

Risk factors for post caesarean surgical site infection at a tertiary care center in Eastern Nepal

Manisha Chhetry, Shanti Subedi, Basudeb Banerjee

Department of Obstetrics and Gynecology, Nobel Medical College and Teaching Hospital

Correspondence

Dr. Manisha Chhetry
Lecturer
Department of Obstetrics and
Gynecology
Nobel Medical College and
Teaching Hospital, Biratnagar,
Nepal

Email:

manisha.chhetry2013@gmail.com

DOI: <http://dx.doi.org/10.3126/jcmsn.v13i3.18402>

Orcid ID: orcid.org/0000-0002-3432-8544

Article received: Sept 2nd 2017

Article accepted: Sept 29th 2017

ABSTRACT

Background & Objectives: Post cesarean surgical site infection (SSI) is one of the commonly encountered complications which considerably increase the burden to health care. It is caused due to the interplay of various patient related, procedure related and iatrogenic factors. This study aims at identifying common risk factors for post cesarean SSI at our centre. **Materials & Methods:** This was a prospective observational study conducted from July 2015 to December 2015, in which all patients who were admitted with post cesarean SSI or developed SSI during their stay were included and their risk factors were studied. **Results:** Emergency procedures (82.97%) were more likely to develop SSI as compared to elective cesarean (17%). Among the patient related risk factors most of them were nulliparous (48.9%), term gestation (42.6%), malnourished (53.1%) and had history of prolonged leaking (44.68%). The mean age was 24.04±4.6years. Most of the patients who developed SSI were operated for repeat cesarean and fetal indications. Most patients who had SSI had at three to five per vaginal examinations (2.72±2). 66% of patient who had SSI had duration of surgery more than one hour. 68% of the surgeries which developed SSI were done by residents as compared to 32% of those done by consultants **Conclusion:** The commonly associated risk factors linked with post cesarean SSI are maternal age, emergency procedures, prolonged membrane rupture, multiple vaginal examinations, malnutrition and the experience of surgeon.

Key words: Cesarean section; post-operative; surgical site infection

Citation: Chhetry M, Subedi S, Banerjee B. Risk factors for post caesarean surgical site infection at a tertiary care center in Eastern Nepal. *JCMS Nepal*. 2017;13(3):314-7.

INTRODUCTION

Cesarean delivery (CD) is the most common surgical procedure performed on women in both developed and developing world alike.¹ One of the most common complications associated with cesarean section is infectious morbidity out of which wound infection or Surgical Site Infection (SSI) being diagnosed in 2.5 to 16% of cases.² Development of SSI depends on a complex interplay of many factors including the pre-morbid condition of the patient, nutritional status, age maternal age, virulence of organism, premature rupture of membranes and surgical techniques used to name a few. This study aims at identifying common risk factors for post cesarean SSI at our

centre thereby identifying high risk groups. This will help in formulation of targeted evidence based protocols to decrease the hospital incidence of post cesarean SSI.^{3,4}

MATERIALS AND METHODS

This was a prospective study in which all patients who were admitted in the post-natal ward with post cesarean surgical site infection (SSI) or developed SSI during their stay during the study period were included and the various risk factors associated were studied. The wound swabs were sent at the time of admission and the common organisms; patients were given standard wound care, oral antibiotics and correction of co-morbidities along with supportive

therapy.

All analysis was carried out using the statistical software SPSS version 16 for Windows. p value < 0.05 was considered to be statistically significant. The values have been expressed as Mean \pm Standard Deviation or Median (Inter-quartile Range) whichever applicable.

RESULTS

Out of the total 8066 caesarean sections done during the study period 47 patients were diagnosed as post cesarean SSI. Out of these 47 patients, eight (17%) had undergone elective cesarean whereas 39 (82.97%) had emergency procedure.

The age distribution of the patients is as shown in Table1 and their mean age was 24.04 ± 4.6 years.

Most of the patients who developed SSI were operated for repeat cesarean and fetal indications as shown in the table 2.

Among the patients related risk factors (table3) most of them were nulliparous (48.9%), term gestation (42.6%), malnourished (53.1%) and had history of prolonged leaking (44.68%)

The surgery related risk factors studied are shown in table 4.

Most patients who had SSI had at three to five per vaginal examinations (2.72 ± 2) and an average of two days of hospital stay (1.85 ± 1) prior to being delivered by cesarean

Table1. Age distribution of the study group.

Age (years)	Number	Percentage
<20	5	10.6
20-25	26	55.3
26-30	12	25.5
31-35	2	4.3
>35	2	4.3

Table2. Indications for cesarean section

Indications	Number	Percent
Previous cesarean section	8	17
Fetal distress	8	17
Arrest of descent and dilatation	8	17
Malpresentation	6	12.8
Failed induction	6	12.8
Medical disorders	4	8.5
Placenta previa	3	6.4
Severe oligohydraminos	3	6.4
Cephalo-pelvic disproportion	1	2.1

DISCUSSION

The development of SSI is multi-factorial⁵ and various risk factors have been found to predict post cesarean SSI.^{3,4,6} One of the patient related factors is young maternal age as most of the infections (92%) occurred in women less than thirty years of age, this is in accordance with other studies.^{7,8} Hypertensive disorders in pregnancy which is linked with chronic alteration in peripheral blood supply have been found to a risk factor for SSI.^{9,10} In this study 27.7% of patients with SSI suffered from this condition. Both obesity and malnutrition have been associated with increased risk of SSI.^{7,8} The association of obesity with SSI could be due to relative avascularity of adipose tissue and hence poor healing, difficulty in handling of tissues and hence more chance of micro-trauma and also failure in obliteration of dead spaces. Likewise malnutrition can lead to SSI due to poor healing of tissues and decreased immunity. In our study population malnutrition was a more common risk factor (53.1%) as compared to obesity (14.9%) and it is a reflection of the general population characteristic of our part of the world where most childbearing women are anemic and malnourished. Prolonged rupture of membrane (>8 hrs), prolonged labor and multiple per vaginal examinations (>3)

Table3. Patient related risk factors for post cesarean SSI

Patient characteristics	
Mean age	24.46 ± 4.6 yrs
Parity	
1	23(48.9%)
2	16(34%)
≥ 3	8(17%)
Period of gestation	
Preterm	10(21.3%)
Term	20(42.6%)
Post- term	17(36.2%)
Obesity	7(14.9%)
Patient in labor	31(66%)
Patient in second stage of labor	7(14.9%)
Overt diabetes/ GDM	3(6.4%)
Hypertension	13(27.7%)
Prolonged PROM	21(44.68%)
Chorio-amnionitis	2(4.3%)
Malnutrition	25(53.1%)
Infection present elsewhere	8(17%)
Anemia	10(21.3%)
Smoking	2(4.2%)

Table 4. Surgery related risk factors for post caesarean SSI

Surgery related factors	
Surgeon	
Consultant	15(31.9%)
Resident	32(68%)
Duration of surgery (hrs)	
<1hrs	16(34%)
1-2hrs	20(42%)
>2hrs	11(24%)
Placenta removal method	
CCT	31(66%)
Manual	16(34%)
Timing of prophylactic antibiotic	
½ hr prior to operation	32(68%)
During operation	15(31.9%)
Type of skin incision	
Pfannenstien	40(85.1%)
Vertical	7(14.9%)
Vaginal hand needed for delivery of head	8(17%)

are established risk factors of SSI.^{3,6,11} Even in the present study they were found to be significantly associated with SSI with prolonged PROM in 44.5% of patients and most patients with more than three per vaginal examinations. Loss of protective cervical mucus plug and barrier effect of fetal membranes and amniotic fluid after rupture of membranes are thought to be the culprits. The more the vaginal examinations the more risk of introduction of infections.

Prolonged operating time leading to more exposure to microorganisms has found to be associated with SSI^{6,12,13} and even in this study 66% of patient who had SSI had duration of surgery more than one hour. Excellent surgical techniques with good tissue handling, adequate hemostasis while preserving tissue blood supply, obliteration of dead spaces and standard post-operative wound care are associated with good tissue healing and less infection.¹⁴ This is where experience of surgeon comes into play. Even in this study 68% of the surgeries which developed SSI were done by residents as compared to 32% of those done by consultants.

Emergency procedures (82.97%) were more likely to develop SSI as compared to elective cesarean (17%). This is in accordance with other studies elsewhere.^{15,16} This could be due to the simple reason that emergency procedures are mostly unplanned and associated with other risk factors like prolonged membrane rupture, multiple vaginal examinations and prolonged labor.

Antibiotic prophylaxis is one of the most significant protective factors in decreasing SSI.¹⁷⁻¹⁹ It is recommended for all cesarean deliveries though role of timing of administration remains controversial. In our study all patients received prophylaxis antibiotics, 68% prior to surgery and rest during surgery.

CONCLUSION

SSI after a cesarean section is a commonly faced complication. The commonly associated risk factors are maternal age, emergency procedures, prolonged membrane rupture, multiple vaginal examinations, malnutrition and the experience of surgeon. Identification of risk factors, formulation of infection control strategies and their periodic review should be done to curb the increasing menace of SSI.

REFERENCES

1. Betrán AP, Merialdi M, Lauer JA, Bing Shun W, Thomas J, Van Look P, ET AL. Rates of caesarean section: analysis of global, regional and national estimates. *Paediatr Perinat Epidemiol.* 2007;21(2):98–113. <https://doi.org/10.1111/j.1365-3016.2007.00786.x>. PMID: 17302638.
2. Owen J, Andrews WW. Wound complications after cesarean sections. *Clin Obstet Gynecol.* 1994;37:842. <https://doi.org/10.1097/00003081-199412000-00009>. PMID: 7842552.
3. Olsen MA, Butler AM, Willers DM, Devkota P, Gross GA, Fraser VJ: Risk factors for surgical site infection after low transverse cesarean section. *Risk.* 2008;29(6):477–484.
4. Gong SP, Guo HX, Zhou HZ, Chen L, Yu YH: Morbidity and risk factors for surgical site infection following cesarean section in Guangdong Province, China. *J Obstet Gynaecol Res.* 2012;38(3):509–15. <https://doi.org/10.1111/j.1447-0756.2011.01746.x>. PMID: 22353388.
5. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Am J Infect Control.* 1992;20:271. [https://doi.org/10.1016/S0196-6553\(05\)80201-9](https://doi.org/10.1016/S0196-6553(05)80201-9).
6. Killian CA, Graffunder EM, Vinciguerra TJ, Venezia RA. Risk factors for surgical-site infections following cesarean section. *Infect Control Hosp Epidemiol.* 2001;22(10):613–7. <https://doi.org/10.1086/501831>. PMID: 11776346.
7. Myles TD, Gooch J, Santolaya J: Obesity as an independent risk factor for infectious morbidity in patients who undergo cesarean delivery. *Obstet Gynecol.* 2002;100(5):959–64. [https://doi.org/10.1016/S0029-7844\(02\)02323-2](https://doi.org/10.1016/S0029-7844(02)02323-2). PMID: 12423861.
8. Ezechi OC, Edet A, Akinlade H, Gab-Okafor CV, Herbertson E. Incidence and risk factors for caesarean wound infection in Lagos Nigeria. *BMC Res Notes.* 2009;2(1):186. <https://doi.org/10.1186/1756-0500-2-186>. PMID: 19772612.
9. Cardoso Del Monte MC, Pinto Neto AM. Post discharge surveillance following cesarean section: the incidence of surgical site infection and associated factors. *Am J Infect Control.* 2010;38(6):467–72. <https://doi.org/10.1016/j.ajic.2009.10.008>. PMID: 20226571.
10. Schneid-Kofman N, Sheiner E, Levy A, Holcberg G. Risk factors for wound infection following cesarean deliveries. *Int J Gynecol Obstet.* 2005;90(1):10–15. <https://doi.org/10.1016/j.ijgo.2005.03.020>. PMID: 15913620.

11. Muganyizi P, Kidanto H, Kazaura M, Massawe S. Caesarean section: trend and associated factors in Tanzania. *Afr J Midwifery Womens Health*. 2008;2(2):65–8. <https://doi.org/10.12968/ajmw.2008.2.2.65>.
12. Kaplan N, Smadi A, Al-Taani M, El-Qudah M. Microbiology of wound infection after caesarean section in a Jordanian hospital. *East Mediterr Health J*. 2003;9(5/6):1069.
13. Leong G, Wilson J, Charlett A. Duration of operation as a risk factor for surgical site infection: comparison of English and US data. *J Hosp Infect*. 2006, 63(3):255–262. <https://doi.org/10.1016/j.jhin.2006.02.007>. PMID: 16698117.
14. Campbell DA Jr, Henderson WG, Englesbe MJ, Hall BL, O'Reilly M, Bratzler D, Dellinger EP, et al. Surgical site infection prevention: The importance of operative duration and blood transfusion—results of the first American College of Surgeons–National Surgical Quality Improvement Program Best Practices Initiative. *J Am Coll Surg*. 2008;207(6):810–20. <https://doi.org/10.1016/j.jamcollsurg.2008.08.018>. PMID: 19183526.
15. Shrestha S, Shrestha R, Shrestha B, Dongol A. Incidence and Risk Factors of Surgical Site Infection Following Cesarean Section at Dhulikhel Hospital. *Kathmandu Univ Med J*. 2014;46(2):113–6.
16. De D, saxena S, Mehata G, Yadav R, and Dutta R. Risk factor analysis and microbial etiology of surgical site infections following lower segment caesarean section. *International Journal of Antibiotics*. 2013;283025.
17. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical infection in clean and clean contaminated cases. *Indian J Med Microbiol*. 2005;23:249e52.
18. Fernandez H. Antibioprophylaxie dans les césariennes et les interruptions volontaires de grossesse [Antibiotic prophylaxis in caesarean section and voluntary termination in pregnancy]. *Ann francaises d'anesthesie et de reanimation*. 1994;13:128e34.
19. Hopkins L, Smaill F. Antibiotic prophylaxis regimens and drugs for caesarean section. *Cochrane Database Syst Rev* 1999. Art. No.: CD001136. <https://doi.org/10.1002/14651858.CD001136>. PMID: 10796247.