Post Caesarean Wound Infection in a Tertiary Level Hospital in Rajasthan

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ABSTRACT

BACKGROUND

Caesarean section is one of the major obstetric surgeries performed to save the lives of mothers and fetuses. Caesarean section like any other surgical intervention may be accompanied by a number of complications, such as surgical site infections (SSI). We wanted to determine the incidence of wound sepsis following caesarean section, factors that contribute to wound sepsis, types of pathogens causing wound sepsis, and the impact of wound sepsis on the duration of hospital stay.

METHODS

In this prospective study of 450 candidates. Each candidate has been examined thoroughly after taking a detailed history and were followed after caesarean section to look for any wound infection, along with the cause and factors responsible for that. Patients were evaluated for stitch line sepsis, culture and sensitivity in cases of sepsis and increase in duration of hospital stay recorded. Microsoft excel worksheet has been used for data entry and appropriate tests were applied to find significant association. P value < 0.05 was considered as statistically significant.

RESULTS

Post caesarean wound infection was found in 6.8 % of patients. It was found to be more in the age group 31 - 35 yrs., more in illiterates, in primiparas, and who had less than 4 ANC visits, was more in hypertensives, and whose Hb was less than 11, in those who were in labour, or in those who had more than 3 vaginal examinations, and in those who had ruptured membranes and with meconium stained liquor. More cases were seen with emergency caesarean section.

CONCLUSIONS

Factors which were statistically significant were patient in labour, increased number of vaginal examinations, ruptured membranes, meconium stained liquor, and emergency caesarean section. Infections can be reduced by thorough precautions, proper antibiotics, and elective caesarean section.

KEY WORDS

Prolonged Labour, SSI, Meconium Stained Liquor, Caesarean Section

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DOI: 10.14260/jemds/2020/829

How to Cite This Article:

Parween G, Rathore SB. Post caesarean wound infection in a tertiary level hospital in Rajasthan. J Evolution Med Dent Sci 2020;9(50):3778-3782, DOI: 10.14260/jemds/2020/829

*Submission 24-08-2020,
Peer Review 27-10-2020,
Acceptance 03-11-2020,
Published 14-12-2020.*

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BACKGROUND

Caesarean section is one of the major obstetric surgeries performed to save lives of mothers and fetuses.¹ In last few decades, the incidence of caesarean deliveries, has risen dramatically, whether it has been primary or repeated, with an estimated number of worldwide caesarean section was 22.9 million in 2012.^{2,3} In the year 2018 - 2019 as per data collected by the Union Ministry of Health and Family Welfare under the Health Management Information System (HMIS), was 14 per cent of the total births took place through a C-section. 19 lakh caesarean section took place in India alone out of total 1.3 crores deliveries in public hospitals.

Caesarean sections being a surgical procedure may give rise to a number of complications. SSI being one of them. SSI has significantly decreased in the last three decades.^{4,5} But despite of this decrease, SSI continue to increase due to rise in incidence of caesarean section, despite improvements in hygiene conditions, antibiotics prophylaxis, sterile procedures and other practices. Post-caesarean SSI increases maternal morbidity and mortality.^{6,7} Their socio-economic condition includes increase in health care cost and prolong maternal hospitalization and may cause psychological distress to women recovering from caesarean section and caring for the newborn at the same time.

Surgery itself is a risk factor for acquisition of infection and overall incidence of SSI in India was found to be 4.17 % in a surgical ward in India.⁸ Low socioeconomic status and malnutrition further surpluses the risk of infection in caesarean sections. Caesarean section compared to vaginal delivery carries 5 to 20-fold increased risk of infection.^{9,10}

Surgical site infections may necessitate readmission, thus increase hospital bills, delays recovery, prolong hospitalization or outpatient treatment, as well as other morbidities and mortality. The overall average rate of infection in caesarean section wound has been estimated from 3 - 15 %¹¹⁻¹³ thereby increasing the morbidity and mortality and causing significant psychological distress to mother and anchoring financial burden to family.

The causative agent of post caesarean wound infection is universal with regional variations.¹⁴⁻¹⁷

The rate of SSI following caesarean section varies from place to place because of certain intrinsic and extrinsic variables. This includes the patient specific factors like obesity, age, underlying medical conditions like anaemia, hypertension, asthma, diabetes mellitus, immune-compromised states like HIV infection, hypoalbuminemia, and hyperlipidaemia. And also it varies due to medical and health facilities, infrastructure and patient care and management. Other factors include obstetrics specific criteria like preoperative preparation of the patient, type of antibiotic prophylaxis, time interval between membranes ruptured prior to operation, manual extraction of placenta, chorioamnionitis, number of vaginal examinations done before surgery, intraoperative factors like type of anaesthesia, duration of operation, type of skin incision, suture and staples used, transfusion of blood products, grade of operator (consultant / registrar / senior resident), previous caesarean section, and environment of the operation theatre.^{18,19} Evaluation by daily inspection of caesarean incision is an essential part of post-operative care and should be done daily. A high index of suspicion should be observed in patients who present with

fever, erythema, tenderness, purulent discharge or induration.²⁰ These wound infections become apparently visible around 4 - 7 post op day, when most women has already been discharged from hospital.²⁰

In order to reduce the incidence of SSI, targeted prevention strategies need to be implemented to overcome the identified risk factor.

METHODS

This prospective study has been conducted among 450 pregnant females who delivered by caesarean section in the Department of Obstetrics and Gynaecology of Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur, from 1st January 2019 to 30th June 2020. Patients who refused to give consent to participate in the study were excluded. Patients were followed for 2 weeks.

Sample Size

The sample size was calculated using the following formula:

$$N = \frac{Z^2 \times P(1 - P)}{D^2}$$

Where,

N = Sample size

Z = the standard error from the mean corresponding to 95 % confidence interval, which is 1.96

P = the incidence of wound sepsis which is 18 %

D = the absolute precision which is 5 % (0.05)

Sample size was 226

Considering 10 % attrition.

A detailed history of these patients has been taken including the age, socioeconomic status, period of gestation, presenting complain including labour pains and PROM, history and number of antenatal visits, parity, any medical and surgical history including history of previous caesarean section.

A thorough general and systemic examination has included pulse rate, B.P., temperature, pallor, per abdominal and per vaginal examination. Antenatal profile including haemoglobin, blood group, GCT, TSH, HIV, Hbs-Ag, VDRL, HCV and urine analysis has been done.

Operative data has been collected including type of anaesthesia, type of incision, type of scrub done, time of surgery, amount of blood loss has been recorded.

Patient has been evaluated for stitch line sepsis, by sending the discharge collected from stitch line for culture and sensitivity (to identify the organism grown and sensitivity for particular antibiotics) and increase in duration of hospital stay recorded.

A preceded structured questionnaire (Proforma) has been used to gather information from the patient.

Statistical Analysis

Data was entered in Microsoft excel worksheet and Chi-square test has been used to find the significant association. P value < 0.05 was considered statically significant.

RESULTS

Age in years	No. of Cases	Percentage	Those Who Developed Infection	Percentage
≤ 20	31	6.8 %	2	6.4 %
21 - 25	209	46 %	15	7.17 %
26 - 30	165	36 %	10	6.06 %
31 - 35	35	1.5 %	4	11.4 %
Educational Status				
Illiterate	45	10 %	7	15.5 %
School Education	204	45.3 %	15	7.3 %
Graduate	154	34.2 %	6	3.89 %
Post Graduate	47	10.4 %	3	6.3 %

Table 1. Demographic Data

Table 1. Shows larger group of caesarean section is in group of 21 - 25 years (main reproductive age group in Rajasthan) and the infection rate is high in 31 - 35 years age group and large group under study has school education and higher incidence of infection is seen in illiterates.

Parity	No. of Cases	Percentage	Those Who Developed Infection	Percentage	P Value
Primiparous	218	48.4 %	19	8.7 %	
Multiparous	232	51.5 %	12	5.1 %	
With Previous Caesarean Section	182	40.4 %	9	4.9 %	
No. of ANC Visit					
> 4	386	85.7 %	26	6.7 %	
< 4	64	14.2 %	5	7.8 %	> 0.05

Table 2. Obstetric Data

Table 2. Depicts obstetrics data. Large group under study is multiparous, and large no. of wound infection is seen in primiparous and shows large number of cases has more than 4 visits. Percentage of infection is higher in those who has less than 4 visits but this data is statistically not significant.

Blood Pressure	No. of Cases	% age	Those who Developed Infection	% age	P Value
Normotensive	387	86 %	24	6.2 %	
Hypertensive	63	14 %	7	11.11 %	> 0.05
Haemoglobin					
Less than 11	190	42.2 %	16	8.4 %	
More than 11	259	57.5 %	15	5.7 %	> 0.05

Table 3. Pre-Operative Status

Table 3. Depicts preoperative status. Greater percentage of wound infection is seen in hypertensive patient which is statistically not significant and larger population has haemoglobin more than 11. Large percentage of infection seen in group whose Hb is less than 11. It is statistically not significant.

Table 4. depicts percentage of infection is higher in those patient who were in labour which is statistically significant and shows large percentage of infection in those who are in labour for more than 6 hrs., large percentage of infection in those who underwent more than 3 times vaginal examination which is statistically significant and large percentage of infected cases in those who has ruptured membranes which is also statistically significant and meconium stained liquor is highly significant for wound infection.

Table 5. Shows that large number of cases are emergency caesarean section, most infective cases seen in emergency caesarean which is statistically significant and infection rate is 6.8 %. The largest number of organisms which causes SSI was

MRSA (Methicillin-Resistant *Staphylococcus aureus*) followed by poly microbial flora followed by *S epidermidis* and large number of infections occurred on day 4th.

Labour	No. of Cases	% age	Those who Developed Infection	% age	P Value
In Labour	82	18.2 %	13	15.8 %	
Not in Labour	363	80.6 %	18	4.9 %	< 0.001
Duration of Labour					
More than 6 hrs.	45 (82)	54.8 %	8	17.7 %	
Less than 6 hrs.	42 (82)	51.2 %	5	11.9 %	> 0.05
No. of Vaginal Examination					
None	136	30 %	5	3.6 %	
Less than 3	239	53.1 %	14	5.8 %	
More than 3	75	16.6 %	11	14.6 %	< 0.05
Membranes Status					
Intact	318	70.6 %	16	5 %	
Ruptured	132	29.3 %	15	11.3 %	< 0.05
Colour of Liquor					
Clear	449	99.7 %	30	6.68 %	
Meconium Stained Liquor	1	0.22 %	1	100 %	< 0.001

Table 4. Partogram Findings

Type of Caesarean Section	No. of Cases	Infective	Non-Infective	P Value
Elective	213	8	205	
Emergency	237	22	215	< 0.001

Table 5. Parameters Related to Caesarean Section

Micro-Organism	No. of Cases	Percentage
MRSA	5	16.12 %
Sterile	6	19.3 %
Not Sent	9	29 %
E. Coli	2	6.4 %
Staph. Epidermidis	2	6.4 %
Polymicrobial Flora	4	12.9 %
Serous	3	9.6 %
Day of Sepsis		
On Day 4	21	67 %
Between 4 - 7	5	16 %
After Day 7	5	16 %

Table 6. Micro-Organism Deducted in Culture Report

DISCUSSION

Developing post caesarean wound infection is a traumatic experience as caesarean section has a 5 - 20 times higher risk of local sepsis as compared to vaginal delivery.

The common pathogens found were *S. aureus*, poly microbial flora *E.coli*. And among which in our study *Staphylococcus* is the most common cause of postsurgical wound infection. It is important for the caretaker to hand wash regularly and wounds should be dressed in sterile bandages until they heal fully, to avoid any infections from *Staphylococcus* bacteria,

Satyanarayan et al²¹ in their study concluded that SSI were 3 times more common in emergency caesarean section as compared to elective caesarean section. In this study, wound infection after elective CS is 3.7 %, compared to²² 9.2 % in emergency caesarean section. The probable reason may be the less preoperative preparatory time available for surgery.

In prolonged labour due to frequent vaginal examinations there is increased chances of infection in such cases.

Due to loss of protective effect of the intact fetal membranes, premature rupture of membranes, increases the risk of chorioamnionitis. The greater the time length between

the rupture of membranes and the caesarean section, the higher is the wound infection, as the amniotic fluid is no longer sterile once the membranes have ruptured and may act as a culture medium and the resultant infection infects the uterine and skin incision.²²

Departmental policy at Mahatma Gandhi Medical College and Hospital strongly advocates using prophylactic antibiotics, cefotaxime 1 gmi.v. Recent evidences also suggests that pre-incisional antibiotics is a safe prophylactic measures to reduce maternal morbidity by reducing the incidence of SSI.²³

Caesarean section wound infection increases maternal morbidity and prolong hospital stay. In Mahatma Gandhi Medical College patients undergoing caesarean delivery with no associated complication are routinely discharged on fourth post-operative day. Surgical site wound infection increases the hospital stay to about 5 - 8 days.

All measures to reduce the risk of infections, should be taken in the pre, intra, and postoperative phases. Preoperative preventive measures will include clipping of operative site, proper autoclaving of surgical instrument and pre-incisional antibiotics. Proper hand washing prior to procedures and pre-operatively is important in decreasing the risk of infection despite use of gloves. Glove puncture occurs in as many as 60 % of all surgical procedures. This risk is increased in direct proportion to needle handling. It's also influenced by emergency procedure, longer operative time, inadequate muscle relaxation, and number of sutures and wound depth. Thus the surgical team bacteria flora is exposed to the incision and the patient's disease exposed to the surgical team. It's also important to adequately prepare surgical site by cleaning and application of suitable antiseptic. Wound healing and outcome may be related to an incision placement. Which relate to a number of factors, the diagnosis, urgency of operation, presence of a previous incision and cosmetic preference. A transverse incision heals with an almost invisible scar and clinically performs. Presence of dead space increases the risk of wound infection and poor outcome. Use of suture material to close the dead space may further increase the risk of infection and poor wound healing.

Achievement of good homeostasis is also important in wound healing. Serum and tissue fluid collect in the incision as a requisite first step in wound repair in the inflammatory phase. However, excessive blood and fluid is not desirable. Blood is an excellent culture medium and the incidence of experimental wound infections relates to the haemoglobin concentration of wound fluid. For achieving wound homeostasis, the electrosurgical cautery is useful.

Pre-operative antibiotics should be given to all patients scheduled for cesarean section whether emergency or elective. In order to reduce the risk of wound sepsis, infection prevention procedure should be followed appropriately. Effort should be done to reduce length of hospital stay after caesarean section. Evaluation and improvement of pre and post-operative care through regular updation of knowledge and training involving supervision of more skilled person.

CONCLUSIONS

Assessment of risk factors should be done before surgery to determine the incidence and risk of SSI. Modification of these

risk factors can reduce the chances of SSI. By rigorous surgical techniques, postoperative wound infection can be greatly reduced and controlled. The frequency of infection can be prevented by public awareness program and regular updation of hospital prevention policies.

Data sharing statement provided by the authors is available with the full text of this article at jemds.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jemds.com.

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