Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1723-1728), Month: May - August 2019, Available at: www.noveltyjournals.com

Cesarean Section: factors predispose to postoperative Surgical Site Infection at Assuit Maternity Hospital, Assuit governorate, Egypt

Mohamed El-Dossoky Noweir[1], Madiha mohamed Tosson[2]

[1] MD, PhD, Assistant Professor National Medical Institute, Egypt

[2]Assistant professor Obstetric and Gynecology Dept. faculty of Nursing, Assuit University, Egypt

Abstract: **Surgical site infections (SSI) are a significant cause of post-surgical morbidity and mortality and it is considered to be one of the most common hospital associated infections where it accounts for 14-16% of the total healthcare acquired infections, which might be appropriate to be used as an indicator of surgical quality. The aim of the study: This was aiming to identify infection rates and risk factors associated with SSI following cesarean section, at the maternity hospital, Assuit University, Egypt. Subjects & Methods: The study population consisted of (n= 285) women who delivered by cesarean section in Assuit University Maternity Hospital during October to December 2014. A common set of patient- and operative-specific variables were evaluated as potential SSI risk factors. Results Bivariate and multivariate analysis was done for proportional risks and an adjusted RR was obtained Multiple logistic regression analysis identified four factors that were independently associated with an increased risk of infection: ASA score (Relative Risk [RR], 1.21; 95% confidence interval [CI95], 0.11-0.81; P= 0.0221); wound class (RR, 1.21; [CI95], 0.13-0.71; P= 0.027); the risk category (RR, 1.52; 95% confidence interval [CI95], 0.01-0.42; P= 0.014); and prophylactic antibiotic administration for more than 48 hours post-operative (RR, 1.21; [CI95], 0.11-0.81; P= 0.042).Conclusion: These data suggest that risk factors for SSIs following cesarean sections were multifactorial. Analysis and feedback of the data should continue to act as a catalyst for review of practice aimed at reducing postoperative SSI rates.**

Keywords: **cesarean Section, factors predispose, postoperative Surgical Site Infection.**

1. INTRODUCTION

The continuous expanding capacity of the health care facilities and annual population expansion in the Low and Middle Income Countries like Egypt necessitated the need for measuring the quality of provided medical services of health care, thus, the introduction of proper quality indicators. Indeed, finding the proper indicator is challenging. In-hospital, mortality can be one quality indicator but for many procedures is less than 1 %; therefore is not always a sensitive measure [1]. Surgical site infections (SSI) are a significant cause of post-surgical morbidity and mortality and it is considered to be one of the most common hospital associated infections where it accounts for 14-16% of the total healthcare acquired infections, which might be appropriate to be used as an indicator of surgical quality. (1, 2)Infectious complications occur 10 times more frequently following cesarean deliveries than vaginal deliveries. The reported incidence of surgical-site infections (SSIs) following cesarean sections (CS) varies widely. The incidence of CS wound infection has been reported from 2% to 10%.(3) Moreover, the total cost in the United States, including indirect expenses related to this morbidity, could exceed $10 billion annually.(4)

Factors contributes to SSIs in women are either intrinsic or extrinsic factors. The intrinsic factors are patient related like poor nutrition, extremes of maternal weight (underweight or obese), and young maternal age. Although the intrinsic factors cannot be changed, the risk they present in terms of infection is identifiable and manageable. On the other hand,

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1723-1728), Month: May - August 2019, Available at: www.noveltyjournals.com

the extrinsic factors are related to management and care .e.g. little prenatal care, prolonged labor or rupture of membranes, long duration of surgery, general anesthesia, multiple procedures. (5) SSI is linked to factors associated with surgery that may influence the risk of infection. SSI rates calculated by the Centers for Disease Control and Prevention (CDC) and other the National Healthcare Safety Network (NHSN) data users from data reported to the (NHSN) have been risk stratified using a risk index of 3 equally weighted factors: the American Society of Anesthesiologists (ASA) score, wound classification, and procedure duration. (6) Among hospitals reporting to the National Nosocomial Infection Surveillance (NNIS) system, the rate of SSI after cesarean section was 2.8% to 6.7% depending on the risk index category. (7)

On the other hand, numerous clinical trials demonstrated a reduction in incisional infection in cesarean section patients who received antibiotic prophylaxis. The timing of antibiotic prophylaxis also was shown to influence its efficacy. Administration of antibiotic prophylaxis within 2 hours prior to surgical incision was most effective at reducing SSI for most surgical procedures17; for cesarean sections, the administration of antibiotic prophylaxis at cord clamping has been shown to be as effective. (3-5)

Aim of the study:

The current study aimed to identify infection rates and risk factors associated with SSI following cesarean section, at the maternity hospital, Assuit University, Egypt.

Research questions:

1- What are the infection rates & the risk factors associated with SSI following cesarean?

2. SUBJECTS S AND METHODS

Research design:

Across sectional study was used in carrying out this study

Study Setting

The study was conducted at Assuit University maternity Hospital, is a teaching hospital that serves mainly the population of Assuit governorate, Egypt, which accounts for approximately 10 million according to 2012 census, and has 250 beds.

Sample:

The study population consisted of (n= 285) women who delivered by cesarean section in Assuit University Maternity Hospital during October to December 2014 and accepted to participate in the current study.

Tools of data Collection:

The following tool was used in the current study:

Interview questionnaire sheet for data collection composed of three parts

Part (1): Demographic characteristics:

(Name, age, address, educational level, and occupation ...etc)

Part (2): obstetric history:

(No of gravidity, parity, etc...)

The history of previous last pregnancy complications

- Outcomes of previous deliveries if present
- Antenatal complications: (Ante partum hemorrhage, pregnancy induced hypertension, abortion,----------)
- Natal complications: (Intra-partum hemorrhage, prolonged labor, Obstructed labor,----------------------)
- Postnatal complications: (Postpartum hemorrhage, Puerperal sepsis, others)
- The place of delivery: (Hospital, Home, --------)

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1723-1728), Month: May - August 2019, Available at: www.noveltyjournals.com

- The data related to the current pregnancy:
- Weeks of gestation: wks
- Data related to the prenatal health aspects of teenage pregnancy:
- Antenatal health aspects:
- Natal health aspects:

The procedure:

Infections were identified during hospital stay or within 30 days following cesarean section by follow up visits to obstetric and gynecology clinics at Assuit University Maternity Hospital using the criteria of the (CDC) and the NHSN.

All surveillance data were collected by the surveyors. Demographic information, potential risk factors, and surgical indications were recorded. Host-related variables included age, a preoperative condition assessed by American Society of anesthesiologists (ASA) score, duration of labor (time in minutes). Surgery-related variables included presentation to labor room (Elective versus emergency) nature of the operation, duration of the operation, wound class (the elective type of LSCS was considered class I or Clean wound, while Emergency type LSCS was considered to be class II or Clean Contaminated) (8) , risk category, and antibiotic prophylaxis. The study subjects were postoperatively monitored for temperature, SSI, wound, and antibiotic treatment.

Risk stratification of SSI

Infections were stratified according to the NNISS risk index. Each patient was given a risk index between "0" and "3". (8)

Wound class: An assessment of the degree of contamination of a surgical wound at the time of the operation. Wound class should be assigned by a person involved in the surgical procedure, e. g, surgeon, circulating nurse, etc. The wound class system used in NHSN is an adaptation of the American College of Surgeons wound classification schema. (7, 9)

Post discharge surveillance

In recognition of the importance of post- discharge surveillance, the study was further implemented in a collaborative way with the Obstetric and Gynecology nurse who present at all maternity OPD clinics at the Assuit University hospital. The surveyors collected data about participated patient who come to the OPD for post-cesarean section wound dressing. All study subjects were contacted at home by telephone during 30 days after surgery.

If any symptoms suggested wound infection were detected on phone call, the patient invited to come to the corresponding hospital clinic in presence of the surveyor so that the diagnosis of surgical site infection can be confirmed and further management can be carried out. Special attention was given particularly when wound dressing performed, antibiotics prescribed or wound swab sent to the laboratory for culture. All swab cultures sent directly from the OPD or after readmission of the patients were followed up.

Statistical Analysis:

We used the statistical package SPSS v.20.0 for statistical analysis. Bivariate analysis was used to compare quantitative variables, Student t test or Mann-Whitney U test was used for between- group differences, prior normality test and Pearson's chi-square or Mantel-Haenzel to calculate relative risk (RR). To analyze factors associated with the bivariate analysis or clinically important for SSI, Cox multivariate analysis was done for proportional risks and an adjusted RR was obtained.

3. RESULTS

During the surveillance periods, 273 case cesarean sections were enrolled in the study. Of these, 12 patients (4.4%) had an SSI. According to the statistical data, the age factor showed a significance difference ($P < 0.05$), as There was some evidence of an increased likely- hood of infection in women aged >32 years versus those < 31 years, (Relative Risk [RR], 1.27; 95% confidence interval [CI95], 0.65-0.98; $P= 0.032$).

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1723-1728), Month: May - August 2019, Available at: www.noveltyjournals.com

Multiple logistic regression analysis identified four factors that were independently associated with an increased risk of infection: ASA score (Relative Risk [RR], 1.21; 95% confidence interval [CI95], 0.11-0.81; *P= 0.0221*); wound class (RR, 1.21; [CI95], 0.13-0.71; *P= 0.027*); the risk category (RR, 1.52; 95% confidence interval [CI95], 0.01-0.42; P= *0.014*); and prophylactic antibiotic administration for more than 48 hours post-operative (RR, 1.21; [CI95], 0.11-0.81; P= 0.042), as shown in (Table I).

These data suggest that risk factors for SSIs following cesarean sections were multifactorial.

According to NHSN report 2008, Duration Cut Point (in minutes) for the CS operative category is 57 minutes (9), in the present study, neither the infected cases nor the non infected cases exceeded the duration cut point with (mean± SD), (46.2±11.32) for the former compared to (44.05±12.3) for the later and there was no significance difference, (RR, 0.84; 95% confidence interval [CI95], 0.31-1.26; *P= 0.44*).

Moreover, the parity frequency did not affect the incidence rate of the SSI as shown in (table 1)

Table (1) shows relation between different factors contributing to the development of SSI in the CS wound

Variable	SSI				
	Yes %	**No%**	**RR**	**95% CI**	***P***
Age	32.9±6.21	31.0±5.65	1.15	0.65-0.98	0.032*
Operative category					
Elective	3	77	0.66	0.13-3.11	0.566
Emergency	6	102			
Operation time (O.T) in min	46.2±11.32	44.05±12.3	0.89	0.21-1.69	0.365
ASA I II	 4 8	 126 47	1.19	0.04-0.73	0.0037*
Wound class 1 2	 2 10	 112 60	1.11	0.02-0.55	0.0001*
Risk category (score) 0 1	 3 9	 144 29	1.7	0.01-0.29	0.0001*

Table (2) shows the relationship between antibiotic prophylaxis dose and duration, and their effect on prevention of SSI prevalence in the current study

Variable	SSI				
Antibiotic prophylaxis	**SSI %**	**Non-SSI %**	**RR**	**95% CI**	***P***
Once intra-operative	4	131	0.56	0.13-1.69	0.136
1st 24 hours postoperative	2	30	0.82	0.23-2.13	0.336
48 hrs postoperative	2	8	0.136	0.19-1.36	0.268
≥ 48 hrs postoperative	4	4	1.22	0.11-0.65	0.002*

RR, relative risk; CI, confidence interval .*p*, significant at 95%

Multi-microbial > one microorganism

Mono- microbial = one microorganism

Negative culture = no pathogen

Wound class:

1 = clean

2= clean contaminated

3= contaminated

4= dirty

We used the statistical package SPSS v.20.0 for statistical analysis. Bivariate analysis was used to compare quantitative variables, Student t test or Mann-Whitney U test was used for between- group differences, prior normality test or Mantel-Haenzel to calculate relative risk (RR). To analyze factors associated with the bivariate analysis or clinically important for SSI, Cox multivariate analysis was done for proportional risks and an adjusted RR was obtained.

4. DISCUSSION

Infections following C-sections occur with ten times the frequency of vaginal deliveries. The most significant ones involve operative site (Endomyometritis) and surgical site infections. Post cesarean infections vary widely by institution, from approximately 3%- 85% and the incidence of wound infection from 2%-16% [10].

C-section procedure was selected, to monitor and report upon the incidence of SSI at Assuit university maternity hospital. Among the study patients (n=285), there were 165 (57.89%) elective (clean / class I wound) and 120 (42.1%) emergency (Clean Contaminated/ class II wound) C- sections performed. Variable rates of post C-section SSI were previously reported in literature. Our SSI surveillance revealed a rate of 4.21% SSI which was comparable to other published rates. A rate of 4.8 % by Habib [11], 6.2% by Hulton et al [12]], 9.8 % by Tran et al [13], and 11.2% by Johnson et al [14].

The literature suggests that direct observation of surgical sites by trained Obstetrician is the most accurate method to detect SSI (15). Which was in consistence with our study, as, whenever the surveyors discovered at any time during the follow up phone call with the patient that there were any signs or symptoms related to infection, they asked the patient to visit the out patient clinic on the next day, to be examined by the professional physician. Our study sheds light on the importance of standardizing an appropriate method for post-discharge surveillance and benchmarks for further studies.

The validity of the information obtained from patients and physicians and whether the diagnosis of SSI can be based on this is a matter of dispute in several research studies. Seaman and Lammers (16) found that patients, despite using verbal or printed instructions, were unable to recognize infections. They reported that patients correctly identified their infections in only 11 cases, whereas medical examiners diagnosed infection in 21 wounds, and called into question the validity of data obtained using patient- returned questionnaires or telephone surveys. Whitenby etal, in their study, (17) however, demonstrated that patients can accurately diagnose the absence of a wound complication but are less accurate in diagnosing the presence of an infection.

There is contradictory evidence from studies regarding the association of emergency procedures with greater evidence of infection (18). In our study, there was a significant difference ($p < 0.05$) between SSI occurring among the emergency and elective C- sections as shown in (table 1) where (RR, 1.11; [CI95], 0.02-0.55; P= 0.0001). Our results was in accordance with that of Dedra et al (19) who found that infections in the emergency C-sections procedures had more than double the number of infections when compared to the elective procedures.

This finding could be attributable to the fact that in emergency cases membrane rupture and multiple vaginal examinations are frequent. There is also increased risk of bacterial contamination or breaks in sterile technique or lack of timely antibiotic prophylaxis. These findings have been reported in studies conducted in Ethiopia (20), India (21), and Nepal (22).

According to our hospital`s policy for antibiotic prophylaxis a single dose is given after umbilical cord clamping single dose allowed to be extended up to 24 hours according to the case. However, many surgeons, does not adhere to the policy and might continue for 48 hours and some times >48 hours. In the present study, the time of the post operative prophylaxis does not affect the incidence rate of SSI except for the patients received more than 48 hours, which was significant ($P < 0.05$) which might be attributed to the effect of antibiotics added to the effect of surgery stress, resulting in reduction of the person`s immunity and resistant which favors the infection. This factor needs further investigations.

In conclusion, this study has maximized the benefits from national surveillance activity at a local level. Post-discharge surveillance is an important element of ‘intensive’ surveillance if we are to achieve accurate infection rates. Analysis and feedback of the data should continue to act as a catalyst for review of practice aimed at reducing postoperative SSI rates, moreover, further investigation is required to test the relation between the prolonged post operative prophylaxis and the SSI rates among CS cases.

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 2, pp: (1723-1728), Month: May - August 2019, Available at: www.noveltyjournals.com

REFERENCES

[1] Birkmeyer JD, Dimick JB, Birkmeyer NJ (2004) Measuring the quality of surgical care: structure, process, or outcomes? J Am Coll Surg 198:626–632

[2] Chu KM, Ford N, Trelles M (2010) Operative mortality in resource-limited settings: the experience of Medecins Sans Frontieres in 13 countries. Arch Surg 145:721–725

[3] Schneid-Kofman N, Sheiner E, Levy a, Holcberg G. Risk factors for wound infection following cesarean deliveries. Int J Gynaecol Obstetric 2005; 90:10 –15.

[4] TRAN, S.T, SILOM, S.J., CHONGSUVIVATWON, G.V., AND GEATER. A. Risk Factors for Post-cesarean Surgical Site Infection. Infection Predictors 2000; 95 (3) MARCH: 367-371.

[5] Myles T D, Gooch J, Santo laya J. Obesity as an independent risk factor for infectious morbidity in patients who undergo cesarean delivery. Obstetric Gynaecol 2002; 100(5 Pt 1):959 –964.

[6] Mu .Y. Edwards .J.R, Torres .S.I and Fridkin . S.K. Improving Risk-Adjusted Measures of Surgical Site Infection for the National Healthcare Safety Network. Infect Control Hosp Epidemiology 2011; 32(10):970-986

[7] National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2004, issued October 2004. Is J Infecting Control 2004; 32:470-85?

[8] Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. Surgical site infection rates by wound class, operative procedure and patient risk index. National Nosocomial Infection Surveillance System, Am J Med 1991; 91:152S- 157S.

[9] Edwards J.R, Peterson K. D, Andrus M L, Dudeck M A, Pollock D A, Horan T. C. National Healthcare Safety Network (NHSN) Report, data summary for 2006 through 2007. Am J Infect Control 2008; 36:609-26

[10] Killian CA, Graffunder, EM, Vinciguerra TJ, Venezia RA. Risk Factors for Surgical-Site Infections Following Cesarean Section. Infect Control Hosp Epidemiologic 2001; 22: 613-7.

[11] Habib FA. Incidence of post cesarean section wound infection in a tertiary hospital, Riyadh, Saudi Arabia. Saudi Med J 2002; 23:1059-63. 15.

[12] Hulton LJ, Olmsted RN, Treston-Aurand J, Craig CP. Effect of post discharge surveillance on rates of infections and complications after caesarean section. Is J Infecting Control 1992; 20:198-201?

[13] Tran TS, et al. Risk factors for post cesarean surgical site infection. Obstetric Gynaecol March 2000; 95:367-71.

[14] Johnson A, Young D, Reilly J. Caesarean section surgical site infection Surveillance. Journal of Hospital Infection 2006; 1-6.

[15] Smyth ET, Emmerson AM. Surgical site infection surveillance. J Hosp Infect 2000; 45:173-184.

[16] Lammers R, Seaman M. Inability of patients to self-diagnose wound infections. J Emerg Med 1991; 9:215-219.

[17] Whitby M, McLaws ML, and Collopy B, et al. Post discharge surveillance: can patients reliably diagnose surgical wound infections? J Hosp Infect 2002; 52:155-160.

[18] Dedra K, Creedy RN, Denise L. Post discharge surveillance after Caesarean section. BIRTH; 2001; 28:4

[19] Wenzel R. The economics of nosocomial infection. J Hosp Infection 1995; 31: 79-87.

[20] Amenu D, Belachew T and Araya F. Surgical site infection rate and risk factors among obstetric cases of Jimma University specialized hospital, Southwest Ethiopia. Ethiop Journal of Health Science 2011 July; 21(2).

[21] 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; Volume 2013, Article ID 283025, 6 pages

[22] 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.