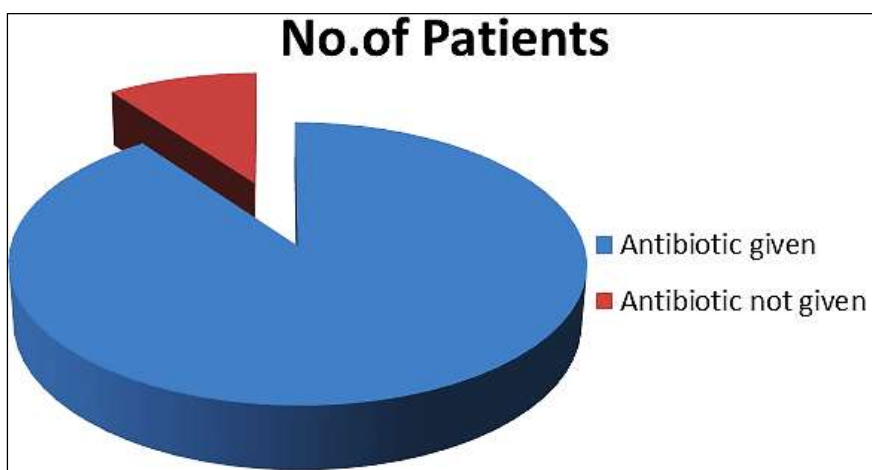


**Fig 6:** Figure showing representation of rupture of membrane and intact membrane

Most of the patients were having Prom 33%.

**Table 7:** 10% Patients cease not given antibiotics prior to caesarean section before 60 min

	No. of Patients	%
Antibiotic given	90	90
Antibiotic not given	10	10

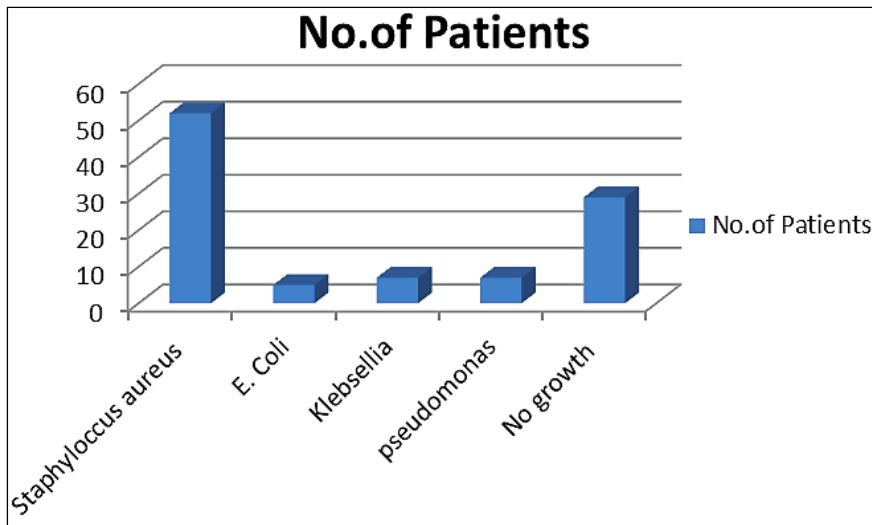


**Fig 7:** Figure showing effect of antibiotics on caesarean section

Most of the patients were having Antibiotic given prior to caesarean section (90%). So preoperative antibiotics cannot prevent postoperative wound infection so it should not be made mandatory.

**Table 8:** Organism isolated from the pus

Organisms isolated	No. of Patients	%
<i>Staphylococcus aureus</i>	52	52
<i>E. Coli</i>	5	5
Klebsiella	7	7
pseudomonas	7	7
No growth	29	29

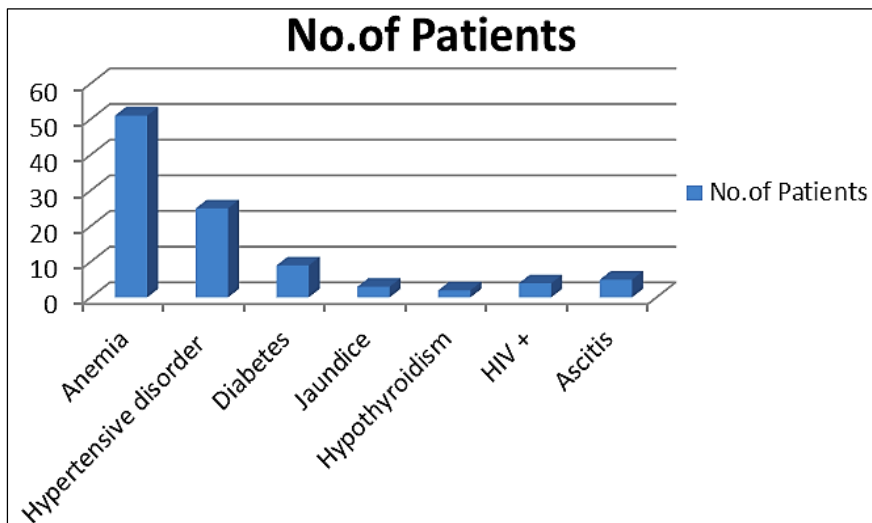


**Fig 8:** Graphical representation showing organism isolated from pus culture

*Staphylococcus aureus* the most common organism isolated in pus after culture. Followed by gram negative organism (E. coli%, Klebsiella and Pseudomonas 7%)

**Table 9:** Medical disorders associated with post cesarean section

Risk Factors	No. of Patients	%
Anemia	51	51
Hypertensive disorder	25	25
Diabetes	9	9
Jaundice	3	3
Hypothyroidism	2	2
HIV +	4	4
Ascites	5	5



**Fig 9:** Graph showing medical disorders associated with post caesarean section

Among medical disorders, Anemia is associated with highest number of cases of post-operative wound infections in caesarean sections [51%]

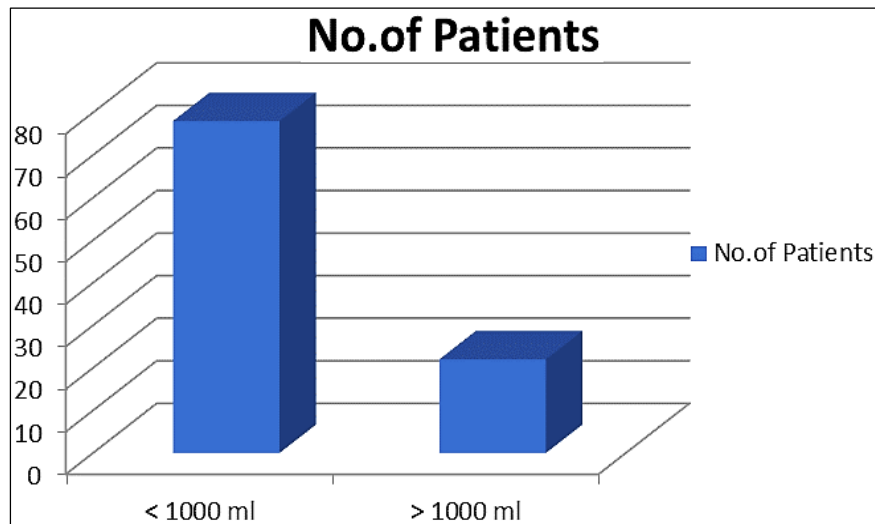
**Table 10:** Obstetrics causes of infection in post-operative cesarean section

Obstetric Risk Factor	No. of Patients	%
Prev. LSCS	35	35
Failed Induction	21	21
Placenta Previa	5	5
Placenta Acreta	2	2
Abruption	4	4
PROM	33	33

Previous LSCS is the most common obstetrics risk factor associated with postoperative infection among all other obstetrics indications.

**Table 11:** Graphical representation showing duration of rupture of membranes

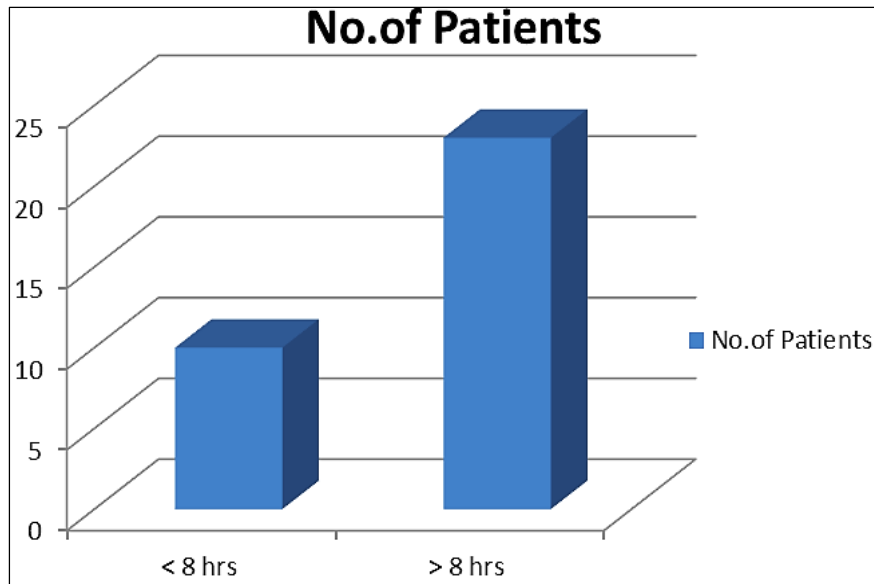
Intra Operative Blood Loss	No. of Patients	%
> 1000 ml	78	78
< 1000 ml	22	22

**Fig 10:** Graph shows out of blood loss proportionate infection in post caesarean section

It has been found that amount of blood loss is proportional to post-operative wound infections.

**Table 12:** Showing duration of rupture of membrane

Duration of Prom	No. of Patients	%
< 8 hrs	10	10
> 8 hrs	23	23



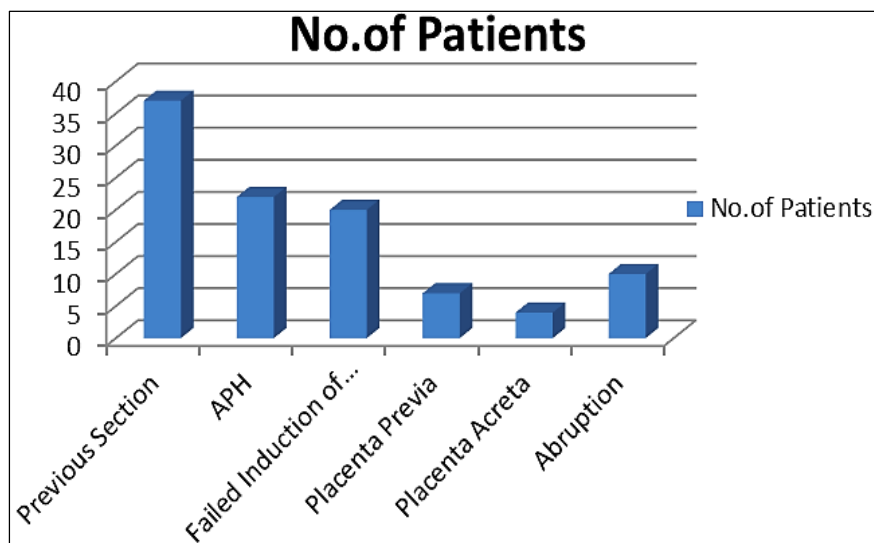
**Fig 11:** No. of Patients

Duration of Prom more than 8 hours shows more incidence of SSI.

So, we can conclude from table 6 and 12 that it is not the presence of leaking per vaginally in an ANC case that predisposes postoperative infections in caesarean section but, it is the duration of rupture of membrane which is important as leaking for more than 8 hours have 23% patients have postoperative wound infections.

**Table 13:** Showing indication of caesarean section

Indication of Caesarian Section	No. of Patients	%
Previous Section	37	37
APH	22	22
Failed Induction of Labour	20	20
Placenta Previa	7	7
Placenta Acreta	4	4
Abruption	10	10



**Fig 12:** Graphical representation of post-operative wound infection in caesarean section



## Discussion

SSI is the second most common infectious complication after urinary tract infection following cesarean delivery <sup>[7]</sup>. It is a surgical complication with a high morbidity rate, but it is associated with predictable and preventable risk factors. The majority of patients in our study group belong to the age group of 21 to 25 years could be because most pregnant women fall within this age distribution and more than from rural areas and from urban areas. This is consistent with the Amenu D *et al.* study <sup>[8]</sup>. Obstetric care services should be strengthened in rural areas. more of the patients were nulliparous which is similar to that of study in Mitt *et al.* <sup>[9]</sup> Tran *et al.* reported that the risk factor of surgical site infection was shown to be reduced by 39% and 60% when women had one or more children respectively <sup>[10]</sup>. Majority of the cases were unbooked which correlates with Amenu D *et al.* study <sup>[8]</sup>. Antenatal care provides opportunities for health education, prior detection and correction of maternal problems. Patients with anemia were seen to be more prone to SSI. Anemia diminishes resistance to infection and is frequently associated with puerperal sepsis. In present study most of the patients had anemia which is consistent with Devjani *et al.* study <sup>[11]</sup>. The results of present study are consistent with Olsen MA *et al.* study <sup>[12]</sup>. Hypertensive disorders were seen in 25% of the women in our study which correlates with incidence seen in Schneid - Kofman *et al.* study. 6 30% of the cases in our study had a repeat CS which correlates with Olsen MA *et al.* study <sup>[12]</sup>. PROM is seen in 27% of cases. PROM associated with the largest bacterial inoculum and liquor gets infected and infection supervenes <sup>[13]</sup>. An obstetric related risk factor of both intrinsic and extrinsic origin is length of time that the membranes are ruptured prior to cesarean section. Following membrane rupture, the amniotic fluid is no longer sterile and may act as a transport medium by which bacteria come into contact with the uterine and skin incisions <sup>[14]</sup>. The increased incidence of SSI in cases with intact membranes may be due to multiple vaginal examinations in cases with failed induction and other coexisting risk factors. The risk of postoperative infection has been shown to be proportional to volume of blood loss during cesarean section <sup>[16, 17]</sup>. Therefore In cases of pre rupture of membrane [Prom] >8hours in patients of failed induction pre-operative antibiotics can be considered and it may come out to be a preventing strategy for surgical site infections. A high volume of blood loss is usually associated with poor control of bleeding increased tissue damage from prolonged retraction and manipulation and more sutures <sup>[18]</sup>. Blood loss of more than 1000ml was in most cases similar to that in the Amenu D *et al.* study <sup>[8]</sup>. Majority of the SSI, 63% required secondary suturing while in 37% of the cases, the wound healed with daily aseptic dressings and secondary intention. The most common pathogenic organisms causing SSI in present study were found to be *S. aureus* 55% followed by gram negative rods of which Klebsiella species and pseudomonas 7%, *E. coli.* 5%.

## Conclusion

SSI is more prevalent among emergency procedures and women who were unbooked. It is important for antenatal women to have regular antenatal visits so that modifiable risk factors like anemia are corrected before term. Staphylococcus aureus was predominant organism of wound infection of which 21% were MRSA followed by Klebsiella, pseudomonas and *E. coli.* Proper assessment of risk factors that predispose to SSI is critical for the development of strategies for reducing the incidence of SSI and for identifying high risk patients requiring intensive postoperative surveillance.

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